Indian Society of Remote Sensing

A collection of ISRS - Ahmedabad Chapter Newsletters 1987-2008

(Signatures)

ISRS

SILVER JUBILEE : 1983 - 2008
25 Years

Indian Society of Remote Sensing - Ahmedabad Chapter
Space Applications Centre, Jodhpur Tekra
Ahmedabad 380 015.

Indian Society of Remote Sensing

A collection of ISRS-Ahmedabad Chapter Newsletters 1987-2008

(*Signatures*)

ISRS

SILVER JUBILEE : 1983 – 2008

Indian Society of Remote Sensing – Ahmedabad Chapter
Space Applications Centre, Jodhpur Tekra
Ahmedabad 380015

The Indian Society of Remote Sensing
Ahmedabad Chapter

NEWS LETTER

Vol. 1, No. 1 **July 1, 1987**

C/o. Space Applications Centre, Ahmedabad-380 053.

The Indian Society of Remote Sensing, Ahmedabad Chapter (ISRS-AC) is pleased to present to the members this first issue of its Newsletter.

The main objective of the Newsletter is fast dissemination of relevant information to all members of the Chapter and also to serve as a forum for exchange of views.

The present plan envisages four issues a year.

An editorial committee consisting of :

Shri V. Tamilarasan	SAC	Editor
Shri R. P. Dubey	SAC	Member
Shri Mukund K. Rao	SAC	Member

has been constituted for the purpose.

The co-operation of all members is earnestly solicited to ensure this venture a success. Suggestions to improve quality of the contents and format may kindly be communicated to the Editor of the Newsletter, Shri V. Tamilarasan.

Dr. T. A. Hariharan
Chairman, ISRS-AC

MESSAGE

I am extremely happy to know that the Ahmedabad Chapter of the Indian Society of Remote Sensing is starting a Newsletter. This Chapter is not only the first and the largest Chapter of the Society, but has done commendable work during the last three years under the guidance of its erstwhile Chairman, Shri O P N Calla, in organising talks seminars etc. and also organised the last National Symposium in September 1986 on behalf of the Society. The Newsletter would hopefully keep the members of the Chapter well informed about events and developments of interest to them. It would strive to fulfil the objectives of the Society. I wish this venture a great success.

Dr. Baldev Sahai
President, I S R S

DEAR MEMBERS.....

We are extremely pleased to bring to you this FIRST ISSUE OF THE NEWSLETTER. We have made all efforts to make the NEWSLETTER as attractive as possible not only in its format but also in its contents. But, please note, our efforts have just begun.

We plan to bring to you, through this Newsletter, significant results of case studies, reports of various activities of the Chapter and the Society and also various departments/agencies engaged in remote sensing activity, training and educational programmes, forthcoming symposia/seminars/workshops, important books, important articles from Journals etc. We also plan to have a **LETTERS** section which will feature your comments and views. Further we would like to mention that this is your NEWSLETTER. We expect that each of you will contribute in some way or the other to the Newsletter. Your contribution could be in terms of a description of progress in work and significant results in your field or reporting some interesting feature which you think others should know or it could be through your letters which would not only give us encouragement but, we hope, would also initiate debates on various issues and matters. We very much look forward to your contribution in making this new endeavour of the Chapter a success.

In this issue of the newsletter, we are featuring the society, in general, and the Ahmedabad Chapter in particular. We have one case study on urban land use and also a report on the contribution by SAC to the scarcity programme in Gujarat. We also bring you information on forth comming events, trainings etc. and to end, we have included a complete list of members of the Ahmedabad Chapter as of date.

Lastly we would like to thank the Executive Council of the Chapter for having entrusted us the responsibility of bringing out the Newsletter. Though this job is new to us, we shall do our best to make this Newsletter a success. And, yes, we shall ensure that the Newsletter comes out in time.

—Editorial Committee

THE INDIAN SOCIETY OF REMOTE SENSING

The Indian Society of Photo Interpretation and Remote Sensing (now renamed as Indian Society of Remote Sensing) was conceived by the staff members of the Indian Photo Interpretation Institute (now renamed as Indian Institute of Remote Sensing), Dehradun and scientists/officers from different state and central government organisations in the year 1969.

The main aims and objectives of the Society are :

- To help towards advancement, dissemination and application of the knowledge of remote sensing technology which is deemed to include photointerpreation, photogramm etry, aerial photography, image processing and other related technologies in the field of survey, planning and management of natural resources and other areas of applications where the techology is considered to be appropriate.
- To promote interaction among all persons, bodies, institutions (private and/or state-owned) and industries interested in achieving advancement, dissemination and application of technology as mentioned above.
- To encourage research in remote sensing and related technologies.
- To undertake and execute all acts which shall promote all or any of the aims and objectives of the Society.

Technical Meetings

The topics for the Society's meetings are chosen from the whole range of remote sensing activities. There is an annual conference/symposium on a selected theme, the proceedings of which are published by the Society.

Publications

The Journal of Indian Society of Remote Sensing (Photonirvachak) is the official journal of the Society. The Editor and an Editorial Board are appointed by the Society to oversee the technical contents of the publication.

Local Chapters

As per the constitution of the Society, the local Chapters can be established in response to the request of atleast 15 members from a town or a city. Area lying within 40 km of a town can be included in the jurisdiction of a Chapter. Each Chapter shall conduct its affairs in accordance with the Memorandum and the rules and regulations of the Society.

The Constitution of the Society is to be shortly published in the Journal of ISRS.

THE AHMEDABAD CHAPTER

The first local Chapter of the Society was established in the great cityof Ahmedabad in December 1983. The Chapter which had 33 members in the beginning has grown to 123. This Chapter has members drawn from various institutes, agencies and Government departments in and around Ahmedabad.

Some of the significant activities organised in the short span of time of the Ahmedabad Chapter are :

I A one-day seminar on **Utilisation of Remote Sensing in Gujarat** to mark the occasion of the inaugration of Ahmedacad Chapter on May 1, 1984

II A popular talk on **Satellite Remote Sensing** by Dr. K Kasturirangan, Project Director, Indian Remote Sensing Satellite in June 1984 on the occasion of the fifth anniversary celebration of Bhaskara-1, launch.

III Two scientific film shows titled **Remote Sensing in Mineral Exploration** and **Assessment of Vegetation Using Remotely Sensed Data** in the months of July and August 1984 respectively.

IV A half day panel discussion on **Role of Remote Sensing for Regional Development in Gujarat** on December 12, 1984.

V A two-day symposium on **Remote Sensing in Agriculture** during February 27-28, 1985.

VI A one-day National Seminar on **Remote Sensing of Water Resources** was organised jointly by IWRS and the Ahmedabad Chapter on December 27, 1985.

VII A National Symposium on **Remote Sensing in Geology** during September 17-19, 1986.

Dr. V. K. Dadhwal, Congratulations !

The ISCA young scientist award for the best presentation in Agriculture Section has been awarded to Dr. V. K. Dadhwal, one of our members for the presentation of a paper entitled **Estimating Quantitative Relation Between Environmetal Factors and Growth, Development and Yield of Wheat** at 74th Session of Indian Science Congress Association (ISCA) at Bangalore during January 3-8, 1987. The award includes Rs. 500/-cash, a certificate of appreciation and Rs. 2,500/- as research grant.

STOP PRESS : IRS NEWS : STOP PRESS

The payload for the first of the Indian Remote Sensing Satellite is ready. It was regently "flagged" of by Director, SAC to be airlifted to Bangalore for its integration with the satellite. The payload is made up of two Linear Imeging Self Scanners, LISS-I with 73 m. resolution and LISS-II with 36.5 m. resolution. The payload was developed by the payload project team at SAC. The IRS-1 is scheduled for launch in the end of this year.

CASE STUDIES

1. REMOTE SENSING OF URBAN LAND USE

In order to update the urban land use, examine the urban growth pattern and to suggest future pattern of urban land use by way of development plan and town planning schemes, the Town Planning and Valuation Department (TPVD), Government of Gujarat and the Space Applications Centre (SAC), Ahmedabad took up a joint venture to map the urban land use and monitor the urban spread of Surat city using remotely sensed data.

The aerial colour infrared and black-and-white photographs were interpreted for detailed mapping of urban land use such as transport network, slum typology, quality and density of housing, residential enchroachment on agricultural land and open space in the city. It is found that in general the direction of growth is along the transportation network on north east and southwest direction.

Landsat data of Surat City and its envrions, acquired during December 1978 and May 1984, were analysed employing visual as well as digital techniques for monitoring the changes in urban land use. It was found that during the period 1972–1984, the urban areas of Surat city has increased by 88 per cent.

Realising the potential of remotely sensed data through the case study of Surat city, now the TPVD has taken up a project to prepare regional plan for South Gujarat Region (Bharuch, Surat, Valsad and Dangs districts). The main objectives of this study is to study settlement pattern, transportation network, land use/cover and natural resources. The end result of this study will help evolve a strategy for a balanced Regional Development Plan for the year 2001. (For further details please contact : Shri Shirish Avarani, TPVD/ Shri M H Kalubarme, SAC, Ahmedabad.)

2. REMOTE SENSING WORK CARRIED OUT FOR SCARCITY PROGRAMME OF THE GOVT. OF GUJARAT BY SPACE APPLICATIONS CENTRE, AHMEDABAD

As a sequel to the discussions held with the Secretary, Water Supply, Health and Family Welfare and Chief Engineer (Mech) Gujarat Water Supply and Sewerage Board (GWS & SB), the interpretation of satellite imagery for identifying potential ground water bearing areas was taken up on priority basis at SAC.

The interpretation involved the enlargement of the Landsat TM imagery to 1:50 000 scale and transferring the ground water potential features onto the Survey of India topographical maps at 1;50,000 scale. Potential pockets of ground water around villages were identified. Hydrologists and Gelogists from the concerned districts were apprised of the information extracted and also of the inferences drawn.

In all, work for seven districts comprising about 400 villages was completed by April, 1986.

After geohydrological and geophysical surveys 150 mm. diameter borehole drilling was carried out in the indentified areas. The results reported in the second meeting of the high power action group of the Government of Gujarat for drinking water scarcity shows saubstantial increase in success rate (68.12% as against 45% last year). For further details contact Dr. Baldev Sahai SAC.

ANNOUNCING

National Symposium on **Remote Sensing in Land Transformation and Management** alongwith the Annual Convention of the Indian Society of Remote Sensing, will be held at the National Remote Sensing Agency, Balanagar, Hyderabad during December 21–23 1987.

For details contact :

Dr. L. Venkatratnam
Organising Secretary for the National Symposium & Head Soils Division
National Remote Sensing Agency
Balanagar,HYDERABAD–500 037(A.P.)

FORTH COMING EVENTS

September 1987

7-11 Advances in Digital Image Processing, Annual Conference. Contact : Dr. P. M. Mather, 1987 RSS Conference Organiser, Department of Geography, University of Nottingham, Nottingham, NG7, 2RD. England.

14-18 4th Australian Remote Sensing Conference. Contact ; Mr. L. Michael, Secretary South Australian Centre for Remote Sensing, Innovation House, Ist Ave, Technology Park, The Levels, South Australia 5095, Australia, Telex AA 88556,

22-24 Third Conference and Exhibition on Sensors and their Applications, at Institute of Physics, Meetings Officers, 47 Belgrave Square, London, SW1 X 8Q X UK.

October 1987

26-30, 21st International Symposium on Remote Sensing of Environment Environmental Research Institute of Michigan (ERIM), Ann Arbor, MI 48107.

November 1987

24-26, Seventh Indian National Cartographic Association Conference at Space Applications Centre, Ahmedabad 380053

December 1987

21-23 National Symposium on Remote Sensing in Land Transformation and Management along with the Annual Convention of the Indian Society of Remote Sensing at NRSA, Hydeabad.

21-24, National Space Science Symposium : Special Session on Science of Remote Sensing to be held at Physical Research Laboratory, Ahmedabad 380009.

March 1988

28-31, Sixth Thematic Confrence on Remote Sensing for Exploration Geology at Houston, Texa, Contact : Thematic, Conformate Environmental Research Institue of Michigan (ERIM), P. O. Box 8618, Ann Arbor, MI 48107.

EDUCATION AND TRAINING

TRAINING :

The following two training programmes are schedule by NRSA :

- Third Training Course (8 weeks) on Remote Sensing Applications from October 21 to December 17, 1987
- 5-day appraisal course on Applications of Romete Sensing Second Course September 7-11, 1987

For details please write to Dr. R S Ayyangar, Head Training Division, National Remote Sensing Agency, Balanagar, Hyderabad 500 037, Phone : 262572, Gram : REMOSEN, Telex : 0155–6522

EDUCATION

The library of the Space Applications Centre (SAC) has a few video films and movies on various topics of remote sensing A list of these is given below.

Video Films

1. The Role of Pattern recognition in Remote Sensing
2. Spectral properties of soils
3. Correction and enhancement of digital image data
4. The remote sensing information system

Movies

1. Remote Sensing : Minerals
2. Remote Sensing : Vegetation

USEFUL REFERENCES

A list of books that could serve as useful references is given below :

1. Remote Sensing Today's solutions for tomorrow's information needs, IGARSS, ESA SP-254 three volumes. Edited by T. D. Guyenne and J. J. Hunt Published by ESA publications division, C/o. ESTEC, Noordwijk, The Netherlands, Price Dollars 90.

2. Wildlife Habitat Evalution Using Remote Sensing Techniques 1986. Edited by D. S Kamat and H S. Panwar IIRS and Wildlife Institute of India, Dehradun.

3. Remote Sensing and Tropical Land Management. 1986. Edited by M. J. Eden and J. T. Parry Chichester, A John Wiley Publication Price Pounds 37.00

4. Results from the Joint Indo-Soviet Remote Sensing Experiment TERRA Onboard Salyut-7 Special Publication No. ISRO-SP-17-86 Edited by T. K. Alex. V. Aruna Rao and T. A. Hariharan 299 Pages Published in 1986 by :- Publications and Public Relations Unit India Space Research Organisation HQ. Cauvery Bhavan, Bangalore-560 009

5. Extraction of Information from Remotely Sensed Images published by American Society for Photogrammetry and Remote Sensing, 210, Little Falls st . Falls Church, Virginia-22046, USA, Price Dollars 30.

6. Setellite remote sensing for resource development, 1986 Edited by K H Szekielda Pulished by Graham Trotmen Ltd, London Price Pounds 37 50

INDIAN SOCIETY OF REMOTE SENSING

EXECUTIVE COUNCIL 1987-89

President	Dr. Baldev Sahai, SAC. Ahmedabad
Vice-Presidents	Dr. R V Rama Rao, INCOR, Visakhapatnam
	Dr. M L Manchanda, IIRS, Dehradun
Secretary	Shri S K Bhan, IIRS, Dehradun
Joint Secretary	Shri A N Singh, RSAC UP, Lucknow
Treasurer	Dr. Jitendra Prasad, IIRS, Dehradun
Members	Dr. B S Sangwan, HAU Hissar
	Dr. M S Kuhad, HAU, Hissar
	Shri G S Oberoi, SOI, Chandigharh
	Shri Y V S Murthy, CSRE, IIT Bombay
	Shri K M Saini, AIS&LUS, New Delhi
	Dr. T A Hariharan, SAC Ahmedabad (Zonal Representative from Western Zone)
	Dr. D P Rao, NRSA, Hyderabad, (Zonal Representative from Southern Zone)
Ex-officio	Dr. L R A Narayan NRSA, Hyderabad

AHMEDABAD CHAPTER

EXECUTIVE COUNCIL 1987-1989

Chairman	Dr. T A Hariharan. SAC, Ahmedabad
Vice-Chairman	Dr. R T Shukla, DGM, Ahmedabad
Secretary	Dr. S R Nayak. SAC, Ahmedabad
Joint Secretary	Mr. D M Pancholi, CDO, Gandhinagar
Traesurer	Mr. Tej Pal Singh, SAC Ahmedabad
Members	Mr. J V Bhatt, DGM, Ahmedabad
	Mr. R N Jadhav, SAC, Ahmedabad
	Mr. J S Parihar, SAC, Ahmedabad
	Mr. H N Parikh, GWRDC, Ahmedabad
	Mr. S V Thakur, Town Planning, Ahmedabad
	Dr. G R Vekaria, LD Engg. College, Ahmedabad
Ex-officio	Mr. O P N Calla
Permanent Invitees	Prof. P D Bhavsar, PRL, Ahmedabad
	Dr. Baldev Sahai, SAC, Ahmedabad
	Shri J F Mistry, Irrigation Dept, Gandhinagar

LIST OF MEMBERS OF AHMEDABAD CHAPTER

The list of the members of the Ahmedabad Chapter has been compiled from the regular mailing list, as of May 1987. This list will not be included in the subsequent News Letters. New members who join the Chapter after May 1987 will be listed in the subsequent issues. Please inform us if any names are missing so that they can be included in the mailing list immediately.

LIFE - MEMBERS

A. Space Applications Centre, Ahmedabad-380 053

Dr. Ajai
Dr. Baldev Sahai
Dr. Bardhan M.
Shri Bhatnagar G. C.
Shri Calla O. P. N.
Dr. (Ms.) Chaturvedi Neera
Shri Dasgupta A. R.
Dr. Desai Pranav
Dr. Dhinwa P. S.
Shri Dubey R. P.
Shri Dwivedi R. M.
Shri Garg J. K.
Shri Goel R. K.
Shri Gopalan A. K. S.
Dr. Hariharan T. A.
Shri Jadhav R. N.
Shri Kalubarme M. H.
Shri Kandya A. K.
Shri Kulkarni A. V.
Shri Mehta N. S.
Dr. Muley M. V.
Dr. Naik S. D.
Dr. Narain A.
Dr. Navalgund R. R.
Dr. Nayak S. R.
Dr. (Mrs.) Panigrahi Sushma
Shri Parihar J. S.
Shri Patel N. K.
Shri Pillai N. S.
Shri Rao Mukund K.
Dr. Sharma Ravi
Dr. Shivmohan
Shri Singh T. P.
Dr. Sood R. K.
Shri Tamilarsan V.
Shri Thakkar P. S.

B. Directorate of Geology and Mining, Ahmedabad-380 0016

Shri Bhatt J. V.
Shri Joshi C. K.
Shri Madhukara N.
Shri Naik K. K.
Shri Patel J. M.
Shri Pathole B. P.
Dr. Shukla R. T.
Dr. Talati D. J.

C. Physical Research Laboratory, Ahmedabad-380 009

Prof. Bhavsar P. D.

D. Gujarat Maritime Board, Ahmedabad-380 016

Shri Desai Vikasin

E. Dept of Physics., Ahmedabad-380 009

Prof. Verma S. D.

F. Indian Institute of Management, Ahmedabad-380 015

Prof. Madhavan T.

G. Irrigation Dept, Gandhinagar-382 010

Shri Mistry J. F.

H. Gujarat Water Resources Dev. Corpn, Gandhinagar-382 010

Shri Sharma S. C.

I. GEER Foundation, Gandhinagar-382010

Shri Agarwal J. P.

J. Others From Ahmedabad

Dr. Bhatt Panubhai
Shri Patel M. M.
Shri Raval H. M.
Shri Shukla Pradeep

ANNUAL MEMBERS

A. Space Applications Centre, Ahmedabad-380 053

Miss Advani Sonia
Shri Andharia H. I.
Shri Arya Ashutosh
Dr. Basu Aparna
Miss Beenakumari
Shri Bhatt H. P.
Dr. Chakraborty Manav
Shri Chauhan H. B.
Dr. Dadhwal V. K.
Shri Das Bhaskar
Miss Dwivedi Kavita
Dr. Ghosh R.
Dr. Gupta M. C.
Shri Ilanthirayan S.
Shri Jothimani P.
Mrs K. S. Sudha
Dr. Kimothi M. M.
Shri Lole B. S.
Shri Majumdar T. J.
Shri Mallick K. D.
Shri Mankodi P. C.
Shri Mathur K. M.
Miss Mehta Jagruti
Shri Mehta Ramlal
Shri Murthy E. S.
Dr. Murthy K. V. S.
Shri Murthy T. V. R.
Dr. Nandkumar R.
Shri Narayana A
Shri Padia K. N.
Dr. Palria S.
Miss Pandeya Anjali
Shri Pandya R. M.
Dr. Pathak P. N.
Shri Pathan S. K.
Dr. Pokhrana S. S.
Dr. Potdar M. B.
Shri Rajawat A. S.
Dr. Ramani R.
Shri Rao R. S.
Shri Ravi N.
Shri Roy C. L.
Dr. Saratbabu G. V.
Shri Shaikh M. G.
Shri Sharma A. K.
Shri Sharma Rajeev
Shri Sharma S. K.
Mrs. Sharma Tara
Shri Solanki H. U.
Dr. Shridhar V. N.
Dr. Srivastava V. K.
Dr. Thakur S. S.
Miss Vanikar Yogini
Miss Vora Ketki
Dr. Vyas N. K.

B. Central Ground Water Board, Ahmedabad-380 009

Shri Arunkumar
Shri Purchure P. K.

C. Town Planning & Valuation Dept., Ahmedabad-380 006

Shri Avarani Shrish

D. L. D. College of Engineering, Ahmedabad-380 009

Dr. Vekaria G. R.

E. M. G. Science Institute, Ahmedabad–380 009

Prof. Dave V. D.
Shri Pandya G. B.
Shri Shah R. D.

F. Public Health Dept., Ahmedabad-380 014

Shri Shukla R. N.

G. Central Designs Organisation, Gandhinagar-382 010

Shri Pancholi D. M.

H. Others From Ahmedabad

Shri Ayachit Vijay
Shri Mehta Kaushik S.
Mrs. Mohini S. P.
Shri Parikh H. N.
Shri Patel B. P.
Shri Thakur S. V.

J. K. Garg,

The Indian Society of Remote Sensing
Ahmedabad Chapter

NEWS LETTER

VOL. 1 No. 2
and
VOL. 2 No. 1

January 1, 1988

Dear Member,

We bring to you this issue of the newsletter-a combined second and third issue. We had to take course to this step (of combining the second and third issue) due to unavoidable circumstances. We tried our best to bring to you the second issue in October 1987, but once we slipped (considerably, we feel) we thought it better to combine the second issue with the third one. As a result, we have for you an expanded third issue packed with more articles/information/news.

Going back to the first issue, we have received encouraging responses and some useful suggestions to make this newsletter and its contents more interesting. The first thing we decided was to make the newsletter more colourful and so we thought of using colour pages. The ISRS logo also finds place in the masthead and also the print style is better. We hope that these changes have improved the image of the newsletter.

In this issue, we have for you two case studies-one on Forestry applications and another on Coastal (pertaining to the coastal problems of Gujarat). Both the case studies are typical examples of the utility of remote sensing techniques in the respective application areas. We have two departmental reports by DGM, Gujarat and GERI, Vadodara on their remote sensing activities. A new feature – **Satellite Update** - brings to you the latest information in the field of remote sensing satellites (both present and planned). The routine features on forthcoming events, books/journals etc. are also included. A report on the society/chapter activities is also included.

Some of our members have voiced their concern on not finding their names in the membership list published in the first issue. One member has expressed doubts whether only senior people's names are to be included. Believe us, the missing names were unintentional and there is no senior-junior concept. In this issue, we have an addendum to the members list where we hope all the names are included. In addition, we have for you a list of the society members from Gujarat (other than those from Ahmedabad) which you may find useful.

We wold like to once again request all of you to contribute articles/views/reports etc. which could be included in the forthcoming issues of the newsletter. In particular, we would like to include departmental reports from other organisations on their activities in remote sensing. And please do send in your views on the newsletter-its format, content, reading etc

Lastly, though late, we wish you all a happy new year !

—Editor

CHAPTER ACTIVITIES

FILM SHOWS ON REMOTE SENSING IN MINERAL EXPLORATION

The Ahmedabad Chapter of Indian Society of Remote Sensing had arranged the screening of three short films at the lecture theatre of the Physics Department of Gujarat University on September 12, 1987. The films titled "Treasures of the Earth", "Rocks and Minerals" and "Remote Sensing in Mineral Exploration' were shown with the courtesy of the Directorate of Geology and Mining and the Space Applications Centre. These films depict how the minerals and rocks had been formed in the earth, how one can identify the minerals, rocks and the methods and techniques at several stages for the exploration of minerals. This was followed by a question and answer session in which Dr. R. T. Shukla and Shri V. Tamilarasan gave explanation to the queries raised by the audience.

ANNOUNCEMENT

Seminar on Remote Sensing Activities in Gujarat

The recent advances in the application of Remote Sensing techniques for exploration, monitoring and management of natural resources, are being promptly adopted by the Gujarat Government with significant success. The Gujarat Engineering Research Institute (GERI) in Baroda has been identified as the nodal agency to coordinate these activities. GERI, in collaboration with the Indian Remote Sensing Society, Ahmedabad Chapter (ISRS AC) is organising a one day Seminar on the **Remote Sensing Activities in Gujarat** during March 1988, the details of which are given below.

Objectives :

The main objective of the Seminar is to bring together the various groups involved in remote sensing activities in the State, and to provide a forum for exchange of information on the status of the activities.

Themes :

The following themes are expected to be discussed :-

- 0 Groundwater Exploration
- 0 Land use and Land cover Mapping
- 0 Wasteland Mapping
- 0 Crop Production Forecasting
- 0 Crop Stress Detection
- 0 Crop Yield Modelling
- 0 Salinity/Water logging
- 0 Coastal Environment
- 0 Forestry
- 0 Town Planning and Urban Land Use

Exhibition

An exhibition (of maps, satellite imagery, activities of the Gujarat State Remote Sensing Organisation) is also planned on the same day.

Correspondence

All correspondence connected with the Seminar and registration may please be sent to :

Dr, B B Jambusaria
Organising Secretary
Gujarat Engineering Research Institute
Vadodra-390 007.

Gram : RESEARCH

Phone : 327213-14-15, 3266876, 326891.
325283 (Direct), 323497 (Residence)

'LAKSHMI NARAYAN CALLA ENDOWMENT' LECTURE

The "Laxminarayan Calla Memorial Lecture" has been started as generous financial support was received from Shri O. P. N. Calla. It is planned to invite an eminent person to deliver a talk on subjects related to natural resources and remote sensing. This year, Prof P. R. Pisharoty was invited to deliver this memorial lecture on 'Remote Sensing of Ocean Floor Topography'. Summary of this lecture (delivered on 30 Dec. 1987 at Space Application Centre) is given below.

SEASAT was a remote sensing satellite designed to assess the value of micro wave sensors for the remote sensing of the worlds oceans. It may be recalled that our Bhaskara satellite carried a microwave sensor designed and fabricated by Prof O P N. Calla of SAC. One of the important sensors carried by SEASAT was a radio altimeter (13.5 GHz, pulse width 3 nano seconds) for measuring the sea-surface heights, with a precision of 10 cms (Root Mean Square). It took data for 70 days, 14 tracks each day.

Through appropriate filtering, data on the height of the marine geoid in the wavelength region 30 km to 300 km were obtained. Using known bathymetry data for a couple of tracks, algorithms were generated for the determination of bathymetry over the rest of the oceans, mostly unsurveyed in the conventional way with echosondes and ships.

The development of the algorithm is a highly skilled job, involving ' time series" analysis and geophysical theories. These were briefly described by Prof. Pishroty. The final global bathymetric map was reasonably good. Based on the success of SEASAT (and the analysis of data obtained), two remote sensing satellites for the measurement of sea surface topography are being planned for launch in 1991--the Navy Remote Ocean Sensing System (N-ROSS) and Ocean Topography Experiment (TOPEX).

GUJARAT FROM SPACE :

GUJARAT FROM SPACE is the name of the publication that the ISRS Ahmedabad Chapter has been planning to bring out for quite some time. The idea of having such a publication has arisen from the fact that, although a lot of work using remote sensing techniques has been done by various departments/agencies in Gujarat, there is no single source where information on the work done can be obtained either as a reference or as a record. The information, presently, lies scattered in various reports/journals etc

The aim of the Ahmedabad Chapter is to bring out a comprehensive publication on the work done in Gujarat in all the fields of natural resources till now. The Chapter proposes to have this publication ready towards the end of 1988.

A set of five major chapters have been identified as the broad framework of the publication. Within these, there are specific topics on which details/case studies etc. can be prepared/compiled. The Executive Council has decided some of the topics for the five main chapters. This is given in the table below.

The Chapter requests from its members suggestions or guidelines so as to finalise the framework of the publication.

LIST OF SUGGESTED TOPICS

CHAPTERS	SUGGESTED TOPICS
1. Water Resources	(i) Ground water studies (ii) Ukai catchment studies
2. Agriculture & Land Use etc.	(i) Waterlogged and saline areas in command areas (ii) Desertification (iii) Soils (iv) Crops (v) Wasteland Mapping (vi) Urban Land use and Town Planning
3. Forestry	(i) Forest mapping and change detection
4. Geology	(i) Mineral Exploration
5. Marine Applications	(i) Coastal Environmental studies

CASE STUDIES

1 Monitoring of Afforestation and Deforestation on Compartment Level through Remote Sensing

Increasing industrialisation and growing human population are drastically altering the landscape. Forest land is cleared for industrial development, transportation, public utility lines and quite often for agriculture. These anthropogenic changes and the changes created by natural catastrophes such as fire, insect infestation, disease and floods must be measured/monitored periodicially to keep the forest information updated and useable for decision making.

Forest mapping and damage detection project (FMDD) is one of the experimental applications project under the Indian Remote Sensing Satellite Utilisation Programme (IRS-UP). One of the objectives of FMDD is monitoring of afforestation and deforestation.

Monitoring of vegetation change through remote sensing has received attention recently and most of the work is confined to temporal registration and digital analysis of Lancsat data.

The study was carried out on monitoring of afforestation and deforestation at compartment level in Matin and Jatga blocks of the North Bilaspur forest division of Madhya Pradesh by the visual analysis of multi-temporal Landsat data (Nov. 1972, Feb 1975 and Nov. 1985).

Forest blank areas in different compartments of Matin and Jatga blocks in the years 1972, 1975 and 1985 are demarcated. Afforestation and deforestation maps are prepared on 1:63, 360 scale.

It was found that the total forest blank area was more in the Matin block in all the three years. It was 701.0, 596 4 and 733.9 ha. area in the years 1972, 1975 and 1985 respectively. In Jatga block, the forest blank area was 90.8, 249.6 and 75.5 ha. for the respective years. When the aggregate for the two years is considered, maximum blank area, of 791.9 ha. was recorded in 1972. By 1975, the blank area had increased by 54.2 ha. (846.05 ha. total). But by the year 1985, 809. 4 ha remained blank. Over all net vegetation loss between 1972 and 1985 was 17.6 ha. which is 0.2% of the total forested area (8,941 ha.).

It is found that during 1972-1975 in Jatga block, 14 compartments have undergone deforestation (total area 163.4 ha. out of 3150 ha. total forested area) and only two compartments showed afforestation (area 4.8 ha.). In Matin block, for the same period, number of compartments showing afforestation and deforestation are 9 and 12 respectively. In this time frame in Matin block 230.6 ha. area was reclaimed and 125.7 ha. area was lost. Between 1975 & 1985 Matin block recorded more deforestation and Jatga block underwent afforestation Total deforested area in Matin block during this period was 198.6 ha. and total afforested area in Jatga block in the same period was 186 0 ha. Out of the 16 compartments of Jatga block, during 1975-1985, only one compartment (No. 96) recorded deforestation.

The reason for studying both short peroid (1972-1975) and long period (1975-1985) was to determine whether recorded changes from 1972 to 1985 were similar to the sum of the recorded changes from 1972 to 1975 and from 1975 to 1985 But due to different degress of afforestation and deforestation measures from time to time, an exact agreement could not be expected. For example, a compartment recorded deforestation in the fitst period (1972-1975) and afforestation in the second period (1975-1985) still showed deforestation in the overall long period because the original loss was much greater than the latter gain (compartment number 95 of Jatga block). The vice-versa was also observed.

From the vegetation changes recorded, it is possible to deduce the causes with some degree of reliabiiity. For example, in the

present study maximum blank areas was recorded in the year 1975. This may be due to hectic activity of the the preparatory work of Hasdeo Bango project work during this period. Thereafter, vegetation might have been restored and perhaps this may be the reason for recording less blank area in 1985 than in 1975.

For further details on above case study contact Shri R. N. Jadhav, RSA, SAC, Ahmedabad.

2. COSTAL ENVIRONMENT

The costal environment is very dynamic and governs industrial, engineering, commercial and recreational activities conducted in this environment. Remote sensing data, because of its repetitive and synoptic nature, is useful in the study of various parameters of the coastal environment like coastal currents, chlorophyll, wetlands, shoreline changes, landforms, tidal boundary, offshore bars and underwater features, suspended sedin ents, ocean dumping, waste outfalls, oil pollutions etc.

Various studies related to many of the above cited parameters were conducted at the Space Applications Centre. These studies wera carried out using Landsat and/or Salyut-7 data of the coasts of Gujarat and Orissa. Studies have been also taken up on the Karnataka and Kerala coast under IRS-UP.

Coastal currents and fronts were mapped using Landsat MSS band 6 data, supplemented with band 7 data in the Gulf of Khambhat. It was observed that they are strongly influenced by tides.

Wetland mapping was carried out in the Gulf of Khambhat, Gulf of Kachchh and in the Mahanadi delta using visual as well as digital techniques. It was observed that mangroves are dwindling on the Gujarat coast and the Orissa coast. This is very alarming as they provide :

(i) nutrients to the sea water,

(ii) habitat for shrimps and crabs etc., and

(iii) protection from sea erosion.

Coral reef area in the Gulf of Kachchh have also reduced considerably owing to high turbidity in water.

Shoreline changes were mapped (1972-84) mainly in the Mahi, the Narmada and the Tapi estuaries. Complex erosional and depositional changes were noticed in the Mahi estuary. These erosional changes are threatening the existance of the cooling pond at the Dhuvaran Thermal Power Station. The possible reason for these changes is the construction of dams on the Mahi and its tributary. In Narmada estuary, depositional changes are more pronounced than erosional changes.

Coastal landforms have been also mapped using False Colour Composites made using Landsat MSS bands 4, 5, and 7 on 1,250,000 scale. Strandlines were demarcated on the Saurashtra coast based on white bands of milliolite rocks. The sudden truncation of paleoriver channels are clearly visible on the imagery. High tide flats, intertidal slopes, subtidal zone, paleomudflats etc. were delineated in the Gulf of Khambhat area.

Suspended sediments were mapped for the Gulf of Khambhat using density slicing techniques. These maps show that concentration of suspended sendiments is largely dependent on the tidal and seasonal conditions. It is concluded that Landsat MSS data allows broad coastal wetland as well as landform mapping, and provides interesting information on estuarine circulation and water quality.

For further details, please contact Dr. S. R. Nayak, RSA, SAC, Ahmedabad.

Dr. George Joseph, CONGRATULATIONS !

Dr. George Joseph, one of our esteemed member, was awarded the National Academy of Sciences, India award in the field of Instrumentation for the year 1986 This was in recognition of his work in the development of a number of sensors for remote sensing satellites. The award is sponsored by The Scientific Instrument Company (SICO). Dr. George Joseph is currently the Deputy Director (Remote Sensing) at the Space Applications Centre, Ahmedabad. We take this opprtunity (though late) to congratulate Dr. George Joseph !

REPORTS FROM ORGANISATIONS/DEPARTMENTS

1. Report on Remote Sensing Activities in Directorate of Geology and Mining Gujarat

The Directorate of Geology and Mining (DGM) Gujarat has been using remote sensing techniques for quite some time - both in its day to day mapping activities as also in research and collaborative projects. The DGM has a collection of aerial photographs (for almost the whole of Gujarat) and also Landsat images (of parts of Gujarat). The Directorate has facilities for interpreting these data sets-mainly visual aids and also a group of trained officers in photogeology and remote sensing. The highlights of the remote sensing activities are described below.

In 1986-87, the DGM took up a campaign for photogeological and photo-geomorphological mapping of parts of Ahmedabad and Sabarkantha districts-mainly around Dehgam and Modasa. Aerial photographs for an area of 1050 sq kms on 1:50,000 scale were interpreted using stereoscopes and othes aids. Various structural feature (faults, folds, hog-backs, etc) and gemorphological features (rills, gullies, piedmont zone etc) could be easily mapped from the photographs. As the drainage pattern is controlled by these structural and morphological features, the drainage was taken as an aid to identify the various features. Bauxite and Trap exposures and the Aravalli super group rocks could be delineated, while much of the area is alluvium. The Bauxite exposures were then checked in the field and was observed that they were restricted to the river banks of Mazam and Watrak rivers. It was found that the Bauxite deposits of Kapadwanj and Powali villages are of potential for exploration. Detailed surveys are recommended for this area.

As part of collaborative work with Space Applications Centre (SAC), DGM was involved in two major areas :-

(a) Using ground based reflectance data as a tool for geological mapping from aerial multispectral scanner data. Ground based reflectance data in about 25-30 regeions of the visible and near IR spectrum were collected in the field (in Ambamata) using a portable spectroradiometer (deve loped by ISRO Satellite Centre, Bangalore) and these were then filtered to represent various sensor bands. These band values were then analysed using linear discriminant techniques. The concept was to develop a discriminant function (which uses these band values as also their possible ratios) which could best identify the different rock types in the area. The function was tested and results were found to be very encouraging. However its actual utility for mapping using acrial sensor data is yet to be done.

(b) Implementing a Mineral Exploration Information System (MEIS) as a case study for the Natural Resources Information System (NRIS). The Geographic Information System (GIS) package--MAPS Analysis package-was used for this case study. Geochemical data (copper, lead and zinc counts) rock type data and elevation data were digitised (manually) into grids for a small area in Amba Mata. Manipulation techniques were chalked out and the potential mineralised area delineated.

For details on the above please contect: Director, Directorate of Geology and Mining, New Mental Hospital Building Ahmadabad-380 016.

2. Remote Sensing Activities at Gujarat Engineering Research Institue (GERI)

The GERI has become the focal agency for all remote sensing activities in Gujarat. The Government of Gujarat has decided to set up a **Gujarat State Remote Sensing Organisation (GSRSO)** at GERI. As part of setting up this organisation, Director GERI has had

a series of meetings with many other departments under the Government of Gujarat, mainly to take stock of remote sensing activities/ projects being done by each of them. Ultimately, all of these would be brought under the umbrella of GSRSO. Further, the GERI has gone ahead with plans of setting up the GSRSO and has procured the following instruments for visually analysing remotely sensed data (from satellite and aircraft) :

(a) Large Format Optical Enlarger

(b) Optical reflecting projector

(c) Diazo printer

(d) Mirror stereoscope

(e) Sketch master

(f) Light tables

Apart from this, different types of data products colour composites (prints on 1:250,000 and 1:50,000 and diapositives on 1:1 M scale), band 7 product (paper print on 1;250 000) for the entire state of Gujarat have been procured from NRSA and archived.

Apart from its focal point role in setting up GSRSO, the GERI has also been actively involved in some important projects, mainly in collaboration with Department of Space (DOS). These are described below :

(a) Monitoring of Costal Environment-a project under the IRS Utilisation Programme is undertaken in joint collaboration with Space Applications Centre, Ahmedabad. The coastal process and the environment in the Mahi and Narmada estuaries are being studied in this project. The overall aim of the project is to develop a methodology for monitoring the coastal environment using remotely sensed data.

Aerial survey has also been conducted over Mahi estuary in November 1985 and is yet to be done over Narmada estuary. The aerial photographs of the Mahi estuary have been analysed and the geomorphic map of the area has been prepared. Landsat data has been analysed for the two estuaries and shoreline changes (upto 1986) in the two estuaries have been demarcated Reports on the shoreline changes in Mahi and Narmada estuary have been brought out.

(b) Wasteland Mapping Project
This work has been entrusted to GERI by Department of Space and the National Wasteland Development Board (NWDB) and is to be done in collaboration with Space Applications Cantre, Ahmedabad. The aim of this project is to map the wasteland areas of Gujarat on a top priority basis. While the maps for Panchmahal, Surendranagar and Bhavnagar districts have been completed, the Space Applications Centre is now taking up the mapping of Mehsana, Kheda and Ahmedabad districts.

For details on any of the activities of GERI, please contact Director, Gujarat Engineering Research Institute, Race Course, Vadodara-390 007.

IRS LAUNCH

The Indian Remote Sensing Satellite, IRS 1A is in its final stage of launch preparation and was recently transported to the USSR from where it is to be launched sometime in March 1988. The Chapter wishes for a succesful launch of the satellite and is looking forward to a greater success to the Indian remote sensing programme through the utilisation of data from IRS-IA.

SATELLITE UPDATE

1. SPOT DATA ACQUISITION IN INDIA

SPOT data is now being acquired at the Shadnagar earth station by National Remote Sensing Agency (NRSA), Hyderabad. This is as part of an agreement between NRSA & SPOT Image which allows for the direct acquisition of data from the satellite at the earth station and its later conversion into data products for distribution to the user community in India. Valid for two and a half years, this agreement was undertaken in May 1987 after which the SPOT data is being regularly acquired.

Data products in the form of Black-and-White prints and transparencies, colour prints and transparencies, digital data in CCTs from both the panchromatic (with 10 m resolution) and multi-spectral (20 m resolution) sensors are now available on payment basis from NRSA.

Users interested in getting SPOT data may contact NDC, National Remote Sensing Agency, Balanagar, Hyderabad-500 037.

2. SPOT IMAGE

SPOT Image Corporation has announced the follow-on to the present SPOT satellite. While SPOT-2 (the immediate successor to the present SPOT) will have no changes, the SPOT-3 and SPOT-4 are planned with modified sensors. Two important modifications, which are noteworthy for the user community are :

(a) The inclusion of a middle infrared (1.58-1.75 micrometer) band in the HRV sensor.

(b) Onboard registration of 10 m and 20 m (i.e. panchromatic and multispectral) from the HRV sensors

The first modification will mean that the users will be able to look at aspects like plant moisture etc. using the 20 m resolution data a level better than the present capability from TM at 30 m resolution. The second modification will mean that it will then be possible to look at the panchromatic and multispectral data in conjuction, as the two data sets would be automatically registered onboard, thus reducing the processing efforts on the ground.

There are also plans to add a new sensor module called **VEGETATION** having five spectral bands (red, green, blue, near IR and middle IR), 1 km and 4 km rasolution, 220 km swath and high radiometric resolution of 10 bit coding (which means the total dynamic range would be of 1024 levels). Compare this against the 128 levels of IRS, 256 levels of TM and the present SPOT. This sensor is supposed to be mainly optimised for monitoring vegetation as well as oceans.

3. NAVY REMOTE OCEAN SENSING SYSTEM (N-ROSS)

The US Navy's N-ROSS is back in the reckoning after a 'shelving' for about 2 years. Originally planned as a replacement for SEASAT the N-ROSS was slated for a 1991 launch with the objective to provide global oceanographic data under all weather conditions. This was tobe achieved through a package of four sensors a Radar Altimeter (useful for studying wave heights, bathymetry etc.), a scatterometer (mainly for winds), a special sensor microwave imager and a low frequency microwave radiometer.

LOOK OUT FOR THE NEXT ISSUE

The Editorial Committee recently talked to Dr. Baldev Sahai who is the President of our society. The hour long discussion was on a wide range of topics. We bring to you a record of this interview in the next issue.

USEFUL REFERENCES

A list of books which could serve as useful references is given below :-

1. Remote Sensing :- Principles and Interpretation, Second Edition, By F F Sabins, Published by W H Freeman, New York, Price : US Doller 47 95.

2. Hydrologic Applications of Space Technology, 1986, IAHS, Publications No. 160. Edited by Al Johnson, Published by Int Asso. Hydrological Science (Wellingford), Price Doller 45 00.

3. Spectral signatures of objects in Remote Sensing. 1986, ESA Publication, SP 247, By T D Guyenne, Published by Noordwijk, The Netherlands, Price 200 FF.

4. Classification of Remote Sensing Images, By I L Thomas, V M Benning and N P Ching, Published by Adam Hilger Bristol, Boston, Price : Doller 25.00.

5. Digital Image Processing in Remote Sensing 1987, Edited by J P Muller, Published by Taylor & Francis, London, Price Doller 54 00

6. Remote Sensing Yearbook 1987, Edited by A P Cracknell and L W B Hayes Published by Taylor and Francis Inc. 242 Cherry Street, Philadephia, P A, 19106-1906, Price Doller 126.00.

7. Principles and Applications of Photogeology. 1986, By S N Pandey, Published by John Wiley.

8. Geomorphology from Space, 1986. NASA Special Publication No. 486. Edited by N M Short and R W Blair.

9. Remote Sensing Applications for Consumptive use (Evapotranspiration) Edited by A I Johnson and A Rango, 1986. AWRA Monograph series No 6, American Water Resources Association, 5410 Grosvenor Lane, Suite 220, Betherda, Maryland 2084

10 Oceanic Remote Sensing, 1987. Edited by F V Bunkin, NY NOVA Science Publication

11. Remote Sensing Applications in Meteorology and Climatology. Edited by R A Vanghan, Published by D Reidel, Dordrecht

Training Course on Satellite Oceanography

A two-week training course on satellite oceanography was organised at the Space Applications Centre, Ahmedabad during September 7-18, 1987 under the joint sponsorship of the Department of Space and the Department of Ocean Development. The main objective of the training course was to expose the participants to the state of the art in satellite oceanography giving due emphasis on the application potential of this new technology.

The training course was attended by about 20 participants from 16 different organisations from different parts of the country which included a number of Central and State Government R&D institutions, Defence R&D Laboratories and Universities. About 20 lectures were delivered during the training course which dealt with different techniques of satellite remote sensing using optical, infra-red and microwave sensors for studying problems related to physical and biological oceanography. In addition, a few tutorial exercises onthe VAX-11/780 computer were also conducted to demonstrate the use of satellite data for deriving oceanographic parameters.

FORTHCOMING EVENTS

March 1988

9-11 Microwave Radiometry and Remote Sensing Applications at Fivenze, Italy, Contact : Dr. P Pampaloni, CNR-IROE via Pancitatichi, 64 50127 Florence, Italy.

28-30 4th International Conference on Pattern Recognition. Contact : Dr. J kittler, University of Surrey, Gildford GU25XH, England

April 1988

4-8 Recent Advances in Sensors, Radiometry and Data Processing for Remote Sensing : orlanda, USA, SPIE Technical Symposium, Contact : SPIE, Box 10, Bellingham Washington 98227-0010, USA

May 1988

16-19 6th Thematic Conference on Remote Sensing for Exploration Geology at Houston, USA. Contact : ERIM, P O Box 8618, Ann Arbor, Michigan 48107, USA.

July 1988

1-10 16th International Congress on Photogrammetry and Remote Sensing, ISPRS. Contact : Prof. S Murai, Institute of Industrial Science, University of Tokyo, ISPRS, 722 Roppongi, Minatoku, Tokyo, Japan.

September 1988

13-16 Moving Towards the 21st Century. IGARSS 1988 International Geoscience and Remote Sensing Symposium at Edinburgh, UK, Contast : Dr J A T Young, Department of Geography, University of Edinburgh EH 8 9XP, Scotland.

ADDENDUM TO THE LIST OF MEMBERS

ISRS – AHMEDABAD CHAPTER

HONORARY MEMBER

1. Prof. P R Pisharoty, Physical Research Laboratory, Ahmedabad-380 009.

LIFE MEMBERS

A. Space Applications Centre, Ahmedabad-380 053.

1. Dr. George Joseph
2. Dr. K K Gupta

ANNUAL MEMBERS

A. Space Applications Centre, Ahmedabad-380 053.

1. Shri I M Bahuguna
2. Shri T T Medhavy
3. Shri D G K Murty
4. Dr. A Sarkar
5. Shri S V C Sastry
6. Shri S P Vyas

B. Central Ground Water Board, Ahmedabad-380 009.

7. Shri Arijit Dey
8. Shri P R Gupte
9. Shri L K Mathur

C. Directorate of Geology and Mining, Ahmedabad-380 016.

10. Shri Harsad M Shah

D. Public Health Mechanical Lab, Ahmedabad-380 016.

11. Shri Dipak Patel

SUSTAINING MEMBERS

1. All India Soil and Land Use Survey, Regional Sub Centre, Ahmedabad-380009.
2. The Directorate of Geology and Mining, Ahmedabad-380 016.
3. Space Applications Centre, Ahmedabad–380 053.
4. The Supdt. Engineer, Narmada Projects, Gandhinagar-382 010
5. Director, School of Planning, Ahmedabad–380 009.
6. Central Designs Organisation, Gandhinagar-382 010

PATRON MEMBER

The Director of Research, Gujarat Agricultural University, Ahmedabad–380 009.

OTHER MEMBERS FROM GUJARAT

LIFE MEMBERS

1. Dr. P P Patel, Dept. of Geology, MS University, Baroda-390 002.
2. (Mrs.) K A Bhagawat, Dept. of Botany, MS University, Baroda-390 002.
3. Dr. (Ms) Suman Pandya, The Dhansura Mahila Arts and Commerce College, Dhansura–383 310
4. Dr. B B Jambusaria, Gujarat Engineering Research Institute, Baroda-390 007.
5. Shri A C Patel, Gujarat Engineering Research Institute, Baroda-390 007.
6. Shri S A Laghate, Water Resources Development Corporation, Rajkot–360001
7. Shri S L Shanbhag, Gujarat Water Resources Development Corporation, Rajkot-1.
8. Shri P M Pofali, Irrigation Department, Rajkot–360 001.
9. Shri J B Trivedi, Irrigation Department, Rajkot–360 001.

ANNUAL MEMBERS

10. Prof. A N Mehta, B A College of Agriculture, Anand–388 110.
11. Shri Venkatesh Hosahalli, B A College of Agriculture, Anand-388 110.
12. Shri Hakimuddin, B A College of Agriculture, Anand–388 110.
13. Shri P N Shah, Gujarat Engineering Research Institute, Baroda-390 007.
14. Shri V B Patel, Gujarat Engineering Research Institute, Baroda-390 007.
15. Shri D G Mankad, Irrigation Department, Baroda-390 001.
16. Shri P D Dhru, Irrigation Department, Godhra.
17. Shri Nayan Shah, Gujarat Water Supply and Sewarage Board, Nadiad.

SUSTAINING MEMBERS

1. National Bureau of Soil Survey and Land Use Planning, Western Region, Baroda.
2. National Dairy Development Board. Anand-388 001

With Best Compliments From :

Shri Ambica Lime Supplying Co.

Opp. Octroi Naka, At the End of Shastri Bridge,
Near Vishala Hotel, Sarkhej Road, AHMEDABAD-380 007.

PHONE : 410525

BOOK-POST

To,

undelivered
ease return to :
r. S. R. Nayak
ecretary, ISRS-AC.
mote Sensing Area,
ace Applications Centre,
HMEDABAD-380 053.

We Welcome your Suggestions & Comments

— **Editor** —

EDITORIAL COMMITTEE :

Shri V. Tamilarasan Shri R. P. Dubey Shri Mukund Rao
SAC, Ahmedabad.

The Indian Society of Remote Sens
Ahmedabad Chapter
NEWS LETTER

VOL. 2 No, 2 **April 1, 1988**

Dear Member,

The seventeenth of March 1988 is a golden day in the history of Indian Remote Sensing Programme. IRS-1A- the first of a series of operational remote sensing satellites was launched successfully on this day. We feel elated to have witnessed this grand event and fortunate enough to be a part of the excitement. Elsewhere in the newsletter we bring you more details on the satellite.

We also have something new to offer in this issue. We are now going to bring to you the views and ideas (on various topics) of different people in a feature entitled INTERVIEW. We plan to discuss and interview selected persons on topics of interest–remote sensing, problems of Gujarat etc. For this issue, we had an hour long discussion with Dr. Baldev Sahai, President of our Society, on a wide range of topics-the society's activities, the chapter activities, future of remote sensing etc. Dr. Sahai has some strong views on the society's future, role of chapters and this news letter. Turn over to the INTERVIEW section and read on for more details. We have a few more interesting personalities for the future issues. We hope you will find this feature interesting and also that this mode of exchange of views and ideas will be rewarding.

Geographical Information System (G.I.S.) is an emerging technological tool for solving different problems of natural resource management. Suppose there were problems which went like this calculate by density, age group, disabled people and movement ease the population at risk from drought in any district of Gujarat or calculate the area (total and land use wise) that would be inundated if the height of Narmada dam was raised/lowered. NO PROBLEM, one would say, provided one has a handy GIS package. We bring to you a note on GIS in this rssue. We we will follow it up with more details in the forthcoming issues.

Apart from these, we have a write-up on a very useful instrument for visual interpretation of satellite data. This instrument-the High Magnification Enlarger (HME) will soon be available in the market. You will find the details of the instrument useful.

How did you find the second/third issue? We haven't heard from any of you on these lines. We earnestly look forward to your comments/suggestions, and even criticisms, if there are any. A successful newsletter not only needs a good editorial staff but also a good amount of participation by the readers and this is what we are looking for. Just a line from you will give us a lot of encouragement and will enadle us to bring out a better news letter.

-Editor

INTERVIEW

Dr. Baldev Sahai is the president of ISRS (from 1987) and has been a very leading and active member of the society. It was because of his inititive that the Ahmedabad chapter was set up (in 1984) and has grown to such a stature today. Dr. Sahai is the Group Director, Remote Sensing Applications Group (RSAG) at Space Applications Centre (SAC) and also Associate Director for the IRS Utilisation Programme (IRS-UP). All these responsibilies keep him very busy. However, when we talked to him about this interview for the news letter, he readily agreed to give us time in spite of his busy schedule. We had gone prepared for conducting the interview (a set of questions which we had rehearsed before, a tape recorder, note-pads, pencils etc.) but we wonder if Dr. Sahai needed any such preparations, for he soon set things rolling and even before we knew it the interview had started.....

SOCIETY AND CHAPTER ACTIVITIES

Q. Dr. Sahai let us start with the society first and later we shall disccuss other topics- the Chapter, remote sensing technology etc. According to you what is the present standing of the society and what are its future plans ?

A. The society has been very active for the last 6-7 years-say since the SWAR symposium. The society has been concentrating on a concerted membership drive to have more members, setting up of local chapters - now chapters are already set up at Ahmedabad, Hyderabad, Delhi, Lucknow, Bhubaneswar and Dehradun and a few more are to be set up soon at Jaipur, Bombay and Bangalore. We also hope to have about 1000 members shortly because of the membership drive.

Q. Presently, how many members are there in the society ?

A. The membership achieved upto end of 1987 was 600 - i.e those who had paid the dues, but if the members who have not paid dues are also included then it would be around 1000. This essentially means that people who paid dues in 1987 are 600. As far as the society activities are concerned we have organised one national symposium every year, since SWAR.

Q. What do you think is the impact that the society has on RS technology ?

A. Right now the major activity of the society, apart from organising national symposia, is the Journal of the society-JOURNAL OF INDIAN SOCIETY OF REMOTE SENSING (PHOTONIRVACHAK). This actvity is a major one at the national level. Through this, the society is trying to disseminate information on RS technology. Apart from this, the Chapters have been organising, at the local level, lectures, film shows, topical discussions etc. This is another way of disseminating information to the members about the RS technology. All this does have an impact.

Q. Since you have taken over as President (form 1987) what have been your plans, apart from the membership drive and the journal, to further the growth of the society ?

A. The first decision that has been taken, since I took over, was to increase the frequency of the journal. Previously it was two issues a year but with effect from 1988 we have

increased it to four issues. Another thing which I am trying to see is to have more local chapters. When I took over there was only the Ahmedabad Chapter but now there are many. We are now trying to have more interaction of the members at the Chapter level where the members can meet more frequently. We feel that this way the members need not have to travel long distances to participate in the society activities.

Q. While the Chapters would take up their own regular activitres, does the main society have any plans for assigning particular tasks of national/regional importance to the chapters? Say, the society could plan out an annual programme of activities and ask the chapters to implement it.

A. It is very difficult to give any guidelines on particular tasks or activities to the local chapters as one has to think of the local conditions and problems, the type of membership etc. It is the chapters that have to evolve plans and policies at the local level which, in turn, should aid the dissemination of RS technology in the country. But the important thing is for the members to have more frequent interaction and come out with innovative ideas. We must always remember that it is the part that constitutes the whole and not the other way.

Q. In this connection, could we think that in the coming years the society would be similar to other international socieities like ACRS, ASPRS etc. and that we could have other activities (other than symposium and chapter level interaction)- say publishing books and journals, making good slide-sets, conducting tours, undertaking consultancy work etc.?

A. Primarily, the major activities of most of the societies is bringing out journals/newsletter, organising symposium etc. In fact beyond this, any other task becomes essentially a localised one and that is why we feel the chapters have to take the lead in organising local level activities, because presently, it is also not feasible to organise more than one national level symposium per year. But chapters must take up from here and even try to organise regional level meetings where the regional problems could be discussed.

Q. For this, would it not be proper that the executive council decides on certain regional topics and then asks the chapters to take lead as some of the chapters may not be in a position to take up activities on their own.

A. I personally feel that one should not give directives and that the local people must come up with ideas and evolve programmes as they are better in touch with the problems of that region and can feel the pulse of the people/problems better. This way the programmes would then be tailored to these regional needs. And, if one always thinks of the executive council providing guidelines, then many of these problems could be glossed over. Further, it is very difficult for members to attend frequent national level activities because of travel and fund constraints. One must keep these problems in mind before activities are taken up Thus, I feel chapters should take up activities which involves minimum travel expensee so that the interaction could be more frequent than what could be achieved at the national level. Say, for organising a lecture not much of funds are required. Similarly, screening of video programmes/film shows by contacting agencies like USIS, British Council etc. would not require much of funds. Such programmes could be held more frequently than an annual symposium.

Q. Yes, these activites which you have mentioned do not require much funds but why can't we think of one day workshops, seminars or any such activitiy which the chapter could

organise? Such activities would be organised by the chapters, say 3-4 times in a year and this could be apart from the national symposim. In such a case, the funds are a constraint and.....

A. Why should funds be a constraint? Why shoud Chapter unnecessarily have ambitions of doing things in a big way. Say, why should the chapters think of bringing out proceedjngs? One should have an open mind and have discussions at such meetings and the chapters need not worry about funds for bringing out the proceedings. The problem comes only in such cases. I feel the chapters should have programmes which do not require funds or require minimal possible funds. For example, I am associated with the Indian Physics Association since 1979 and there are few chapters in Gujarat and they get together and hold symposia and do not worry about finding funds. Members travel on their own and they have no ambitions to distribute bags etc. and thus minimal possible funds are sufficient. I strongly feel, and reiterate here again, that the chapters should organise programmes which require minimal or no funds.

Q. Just like the Centre-State relationship is a big big bone of contention, it is now coming out that the HQ-Chapter relationship needs to be well defined because we find tbe chapter always complains of lack of funds and the HQs feels that funds should not be a constraint as the chapters should go in for activities involving minimum funds. What do you have to say adout this?

A. So, if this ambition of the chapter of spending more money is cut then the problem does not come. Today, whatever aberration has come is because of the ambition of the Ahmedabad chapter to have lot of funds and spend lot of money which, we feel, at the local level should not be required. Now, if the chapter tailors its programe then funds are not a constraint at all. Then the problem with the HQ would not come up. The underlying factor is that the chapter wants more money from the HQ or a greater share of funds to be kept back with it. On the other hand, the HQ requires funds as the activities that it has taken up at the national level - specially the publication of the journal - does require lot of funds. So, the chapters must keep their ambitions to the local level of activities.

Q. But, sir, on the other hand there are certain things we should look at. The Chapter's activities, whatever they are-for example even the Ahmedabad Chapter's activities cannot be handled or even be taken up by the main society at all. And so.....

A. That is why the chapters are set up. The chapters are part and parcel of the society. They collectively constitute the whole. Now, if the chapters are getting unnecessarily into those sort of activities ..... for example there is no reason why the chapter should have ambitions at the national level of holding symposia. By doing that, the chapter is unnecessarily getting into conflict at the national level. I will tell you the situation that would arise. For example, somebody comes to the Ahmedabad Chapter's symposium from Guwahati. He cannot travel more than once a year or more frequently and thus may not be in a position to later attend the society's national symposium/activities. That is why, I feel that the chapters should confine themselves to localised activities, thus making the members' interaction more frequent and effective which, in a way, is not possible at the national level because of the travel constraints that I just mentioned.

Q Could we then put it this way that chapters should largely interact at the level of members, by frequent activities, and the main society would interact at the larger level

by organising national symposia etc.

A. Yes, but the symposia are also attended by the members and what I feel is that the chapters should interact at the local level rather than at the members' level or non-members' level. Ultimately, both the chapter and the main society aim for the interaction of members since the society is of the members. But, we should be clear of one thing it is possible for 150 members of the Ahmedabad Chapter to gather at Ahmedabad but it is highly unlikely that all the 150 would be able to attend the national symposium/meeting which could be held somewhere else. In this context, the chapter should concentrate on the interaction of these 150 members rather than worrying about HQ level or chapter level etc.

Q. As we are already on the chapters, what is your opinion on the Ahmedabad chapter activities and do you have suggestions, keeping in mind the larger interests of the society.

A. From what I have been observig for the last 2 years, travel again, seems to be a constraint because I find that if the Ahmedabad Chapter organises something at the University, the members find it difficult to travel. So you see the problem. In organising activities, one must keep this constraint in mind that people find it difficult to travel. The activities must be organised in such a way that members do not find it difficult to attend. At no time have I seen more than one third of the members of Ahmedabad Chapter attending any of the chapter activities. So how can one expect that members from all over the state would attend the chapter activities ? This I am mentioning because the Ahmedabad Chapter has been raising the point of state level jurisdiction. My suggestion is that the chapter should primarily organise lectures, on topics of general public interest, which could be well advertised so that they could be attended by all. For example, if the chapter organises a lecure on IRS, immediately after its launch, it will make a good impact on the public.

Q Sir, now let's go over to another topic which is in relation to what you have been saying. It is about this newsletter. Don't you think the newsletter would serve as a better medium for such a local level interaction and information exchange considering that it reaches the members. And then, what is your opinion on this newsletter-now that we nave come out with the first issue at least.

A. The newsletter should aim at keeping the members informed of all the developments, particularly at the local level, and the selection of material should be such that the members would find it useful. For example, there is no use of reporting on International symposia/events etc. because those members who are interested in them would have other accesses to the information. Things like Wasteland mapping activities, drinking water mission etc. particularly in Gujarat - should be well covered so that the mebers are informed on the utility of remote sensing at large. The Chapter newsletter should aim at focussing such local issues.

Q One of the issues that needs to be considered is whether the newsletter must be a glossy, colourful, attractive and a well brought one or should it be simple and brought out with minimal expenses.

A. I feel that it should be least expensive and it should not unnecessarily tax the resources of the Chapter. Otherwise, the Chapter starts facing difficulty in arranging funds and then the issue of funds again becomes a bone of contention. The newsletter need not be a very simple affair. Without any high ambition we should go for minimal cost and minimum delay as most of the efforts in printing causes the delay in bringing out the issues. To my

mind a local level newsletter could even be cyclostyled. The chapter should not end up with a major expenditure on the newsletter as this would defeat the very purpose of having the chapter.

REMOTE SENSING TECHNOLOGY

Q. Sir, now let's come over to the field of remote sensing. There is one thing which we hear nowadays very frequently - OPERATIONALISATION OF REMOTE SENSING. To different people it has different connotation. But what, according to you, is the concept of operationalisation of remote sensing?

A. My concept of OPERATIONALISATION is that-when a user agency adopts remote sensing techniques as a routine technique for his information gathering activities, only then is the technology operationalised.

Q. But then are we not making a dividing line between a user and the developer of the technology. Is it proper to make such a dividing line, particularly in remote sensing?

A. I think it is an unnecessary controversy. I can give you an analogy. The case of a car. The car is developed by somebody but the user just uses the car routinely and does not bother who developed it as long as the car runs. To the user the car is a matter of convenience - a mode of conveyance. A dividing line will always be there between the developers of the technology and the users. At some point of time the car becomes operational but that doen't mean the car manufacturers now should stop improving the models. The developers will always be improving the technology but they should take care to pass on to the users whatever is ready for use at a given time. For example, one activity that has really brought remote sensing to the user's domain or has reached the maximum number of people today is the remote sensing for groundwater exploration, through the Drinking Water Mission. The district level officials and the engineering personnel are now aware of remote sensing. I don't think there has been any other application which has reached that proportions. Even the Wasteland mapping, in that way, has not reached the common man. Because of the Drinking Water Mission more people have heard of remote sensing for ground water. While most of the applications are still limited to the organisational or agency level, the ground water exploration has gone to the execution stage.

Q. But then, is it not because of the government's resolve, to solve the immediate problem of drinking water by finding out potential resources through quick and fast means, that remote sensing techniques got sufficient boost and now these techniques are widely known. Maybe, if such a pressure is there for other application from the government, then they too would be at the same level as the ground water application is now today.

A. After all, what is government? The government is for the people and whatever technology is able to give the maximum benefit to the people, the government has to support that. So, today if drinking water is a problem then the government has to make all efforts to make water available to the people. And So, the pressure – as you say – on any other field will depend on the needs of the people and the government policies will always be dictated by these needs. I feel that we should be happy that the technology has reached such a level at least in this application. For that matter, I can't think of any other application that would reach such a level in the near future.

Q. One thing needs to be considered here, Sir. Is such a policy of operationalisation correct, or, should we allow for the technology to percolate down to the society on its own, rather than going for such a forced operationalisation?

A. In no society does the technology just percolate.....

Q. For example in the US condition.....

A. No. The efficacy of the technology in the given application is what makes it acceptable to people. Today, whatever we have achieved in ground water - no doubt there was support because of the mission – but it is really the needs of the people that has driven the technology to such a level. If one is able to meet those needs, then the technology would be certainly acceptablele to people. Say, for example, if we can give better estimates of crops than what the present techniques give then the remote sensing techniques for crop estimation would automatically get accepted. The fact remains that we are not at that level yet. So, to make the remote sensing technology operational in any application area, one must prove its efficacy. I don't think any technology will find resistance in getting accepted if it proves its efficacy. Why, even the common man buys a thing in the market only if it works and will not like to invest money on things that only promise to work. So, I think the operationalisation solely depends on the efficacy of the technology.

FUTURISTICS OF REMOTE SENSING

Q. Now let us go over to the futuristics of remote sensing. We would like to know from you, in the world context, where is remote sensing now leading to? We have the Landsat and SPOT series which are providing data operationally – but where is the technology leading towards or where is it going to end?

A. The way things look at present, one of the major areas where the technology should find acceptance - by proving its efficacy is in the field of agriculture. This means that the methodology must be developed to an extent where automatically people will find its efficacy to be better vis-a-vis the conventional techniques. Even in the world context, it has not yet been proven that remote sensing technology can provide better crop estimates in time and in that sense, it is still at a developing or R&D stage.

Q. What about ocean applications? There are many satellites present and planned mainly for ocean applications.

A. Yes, there is a lot of stress on ocean applications as it is very difficult to get data of the ocean, conventionally. For example, the ship measurements are all spot measurements but they cannot cover the full ocean area. It is only satellites which make it possible to get the complete picture for a global measurement of the oceans. And that's why, the stress on ocean application is well placed and we should see a lot of good coming out from the remote sensing applications in ocean and the related meteoro--logical problems.

Q. There is one more area which is now a days picking up and is discussed a lot in various forums. It is the integration of remotely sensed data and non-remotely sensed data and their combined analysis. What have you to say for this sort of an analysis approach ?

A. Yes, a lot of effort is needed here. The Geographical Information Systems (GIS) are being developed which are easily understandable and usable by resource scientists/managers and planners, This sort of an approach to analysis is now a days picking up But I feel that the system should be such that scientists can make use of it and generate information which, in turn, can be used for decision making Once such systems are fully developed and available then the integration of data could take place easily.

Q. In the Indian context, you mentioned about ground water exploration as having reached an operational level. Any other application you feel will be operational may be in the near future.

A. If we go by the concept of operationalisation, i. e. the user departments taking up remote sensing application routinely for information generation, I think it will still take some time for other applications although Forest Survey of India has adopted remote sensing technology for monitoring vegetation cover in the country.

Q, But then there is the GSI which has taken up remote sensing application for geology routinely.....

A. No. I am afraid one can't say that GSI is using it routinely because there are still many geologists in GSI who are yet to get familiarised with remote sensing. Even today, GSI has Photogeology and Remote Sensing Division/Wings rather than adopting this as a routine technique for gathering information. To my thinking, the day these separate division/wings are not required and every geologist in GSI becomes familiar with remote sensing technology and starts his exploration/mapping activity using remotely sensed data then that would be the day when it could be considered operational.

Q. You mean, just like the hammer and haver-sack are a part of the geologist's kit, the Landsat data must also become a part of his kit.

A. Yes. He should not think of going to another person for information from remote sensing. I would say that the analogy that you have given of remotely sensed data becoming a part of a geologist's kit, along with the hammer and haver-sack, is perfect and that is how it should be. Only then could it be considered fully operational.

PRESIDENT'S MESSAGE

Q Well, Dr. Sahai, we have asked you all that we wanted to. We must thank you for answering all the questions so patiently and also for readily agreeing to this interview, in spite of your busy schedule. Lastly, as President of the society, we would like you to say something special to our members - may be as a message.

A. Basically, I feel that we should all strive to make remote sensing an acceptable technology because this would then give a proper status to the remote sensing community. My wish is that the members should strive to make the technology acceptable by proving its efficacy so that people would automatically give due status to the technology and hence to the remote sensing community.

SATELLITE UPDATE

IRS-1A LAUNCHED

It is with a great sense of pleasure that we are announcing the launch of IRS 1-A, the first operational Indian Remote Sensing Satellite. IRS-1A lifted off from the Baikanour Cosmodrome in USSR, onboard a Vostok, rocket, exactly at 12:13:30 PM (IST) on the 17th March, 1988. Just 22 hours later one of the sensors - LISS-I - was switched on. Soon, Shadnagar (where the data reception terminal is located) started receiving the first scene from the satellite. Since then, a large number of frames have been collected from the LISS-I camera. The LISS-II camera was switched on on the 28th March, 1988 and data was sucessfully received at Shadnagar.

The first few data sets from LISS-I prove it to be a big success. ' FOREGET MSS AND TM", was one of the cryptic comment made by a member of our chapter who was at Hyderabad and had the chance of having a good look at the first few images. The LISS-II data is also of very good quality and sufficient details can be seen. Details of the satellite and the sensors are given in the table.

The success of IRS-IA is yet another "milestone achieved" under the Indian Remote Sensing Programme. We must recognise that there is still a long way to go in the overall pursuit of operationalisation. But as of now, THERE IS NO LOOKING BACK.

We congratulate all those who have been associated with the IRS-IA programme and wish that all these efforts will lay a strong foundation for the future years to come. We look forward to a successful utlisation of the various applications - thus justifying the Indian remote sensing programme on the whole.

TABLE : DETAILS OF IRS-1A

SATELLITE		
Type	:	Body stabilised remote sensing satellite
Orbit	:	Sun-synchronous, 904 km. orbit
Equat. crossing time	:	10.25 AM, descending node
Mission life	:	Three years
Weight	:	Approx. 975 kg.
Launcher	:	Vostok from Baikanour in USSR
PAYLOADS		
Type	:	Linear Imaging Self Scanning (LISS) system with 2048 element CCD linear array
No of cameras	:	Three - one of LISS-I and two of LISS-II
Spectral bands	:	0.45 - 0.52 microns (Band - 1) 0.52 - 0.59 microns (Band - 2) 0 62 - 0.68 microns (Band - 3) 0.77 - 0.89 microns (Band - 4)
IFOV (micro-rad)	:	80.2 for LISS-I 40.1 for LISS-II
Spatial resolution (in meters	:	72.5 for LISS-I 36.25 for LISS-II
Swath	:	148.48 km for LISS-I
	:	74 km.(approx)forLISS-II(combined swath is146.98km,)
Repeat cycle	:	307 orbits/22 days
No. of bits	:	7 bits (128 levels)
PRODUCTS		
Type	:	Standard, Precision and Special products. Both images (B/W and colour) and CCT
Scale	:	1.1,000,000 for LISS-I 1:500,000 for LISS-II
Standard image size	:	240 mm X 240 mm

REMOTE SENSING FOR THE MEDIA

EOSAT, the commercial agency responsible for marketing Landsat data, is conducting a market survey to determine the need for five-meter resolution remotely senesd data. This survey will determine Whetther EOSAT Shruld proceed with a dedicated programme to fly a high resolution sensor on a Landsat satellite in the 1990s.

If the plans materialise then EOSAT will be able to market :

* three band, 5 meter resolution data for any location in the world
* coverage of any part of the world on a daily basis, and
* data delivery within hours of its collection.

The programme, Satellite Tracking and Reporting (STAR,) is mainly designed to "rope-in" the media and is visualised as a next step for news-reporting - a satellite reporter that can "see" a story up close from space. The programme would combine satellite, sensor, communications and data processing technologies in innovative ways to implement a new information gathering capability. The STAR data would be delivered in standard format-reception would be no different than a "live-feed" from a field unit. With the 5 meter pixels - trucks, buses and vehicles would easily be visible in full colour and would be available within hours of acquisition for manipulation.

HIGH MAGNIFICATION ENLARGER

Space Applications Centre has developed a High Magnification Enlarger (HME) for projecting a part of a 24-cm format satellite imagery at a continuosly varying magnification of 3.5X to 45X. The equipment provides low distortion sharp images of high luminance throughout the magnification range and helps in the comparison of image details with conventional data available in the form of topographic or thematic maps. It could also be used in presentation on a chosen scale.

The main subsystem of the HME is a projection head which houses a light source, heat filter, condenser package, film holder and interchangeable projection lenses. The image is projected on a table top. The film holder is mounted on a carriage which can be moved in X and Y directions. All the movements have manual as well as motorized option.

The first prototype of the HME was developed at SAC in June 1986 and since then it has been extensively used for various IRS UP projects, wasteland mapping project, drinking water mission, remote sensing applications mission etc. The experience from this unit has gone into the development of an improved prototype which incorporates various modifications in functional and operational aspects. In view of the large demand of the remote sensing user community of the country, technology transfer to an industry for commercial production has been initiated.

For more details, please contact Shri R. P. Dubey, R. S. A., Space Applications Centre, Ahmedabad-380 053.

CONGRATULATIONS, DR. GEORGE JOSEPH ! ! !

We once again congratulate Dr. George Joseph, Deputy Director (Remote Sensing) at the Space Applications Centre on his receiving another prestigious award. Dr. George Joseph has been selected for the Shri Om Prakash Bhasin Foundation for Science and Technology Award 1987 in the discipline of SPACE AND AEROSPACE technology. The award carries a sum of Rs. 50,000/-, a memento and a citation. Congratulations, Dr. George Joseph ! ! !

GEOGRAPHICAL INFORMATION SYSTEM (GIS) - AN OVERVIEW

Natural resource planners need regular information on resources availablility for the purpose of planning the future utilisation in an optimum way. Some of the typical examples of queries which are frequently asked and need to be answered are :

- how much is the land converted from agriculture to urban use during a specified period
- which land could be suitable for future urbanisation
- what is the least cost route for logging service between a cutting area and existing high way considering slope, ground cover, drainage etc.
- where could the recreation spots be located and developed considering a strip of requisite size in the vicinity and avoiding particular land uses
- what could be the potential areas for mineral exploration

Apart from the involvement of resource experts who perform the criterion based analysis on basic thematic data, the major task involved in replying to these queries is the handling of spatial and non-spatial data. Traditionally this has been done in map form and all the manipulations (required to reply to the queries) used to be carried out manually by using various techniques for measurement, comparison and summarisation of maps. However, the amount of input data to be handled is so large and diverse that the techniques other than manual needs serious consideration. This becomes even more necessary due to the vast potential of repetitive availability of thematic data (in spatial form) from remote sensing.

The emergence of Geographical Information Systems (GIS) technology has raised hopes of providing an efficient tool for handling of spatial and non-spatial data in an integrated manner so as to be able to manipulate the basic data and generate information required in desired format and level of detail for natural resources planning.

The essential components of a GIS can be divided into 4 major categories :-

- Data capture/editing, including the features for transfer of analog maps or digitized maps (remote sensing based) into system specific form
- Data management functions dealing with optimum storage of the locational and non-locational data and handling of user queries
- Analysis and manipulation modules which provides a set of primitive commands for performing complex analysis tasks in spatial context
- Output and display features for presenting the analysed results in desired form (maps or tables)

Present day GIS technology provides ample scope for facilitating the information generation pertaining to various resource planning areas. Notable among them are :

- Forest management, agriculture, ecology, watershed management, mineral targetting etc.
- Urban and regional planning, landuse planning and management, environmental impact studies
- Route selection (highways/pipelines), utility facilities management
- Census and related statistical mapping, cadastral records management

Scientists at Space Applications Centre (SAC) have been following the technological developments in this field for quite sometime. During the past few years, the developments in this area have reached a stage where the resource planners or information managers can hope to get a commercial software/hardware package which they could use as a tool for implementing the information systems as per their needs. Recently, a technical survey was carried out on the commercial availablity of such packages. The aim was to identify and short list

the packages which could help implement the natural resources information systems required for different disciplines.

Using a classroom training GIS package (called MAPS), an initial attempt was also made to implement a sample Mineral Exploration Information System (MEIS), This work was carried out jointly with DGM-Gujarat. A more comprehensive package is under procurement which is envisaged to be used for implementing information systems in the other areas like crop inventory, watershed management, urban and regional planning and coastal environment monitoring.

Article contributed by Shri R. K Goel, RSA, Space Applications Centre, Ahmedabad-380 053.

BOOK-POST

To,

Dr R. K. Sood

LRD

If undelivered
please return to :
Dr. S. R. Nayak
Secretary ISRS-AC
Remote Sensing Area,
Space Applications Centre,
AHMEDABAD-380 053

EDITORIAL COMMITTEE :
Shri V. Tamilarasan Shri R. P. Dubey Shri Mukund Rao
SAC, Ahmedabad.

Indian Society of Remote Sensing
Ahmedabad Chapter

NEWS LETTER

VOL. 2 NO. 3 JULY 1, 1988

FROM THE CHAIRMAN'S DESK

The Newsletter of ISRS-AC was started a year ago in July 1987 and it is a matter of great satisfaction that four issues originally planned have been brought out during the one year period. Due to unforseen circumstances, one of the issues (Vol. 1, No. 2) got considerably delayed and it had to be combined with the subsequent issue (Vol. 2, No. 1).

The Editorial Committee deserves full credit for the success of its untiring efforts in overcoming the initial problems. Collecting sufficient material for the Newsletter particularly related to typical case studies on the application aspects of Remote Sensing carried out by members and member institutions appear to be more difficult than anticipated. More enthusiastic cooperation from members can easily ameliorate this situation. New features like interviews with our senior colleagues not only on technical matters related to Remote Sensing but also on the activities of the Society as a whole and the Chapter in particular are sure to receive acceptance and appreciation from members.

With a creditable performance in the last year, the Chapter looks forward to greater success to the Newsletter in the coming years and we earnestly solicit your support, cooperation and constructive criticism.

Dr. T A Hariharan
Chairman, ISRS-AC

CHAPTER ACTIVITIES

Popular Talks

Two popular scientific talks on the Indian Remote Sensing Satellite System and its utilisation programme were organised on April 9, 1988 at the Tagore Hall, Paldi, Ahmedabad to mark the successful launching of the IRS-1A satellite. Dr. George Joseph, Associate Project Director, IRS Payloads spoke on various technical aspects of the spacecraft and its subsystems and Dr. Baldev Sahai, Asociate Director, IRS Utilisation Programme described various application projects carried out.

Welcoming the audience Dr. T A Hariharan, Chairman of the Ahmedabad Chapter introduced the speakers and expressed how proud this occasion is for not only the Scientific Community but also for the country as a whole. Shri Pramod Kale, Director, Space Applications Centre was the Chief Guest at this function. He mentioned that the next generation of satellites are slated to carry microwave remote sensing payloads envisaging all weather capability. Dr. S R Nayak, Secretary of the Chapter proposed a vote of thanks.

ANNOUNCING

National Symposium on REMOTE SENSING IN RURAL DEVELOPMENT along with the ANNUAL CONVENTION of the Indian Society of Remote Sensing will be held at Haryana Agricultural University, Hisar during November 17-19, 1988.

IMPORTANT DATES:

Receipt of full length papers : August 31, 1988

Intimation regarding acceptance of papers : September 30, 1988

Last date for receipt of Registration fee of Rs. 250/- : October 31, 1988

For details please contact:

Dr. S P S Karwasra
Organising Secretary
National Symposium on Remote Sensing in Rural Development
Department of Soils
Haryana Agricultural University
Hisar 125 004

INTERVIEW

If one talks of sensors it is very difficult not to be talking of Dr. George Joseph and if one talks of Dr. George Joseph and if one talks of Dr. George Joseph it is very difficult not to be talking of sensors. And that is what we decided to do. To talk to Dr. George Joseph about sensors - specially the recently launched IRS-1A sensors. Dr. George Joseph is presently the Deputy Director (Remote Sensing) at the Space Applications Centre and also the Associate Project Director for IRS payloads and the INSAT AVHRR payload. He is also the Director of the IRS Utilisation Programme. The airborne thermal scanner, the airborne multispectral scanner, the Bhaskara TV payloads, the IRS LISS I and LISS II etc. are some of the sensors which he has been instrumental in developing.

IRS-1A

Q. Before we start with the questions we would like to congratulate you on the grand success of IRS-1A. The cameras onboard have performed extremely well and the images being obtained are of very high quality. Would you like to narrate briefly your experiences with the IRS-1A project?

A. First let me thank you for giving me this opportunity to reach out to the members of the society. And now going on to IRS, the success of this project is very different than those we have had earlier. We started off modestly from the launching of sounding rockets, the first satellite - Aryabhatta, followed by the two Bhaskaras and also the launch vehicles. But now we are in an operational era with the IRS satellite - the capability of which is comparable to any other remote sensing system of the world. We are now having a satellite which is closely comparable to the Thematic Mapper in terms of spatial resolution. The pictures speak for this. Therefore, I feel that we have now entered an operational era in design, development and operation of a state-of-the art remote sensing satellite system. This is certainly an achievement to be proud of, not only for the Department of Space (DOS) but also for the nation, as a whole. And, personally for me, working for the project was a challenge. Even though we had developed some sensors - the airborne thermal sensor, the Bhaskara TV payload, the airborne multispectral scanner etc. the IRS sensors were way ahead in terms of technological capability. Apart from the sensors, even the technology in the satellite in terms of attitude stability, data rate etc. was much advanced than our earlier satellites. Moreover, there was a large amount of indigenisation in the satellite. For example, the gyros; the slippring for the solar array drives; attitude sensors, solar panels and many others were all indigenously made. Of course, the payloads themselves were completely indigenous. All in all, the technology development was truly indigenous even though we had to rely on imported components. And that is why I feel that the work was very challenging. And now that it is all over, it is a matter of satisfaction that everything has gone well.

Q. But there were some reports in the papers that there was some orbit snag just after the launch. What actually happened and how was the problem overcome?

A. It was not actually an orbit snag. May be I should give you the background of the launch to explain this. The satellite had gone through a series of stringent tests and evaluation not only in India but also at the cosmodrome in Baikanour. The hydrazine fuel is loaded and the satellite is mated with the launcher. Just about T-100 minutes the pre-launch operations start and T-35 minutes the umbilical is pulled out and now everything is set for the launch. Once the rocket is launched it takes a pre-determined course so as to launch the spacecraft at a specific height and in a particular inclination orbit. All this takes abot 12 minutes. Once the satellite is "freed" an automatic snap signal deploys the solar panel which is now the power source for the satellite. After this the earth acqusition is done so as to stabilise the spacecraft. Most of the operations, including the LISS-I switch on went off very well and there was no hitch at all. But apparently in one of the orbits there was an earth loss which means that the satellite was not locked-on to the earth as it should have. And once the drift in the attitude is beyond certain tolerable limits then the satellite goes into safe mode. However, the corrections were made and the earth was re-acquired and the satellite was locked-on to the earth. The satellite is now in a very healthy condition and is performing very well.

Q. The two cameras on the IRS-1A are based on the Charge Coupled Device (CCD) technology and are very different than the much proven mechanical scanning systems of the Landsat type. And you have been credited for the idea of going in for a CCD technology way back in 1979-80 when this was still an emerging technology. How did you decide for this as against the mechanical systems at that time?

A. To answer this, I will have to go back to the late seventies when we had already developed the airborne thermal and multipsectral scanner which were mechanical systems. Around this time there were plans for an operational system and various studies were being made. I came across the CCD technology and somehow was fully convinced of their capability for our operational system. I could visualise that the CCD systems would be small and compact and could be designed for a small-end (around 40 kgs) to a high-end (150-200 Kgs) sensor system. So this could fit the bill for a range of satellite systems. The designs would not be complicated and we could achieve better spatial resolution and a higher Signal-to-Noise (S/N) ratio. Apart from all this, I strongly felt that the mechanical systems offered no growth-potential for technological advancement and for that matter I feel that the TM could be considered as ultimate in mechanical systems as far as spatial resolution is concerned. Only a complex detector technology may

provide the type of capability one could have with CCD systems. People were sceptical about the CCD systems and we had to work out many details of design, development etc. to convince. Fortunately, this was accepted and when the IRS project was formulated the Linear Imaging Self Scanning (LISS) system was to be the main sensor for IRS-1A. Incidentally, it might interest you to know that the acronym-LISS - was also coined by me.

Q. How was the 10.30 AM equatorial time chosen for IRS-1A, considering that for the Indian latitutdes this would mean a local time of around 11.15 AM?

A. The choice of the equatorial time is a balance between the requirements of illuminiation and the atmospheric conditions. From the illumination point of view, it may be better to go in for as late as possible so that the terrain is well illuminated by the sun. Say around 11.00 AM or 12.00 noon should be very ideal. But around the later times there will be a problem of haze building up. And thus it has to be a compromise between these two. Keeping in mind the global requirements the Landsat and SPOT have a 0930-1000 AM equatorial time. And we have chosen 10.30 AM.

Q. If one looks at the bands of TM and the IRS-1A the first three bands are exactly similar. On the other hand the fourth band is narrow in IRS as compared to TM. What is the reason for this? Is it some technological trade-off or is it due to application needs?

A. When we decided on the bands for IRS we purposely went in for a narrower width for the IR region because of two reasons. One was to avoid the moisture absorption bands around 0.90 um and the other was we were convinced that narrow spectral bands would be more useful rather than broad ones and that too if we can achieve a better S/N ratio it should be very much useful for discriminability of different targets. In addition to improve the contrast transfer function in CCD, it is better to avoid the longer wave length region. So you see this decision was consciously taken. May be in the TM case they had other limitations and thus had to go in for a broad band.

Q. From the spatial resolution point of view, why were a 73 m and a 36 m resolution chosen and that too together for the same sensor?

A. This is an interesting question. We wanted to have a resolution which could match the resolution of the contemporaneous state-of-the art system which was Landsat MSS at that time. Users have a lot of experience on this data and thus we felt that we should have a continuity. So the resolution of around 80 m was chosen which ultimately resulted in 73 m because of the optics etc. We also felt that we should improve on the 73 m and go in for something better too. So we decided to go in for better resolution by factor of two and thus the 36 m resolution for LISS II.

Q. But extending this further, could we not have gone for another factor of two better and have an 18 m resolution too...

A. Theoretically, Yes. We could have done that. But the practical problems of larger data rate, lower S/N ratio, weight and volume of the sensor etc. would have to be tackled. Not only this, but this would mean a stringent requirement of spacecraft attitude so as not to have smear in the images. So, then everything would become complex.

Q. Now that IRS-1A is launched what are the plans for a continued and assured service to the user community. Are there any plans to improve the services - in terms of better spatial, spectral, temporal resolutions in the future?

A. As a follow-on to the IRS-1A, the IRS-1B is planned for an early 1990 launch. This is going to be similar to the IRS-1A and thus the services that are now on from IRS-1A will be continued by IRS-1B. This may go on upto 1992-1993. Later on, in the IRS-1C we are thinking of going for a better spatial resolution - better than LISS-II. Apart from this, there are also plans to have a microwave satellite with a Synthetic Aperture (SAR) and other passive sensors - for which there is a separate programme. However, all this is still in the programme stage and is yet to be projectised but this will be the thrust area in the future.

Sensors Design

Q. From the sensor design point of view, what exactly are the parameters that the design team looks for while arriving at the specifications of a sensor? Could you explain this out.

A. It is a complicated issue and is dependent on many factors. Even if one of them is changed it could have multiplying effects on the other factors. Let me give you an example. If you have a 70 m resolution and want to go in for 35 m resolution, i.e. half of the original one, This would mean that the data rate is increased by four times the original; the integration time has been reduced by a factor of two and so the signal strength is reduced. As a result the S/N ratio is affected. So you see, just by trying to improve the resolution the other factors become problem areas. Therefore, what one has to do is keep the technological feasibility in mind and strike a balance with the requirements. At the same time one must see that the basic requirements are not affected at all. And then there is this misnomer of the resolution. It means different to different people. An application scientist looks at it as the smallest feature that can be seen and to a designer it is the area on ground covered by a projection of the IFOV of the detector on to the ground. But then it is not just the resolution that qualifies the data totally. You see in IRS the resolution is 73 and 36 m but the contrast that one sees in the image is much better than one sees say in MSS or TM. What I am trying to emphasise is that

the resolution alone is not just the parameter based on which the data could be qualified or judged. There are other factors also, like the MTF and the S/N ratio which are very crucial and could well improve the image considerably. For example if there is a 10 m resolution with 20% MTF and a 30 m resolution with 80% MTF I would say that the pictures from the latter would be much better. Similar is the case with S/N ratio. So, you see, there are various parameters one has to consider and the difficult part is to strike a balance amongst all of them.

Q. But in the case of IRS is it not that it has been optimised for Indian region by adopting a suitable gain setting whereas the systems like Landsat etc. are optimised for global regions by adopting to different gains. And is this not the reason we are getting better contrast in IRS?

A. The contrast has nothing to do with gain setting. The gain settings are mainly to allow you a flexibility of going in for different saturation radiance because as season changes or you are in some other region so will your reflectance range change and you must allow for such changes to provide good dynamic range. And as rightly pointed out for global systems, they would opt for extreme ranges so that solar illumination, regions, seasons etc. will not have an impact on the data quality, thus not restricting the utility to any particular region of the world.

Q. Actually, from what you have said, it looks like the technology - or technology constraints - mainly defines particular sensor design. You have talked about MTF, IFOV, S/N ratio, saturation radiance, bit-resolution etc. which are all technology parameters. But where does the application user requirement come into the picture, or does it come at all?

A. You see it is not like that, the user requirements are the most important parameters. But at the same time there are some extreme requirements which are difficult to fully satisfy. Let me give you some examples. As far as bands are concerned users have seen that the green, red and IR regions are best as they are used in the FCC for visual analysis. Individually also these bands are seen to be useful for most of the applications. So when we chose the blue, green, red and IR part of regions for the IRS we were fully catering to the needs of most of the users. No doubt we have not got the middle IR or thermal IR but then I don't see many using the MIR and TIR data in TM at all. Over the globe, people have seen its utility for certain applications but from a general viewpoint the users always fall-back on the visible and near IR bands for operational applications. Let us go on to the resolution. Ask any user and he will say he wants the best resolution. When there was MSS there was a "need" for better than 80 m resolution, when the TM came in there was a "need" for better than 30 m resolution and now SPOT is there. But I somehow feel that the resolution requirements of the user cannot be ever satisfied because there is always a "need" for better resolution. At the same time there are certain problems for going in for better and better resolution. There is the problem of data rate and then the scene noise becomes very prominent and this could lead to improper results. So there has to be a trade-off somewhere. Some studies by Markham and others have even quantified this trade-off as a limit beyond it could lead to wrong clarifications. Coming to our own IRS, I feel that a 30 m resolution should be quite optimum for most of our applications.

Sensors of The Future

Q. Nowadays, there is a trend emerging that the future will be an era of very specific sensors - say the spectrometers on application specific sensors etc. what do you think of this emerging trend and are we also thinking in these lines for the future?

A. The trend is in the direction of spectrometers, that is true especially for global earth observations studies. These spectrometers can take data in large number of very narrow spectral bands - say more than 50 bands in the 0.4 - 2.5 um region. Invariably the spatial resolution cannot be very high. I think they are of the order of 30 m and 1 km for two types o spectrometer systems. Also the swath or coverage cannot be very large otherwise the data rates would be extremely high. So these limitations which would make such systems useful in very specific application areas - mainly as a research tool to study the spectral signature of objects. But I have my own doubts of its operational utility.

Q. But cann't we see these systems as a middle level data collection fitting into the scenario of doing an overall or regional level analysis using the IRS type of system and going in for these systems when we want to do specific area detailed analysis. This would not only go well with the concept of the 3-tiered approach of remote sensing but the advantage is we would have the middle-level also on a satellite platform.

A. That would be perfectly alright if we could achieve high spatial resolution so as to completely replace the aerial data which is presently used as base information or as ground truth data. Further, we would not be able to extend the smaller area analysis to a larger area which is very much required. That is why I am not convinced of its utility as a middle-level data in place of the aereal data that we have presently.

Applications

If we look at our programmes in remote sensing, most of them are oriented towards making maps - either visually or digitally. We are not looking at is the prospect of going in for automatic discrimination/delineation techniques - either onboard or on the ground where we get either the thematic information or the

quantified parameters right away. Should we not look at this area?

A. The remote sensing applications, as it stands now, can be categorised into two groups the first one is related to the mapping based on tonal, textural, shape etc. difference. These techniques are fairly well established and give sufficiently accurate results. The second relates to the quantitative estimation of a particular parameter based on the correlation of the spectral reflectance, with that parameter. Say for example the estimation of a crop yield or turbidity in water. This would necessarily mean establishing correlation between spectral reflectance and yield or turbidity. These are more complex than the first category applications and are still at experiment level. So, when these models are yet to be operationalised it is very difficult to conceive of a black-box processing where you can directly get the quantified information. I don't think we will in the near future get into that sort of a situation because the human experience has a very important role to play.

Chapter Activities

Q. What have you to say about the Ahmedabad Chapter? Do you have any suggestions vis-a-vis the activities of the Chapter?

A. I don't know how often we meet as a Chapter. Apart from the larger gatherings - like the seminar, workshops etc. what is more important for the Chapter is to have more informal meetings and adopt a more personal approach towards the activities. We must have a get-together atleast once a month and have a discussion on a particular topic - say problems in agriculture, geology etc. and more so the problems related to Gujarat. This would also put the problem in the right perspective as we would get different view-points. The thing is the more informal gatherings we have the better would be the interaction of the members. The film shows that are being organised is also a good activity. We must also have public lectures so as to see that remote sensing reaches the common man and the impact of the technology is felt by everybody. We may have formal activities say once or twice a year.

Lastly

Q. One last question. Suppose one was able to put the clock back to say 1979-80 and you were again given the responsibility of making the IRS sensors. With all this exprience with you, how would you go about it? The same way as you did now or any different?

A. Well, if I had all this experience with me I would have done and delivered the sensors just as I did now. No difference at all. I have an excellent team-the best designers and the best engineers and we don't lack in these aspects at all. The same is true for the satellite technology as well and for the whole of ISRO.

PROCEEDINGS OF THE EXTRA ORDINARY GENERAL BODY MEETING OF THE SOCIETY

An extra ordinary General Body Meeting of the Society was called on 5.2.1988 at Hyderabad to ratify the decisions of Executive Council to revise the rates of subscription for various categories of the membership (R. 16.1 of Constitution). The following rates were approved with effective from 1st April, 1988.

Category of Members	Within India		Outside India	
	Admission Fee(Rs.)	Annual Sub(Rs.)	Admission Fee ($)	Annual Sub($)
Members	10.00	50.00	5.00	35.00
Life Members				
- Admitted before 45 years of age	500.00	-	250.00	-
- Admitted after 45 years of age	375.00	-	175.00	-
Sustaining Members	-	500.00	-	175.00
Patron Members	5000.00	-	2500.00	-

Note: Any Member or Life Member of the Society who is temporarily residing outside India shall have to pay extra mail charges as decided by the Secretary apart from normal subscription.

R.16. 2 A member who has been continuously on rolls of the Society for 5 years or more shall have the right to compound for further payments by a single payment of Rs. 375/- only and become a life member.

Under clause R. 9.10 the Chapter's share will continue to be 50% of the annual subscription or 5% of the interest on Life membership.

R.16.3 The entire fee shall be payable in one instalment unless otherwise permitted by the Secretary. In no case it shall be paid in more than three instalments (as before).

R.16. 4 The last known address of a member shall be considered as a valid mailing address for correspondence by the Society. Members should ensure that their addresses are kept uptodate (as before).

PHOTONIRVACHAK NEWS

Shri V K Jha, Scientist SE, Geo-Sciences Division, IIRS, Dehradun has been nominated as Associate Editor of "Photonirvachak", Journal, Indian Society of Remote Sensing.

REMOTE SENSING OF URBAN SPRAWL OF AHMEDABAD

This study was carried out by Space Applications Centre (SAC) in collaboration with the Ahmedabad Urban Development Authority (AUDA), Town Planning and Valuation Department and Ahmedabad Municipal Corporation.

The Urban Sprawl map of Ahmedabad city was prepared on 1:50,000 scale using Landsat MSS (March 1975, January 1982) and Landsat TM (March 1986) data in conjunction with the Survey of India topographic maps. The boundary jurisdiction of the AUDA was incorporated into this map in order to assess the gorwth pattern and trends.

The map shows the physical growth pattern, built up area, its encroachment into the agricultural lands in the villages located in the pheripery of the city. Salient findings are:

(a) The city has extended well beyond the municipal limits and even crossed AUDA limits on the western side, i.e. Near Ambli.

(b) The general trend of growth within a decade (1972-82) were observed mainly along the transportation network.

(c) After 1982, the growth pattern was observed as encroachment into the agricultural lands located between the transportation routes, i.e. Near Chiloda, Chinubhainagar, Ratanpur, Ramol, Vinjhol, Sahijpur, Piplaj, Sarkhej, Fatewadi, Makarba, Vejalpur, Jodhpur, Mamadpur, Ambli, Shilaj, Bhardaj, Ognaj and Khodiar villages.

(d) The rate of the growth as observed is tabulated as follows:-

Sr. No.	Data used for Analysis	Area in Sq. Kms	Phy-sical Growth Sq Kms	Growth Rate in %	Overall Growth Rate
1.	Oct 1972 SOI map	96	-	-	-
2.	14.3.1975 Landsat NSS	124	28	29.1	-
3.	26.1.1982 Landsat MSS	175	51	48.4	82.3
4.	30.3.1986 Landsat TM	256	81	46.3	166.6

It is evident from the above table that the growth rates observed during 1972 to 75, to that of 1982-86 is quite high and overall growth rate from 1972-86 is 166.6 per cent which is a staggering figure.

For further details please contact :

Shri S K Pathan
SAC, RSA
Ahmedabad 380 053.

SATELLITE UPDATE

Landsat Update

Landsat-4 has started collection of TM data from October 1987 through TDRSS. Presently it is collecting approximately 50-60 scenes/day.

Landsat-5 continues to operate nominally providing both TM and MSS data. Landsat data to be available on floppy diskettes.

(Source : Photogrametric Engineerin and Remote Sensing (PERS), April 1988,

Landsat to carry on

The US Department of Commerce has got a US $ 62.5 m. release from the Congress for the continued development of Landsat-6 satellite and associated systems. This follow-on Landsat-6 is tentatively scheduled for a March 1991 launch. Consequently, EOSAT is making all efforts to conserve the life of Landsat-5 so as to minimise (not avoid) the data interruption between satellites. The TM on Landsat-4 has been put into use to take some of the workload of Landsat-5.

What will Landsat-6 offer? It will have a wide array of sensing and off-nadir viewing capabilities (just like that in SPOT). An Enchanced Thematic Mapper (ETM) having the present seven bands of TM and also a panchromatic band with 15 m resolution; a Thermal Infrared sensor and an ocean colour imager form the payload for the proposed Landsat-6.

(Source : Remote Sensing Society's News and Letters, April 1988).

And one from the Russians

The USSR recently put into space the largest civilian survey satellite ever. This remote sensing satellite weighing nearly ten times heavier than the present Landsat is envisaged to provide data on "hydrology, cartography, geology, agriculture, oceans and the environment" say the Russians. While details on the sensors and payloads are not available, there is no doubt that the system would be unique in its own way.

(Source : Remote Sensing Society's News and Letters, April 1988).

APPEAL

Now that we have brought out interviews with two eminent persons, we expect the members to react on the views expressed on different topics in the interviews.

We visualise that these responses/reactions will throw open a "debate" on various topics through the media of this newsletter. Our aim is to make this newsletter a forum for free and frank exchange of views and ideas on any topic of interst to the society. For this the participation from each and every member is very essential. We appeal to all the members for their fullest cooperation.

- Editorial committee

ADDENDUM TO THE LIST OF MEMBERS

The following members of the Ahmedabad Chapter have now become Life Members:-

1. Shri Bhaskar Das
2. Dr. M C Gupta
3. Dr. M B Potdar
4. Dr. V K Dadhwal
5. Shri Rajeev Sharma
6. Smt Tara Sharma
7. Shri M G Shaikh
8. Ms Anjali Pandeya
9. Shri H B Chauhan
10. Dr. K V G Murthy
11. Dr. S S Thakur
12. Dr. S S Pokharna
13. Dr. V N Sridhar
14. Shri E S Murthy
15. Shri T J Majumdar
16. Shri S K Pathan
17. Dr. Manab Chakraborty
18. Shri A Narayana
19. Dr. R Ramani
20. Dr. S Palria
21. Shri T V R Murthy
22. Dr. M M Kimothi
23. Dr. V K Srivastava
24. Shri K N Padia
25. Shri Ramlal Mehta
26. Shri H I Andharia
27. Shri S P Vyas
28. Miss Beenakumari
29. Dr. P N Pathak
30. Shri H U Solanki
31. Dr. G V Saratbabu
32. Shri H P Bhatt
33. Smt K S Sudha
34. Ms Yogini Vanikar
35. Shri T T Medhavy
36. Ms Kavita Dwivedi
37. Dr. N K Vyas
38. Dr. A Sarkar
39. Shri P Jothimani
40. Shri A S Rajawat
41. Shri D M Pancholi
42. Shri S K Sharma

NEW MEMBERS

Life Members

A. Space Applications Centre, Ahmedabad 380 053

1. Shri Pramod Kale
2. Shri R M Patel

Annual Members

A. Space Applications Centre, Ahmedabad 380 053

3. Shri U G Desai
4. Shri G P Sharma
5. Shri S A Sharma
6. Shri S S Manjul
7. Shri Sandip Oza
8. Dr. M P Oza
9. Shri J K Thesia

8. L D College of Engineering, Ahmedabad 380 009
10. Shri J N Patel

Patron Members

11. Gujarat Co-operative Oil Seeds Grower's Federation Limited, Ahmedabad 380 009
12. Gujarat Council on Science and Technology, Gandhinagar 382 010

OTHER MEMBERS FROM GUJARAT

Life Members

1. Shri V B Patel, Gujarat Engineering Research Institute, Vadodara 390 007
2. Shri P S Dwivedi, Gujarat Engineering Research Institute, Vadodara 390 007
3. Shri Kamlesh Patel, Vadodara 390 005
4. Shri G B Dalwadi, Gujarat Engineering Research Institute, Vadodara 390 007

Annual Members

5. Shri Tarun J Patel, Directorate of Geology and Miing, Vadodara 390 001
6. Shri U S Buch, Kevadia Colony 393 151

THE SECRETARY SAYS.....

Our chapter has grown considerably.

Total membership of the Ahmedabad Chapter is 159.

Other members from Gujarat is about 23.

Details of the membership are as follows:

Membership category	Ahmedabad Chapter	Others from Gujarat
Life members	103	13
Annual members	45	8
Sustaining members	7	2
Patron members	3	-
Honorary member	1	-
Total	159	23

LIGNITE BASIN INVESTIGATION USING AERIAL PHOTOS

Recently, the remote sensing laboratory of the Directorate of Geology and Mining (DGM) has carried out the investigation of the lignite basin around the Kharsalia village in Bhavnagar district usIn aerial photographs. About 100 sq. kms. area has been mapped at 1:50,000 scale using black-and-white aerial photographs. Lithologically the area is made of tertiary sediments which are exposed above the Deccan traps and sporadically covered by ferruginous conglomerate - which in turn is embedded with wood fossils.

Aerial photo-interpretation techniques, aided by ground data, have given a new dimension to the problem of locating such basins. Lineaments trending NW-SE and NE-SW could be easily delineated on the aerial photos. The study has revealed that the area is affected by step faulting, is highly jointed and is severely intruded by trap dykes. It was observed that the fractures have given rise to narrow valleys and escarpments.

Thus, the study has enabled the quick investigation of the geology and the structural features. These have helped in the better understanding of the Kharsalia lignite basin.

For details please contact: Director, Directorate of Geology and Mining, Ahmedabad - 380 016.

BOOK-POST

TO,

If undelivered please return to:

Dr. S R Nayak
Secretary, ISRS - AC
c/o Remote Sensing Area
Space Applications Centre
AHMEDABAD - 380 053

EDITORIAL COMMITTEE

S/Shri V Tamilarasan, R P Dubey, Mukund Rao, Space Applications Centre, Ahmedabad 380 053

Shri R C Kachhara, Directorate of Geology and Mining, Ahmedabad 380 016

Dr. P P Patel, M S University of Baroda, Baroda 390 002

Printed at Library, Space Applications Centre, Ahmedabad - 380 053

Indian Society of Remote Sensing
Ahmedabad Chapter

NEWS LETTER

Vol. 2 No. 4 and Vol. 3 No. 1 01 January, 1989

Dear Members,

We now have for you another issue of the newsletter - a combined fourth issue of 1988 and first issue of 1989. And we start with a note of apology - delays, delays, delays and sorry, sorry, sorry. But we will offer no reasons and justifications and let matters be. You know, we now realise bringing out a newsletter (and that too on time) is quite a tough Job. But so what, we are here to do that tough job and if we trip we are ready to face the brickbats. But we have just one small appeal - do send in a "bouquet" sometime. We shall hold it amongst the "brickbats" and carry on our job.

Since the last time we wrote to you there have been some developments. The chapter had its Annual General Body Meeting and some very pertinent issues were disscussed. From the Secretary's report (excerpts are there in this issue), you will realise that the chapter has been going from strength to strength and most important that we are an ACTIVE chapter (just look at all the activities that have been accomplished). We shall bring to you the details of the AGM in the next issue. You will also find a report on the second Laxminarayan Calla Memorial Lecture, which was delivered by Shri P A Raj, Vice-Chairman and Managing Directo of Sardar Sarovar Nigam on the Sardar Sarovar Project. He calls it the " Lifeline of Gujarat" and we are sure it will be so.

We also met Shri J F Mistry, Secretary Water Resources Department in the Government of Gujarat. The interview with him is the main content of this issue.

There is always a funny part in the things we do and so you will find out in this issue under a new section "REMOTE HUMOUR" (look out for more in the subsequent issues). These have been contributed by Dr S D Naik, Space Applications Centre and we would welcome contribution from others too.

Lastly, we shall be missing the services of Shri V Tamilarsan, who was the editor uptill now. He has opted himself out from the comittee because of health reasons. He set the pace for the newsletter activity with a determination which we hope we can match. We shall miss him in the committe. We now have two new members in the editorial committee - Shri J K Garg of Space Application Centre and D M Pancholi of Central Designs Organisation, Gandhinagar.

- Editor

EXCERPTS FROM ANNUAL REPORT

The Annual General Body of the Chapter meeting was held on 30 December, 1988. The annual report was presented by the Secretary and excepts from the report are given below.

Against a total membership of 150 in 1987, the total membership of the Chapter is now 154. The main feature of the membership drive this year was a marked increase in the life membership. Many members have now become life members.

The Council met five times to transact the business of the Chapter.

Two popular lectures on **Indian Remote Sensing Satellite System and Utilisation** were organised to mark the successful launching of the IRS-1A satellite on April 9, 1988 at the Tagore Hall, Ahmedabad. The lectures were delivered by Dr. George Joseph, Deputy Director,(Remote Sensing) and Dr. Baldev Sahai, Group Director, Remote Sensing Application Group, Space Applications Centre. The function was attended by about 300 persons.

Second Laxminarayan Calla memorial Lecture was delivered by Shri P A Raj on **Sardar Sarovar Project - A Lifeline of Gujarat** on Decmeber 30, 1988, i.e. today. (Details are presented elsewhere in the newsletter).

A one day seminar on **Remote Sensing Activities in Gujarat** was organised on October 22, 1988 at GERI, Vadodara. The seminar was hosted by Gujarat Engineering Research Institute, Vadodara and was sponsored by Gujarat Council on Science and Technology, Gandhinagar. (Details of the seminar is given in the newsletter)

This year three issues of the Newsletter were published. The last issue got delayed and now it is prosposed to be published along with the first issue of 1989.

The proceedings of SOARS symposium has been published. The publication of **Gujarat from Space** could not be commpleted due to pre-occupation of the scientists. We hope to complete this next year.

INTERVIEW

Shri Jekishan Fakirbhai Mistry, Secretary to the Government of Gujarat, Water Resources Department is a well known engineer and administrator in the field of Irrigation and Water Resources Development. Shri Mistry's achievements encompass a wide horizon which include hydrology, water resources planning and investigation, research and design, construction of dams, dam safety, drought management and water management. Shri Mistry is also responsible for initiating modern methods and techniques for data collection in the field of water management. His pioneering contributions in these fields have fetched him many laurels in the form of awards and positions in national and international forums. He has written more than 115 research papers. He has also taken keen interest in manpower development and many engineers of the GOG have benefitted from his active role in the civil engineering of the state. As a person, Shri Mistry is dynamic and frank. He readily agreed for the interview inspite of his busy schedule. The Newsletter team met Shri J F Mistry at his residence in Gandhinagar and spent more than an hour discussing various issues.

Q. What are the problems of Gujarat related to natural resources from the overall developmental point of view?

A. Speaking of problems of Gujarat, I can certainly elucidate those which are concerned with irrigation and water. Other problems of minerals/geology etc., I am not an expert at. But I gather that the respective departments are looking into them and in many instances they have taken recourse to remote sensing techniques.

I feel that the major problems, with respect to irrigation and water, are the following:

i) It is well known that Gujarat is short of sweet water. Even though the state has a good amount of ground water, we are considerably short of surface water.

ii) One other problem in the state is the "Ghed" area near Porbandar in Saurashtra where 550 square miles of ground area is virtually flat and there is no drainage. When it rains, the entire area gets inundated -almost completely. As a result for almost 8-9 months in a year nothing grows at all.

iii) Another problem which is now plaguing Gujarat is the waterlogging in the command area of existing irrigation systems like Ukai-Kakrapar, Mahi-Kadana, Fatehwadi and old projects in Saurashtra - Shetrunji, Bhadar etc. The water-logging problems are mainly because of ignorance, of irrigation practices, on the part of the farmers who utilise the irrigation systems and also on the part of the government officials who are supposed to upkeep the systems. The farmers draw out huge quantities of water assuming that the officials would not release water when they need it. Because of the drawing of more water than what is required the areas get waterlogged. As a result, the GW table gets raised adding to the logging problem. This also brings the salts on the surface and ultimately we are faced with the additional problem of salinity in these areas.

iv) Another major problem in Gujarat is the existence of vast tracks of saline lands. We have four types of saline lands. The salinity ingress in the Saurashtra and Kachchh coast are well known. Here the excessive pumping and usage of saline water from the wells has caused the soils to go saline. The wells are having saline water because they are all in the cavernous miliolite limestone, which extends into the sea also and, thus, the sea water has transgressed through these formations from the sea to the main land and ultimately to the wells. Another factor here is that the excessive and rampant pumping out of water has lowered the sweet water table below the sea water level.

Salinity also occurs in the land under tidal ingress which is a slow process and renders the soil saline and useless for agriculture. With a vast coastline, almost 3,00,000 hectares is getting affected by this phenomena.

Moreover, we have the inherent saline soils of Gujarat. The coastal area from Valsad to Bhavnagar - almost 10,00,000 hectares - is having inherent salinity. This area was completely under the sea in the past and now the sea has retarded and we are left with the highly saline soils.

v) Wasteland is the another problem in Gujarat. We have 11 districts in Gujarat which have got more than 15% of the district area under wasteland category.

vi) One more area where we have been concentrating is in the rivers along the South Gujarat coast. We have seen the change of the course of the river Mahi which posed a problem to the power station at Dhuvaran. The Gujarat Electricity Board (GEB) had to costruct dykes, diaphragms etc. to save the power station because of the shift of the Mahi course. Actually, more than the change in the course it was the tidal conditions in the estuary that was of concern.

Q. How have you overcome these problems and where really the contributions from the remote sensing have helped in solving these problems?

A. In the inventorying of surface water, we have rightly taken on the job of making a detailed survey/inventory of surface water resources - mainly the river systems. We have now a network of river gauging stations for measuring the sediment load in the rivers - almost about 200 stations are working right now and accurately measuring the water and the sediment load that is flowing in the rivers.

GW exploration is another area where we have

Q. What is your opinion on the Newsletter?

A. I should say it is very good. I have a few suggestions and that is that the listing of members should be done once at the end of the year rather than printing addendums to the list in every issue. The contributions from different agencies on their application of remote sensing techniques could be increased. I feel that there should be a feature on possible application of remote sensing in every issue. You see, we may tend to forget because of our limited involvement, but if it is "hammered-away" may be it will make more impact.

---o---o---o---o---

Shri J F Mistry, **CONGRATULATIONS!**

Shri J.F. Mistry was joint recipient of the **BHARAT SINGH AWARD** for the year 1987. This was awarded to him for his meritorious contributions in the field of HYDROLOGY. His contributions for organising and promoting activities in hydrology - through his relentless efforts in the state of Gujarat have been recognised. The award is instituted by the National Institute of Hydrology, Roorkee through an endowment amount provided by M/s. Hoysala Group of companies, Bangalore. The award carries a sum of Rs. 5,000/-, a certificate and a citation. Shri Mistry is currently Secretary to the Government of Gujarat, Water Resources Department, Gandhinagar. **CONGARATULATIONS, Shri Mistry!**

In the photograph (opposite) Shri Mistry is seen receiving the award.

---o---o---o---o---

SEMINAR ON REMOTE SENSING ACTIVITIES IN GUJARAT

A seminar on "Remote Sensing Activities in Gujarat" was organised at Gujarat Engineering Research Institute (GERI), Vadodara on October 22, 1988 jointly by GERI and ISRS Ahmedabad Chapter. About 200 delegates from various agencies of state and central governments participated in the seminar.

In his inaugural address, Shri P P Kale, Director, Space Applicaltions Centre emphasised the commitment of ISRO in offering continuity of remote sensing satellite services and also further upgradations in the future systems. He called upon the applications scientists to take up the challenge of developing matching applications packages to deal with the full potential of remote sensing data.

Shri J F Mistry, Secretary, Water Resources Department, Government of Gujarat emphasised the need for establishing a full-fledged autonomous centre for application of remote sensing technology. In his Presidential address, Shri Mistry presented a brief overview of problem areas of the state, the current and future role of remote sensing in solving some of these problems and felt the need for holding such seminars in various parts of the state .

In his keynote address, Dr Baldev Sahai spoke on the various remote sensing applications carried out jointly by SAC and state agencies of Gujarat. Dr Baldev Sahai highlighted the success story of Ground Water Targetting during the recent drought year and also the mapping of wastelands. Giving an overview of various applications, he mentioned the achievements of remote sensing in monitoring ecological changes in the marine national park, forest mapping in Dangs, water logging and salinity studies in command areas, urban sprawl of Ahmedabad and agriculture related studies.

Dr. N B Desai, Director GERI welcomed the delegates.

Scientists from Space Applications Centre and state agencies presented case studies on use of remote sensing techniques in solving the problems related to various natural resources of the state. Delegates took active part in the discussions at the end of each presentation.

A brief account of Chapter activities was presented by Dr. T A Hariharan, Chairman, ISRS Ahmedabad Chapter. Dr. B B Jambusaria proposed the vote of thanks.

A proceeding of the deliberation of the seminar is to be brought out shortly.

WORKSHOP ON CROP YIELD MODELLING

A two-day workshop on "Crop Yield Modelling" was organised at the Space Applications Centre, Ahmedabad during July 27-28, 1988 to critically examine various approaches to yield estimation currently in use and to see if integration of inputs from remotely sensed data in some of these approaches can be attempted to improve the accuracy and timeliness of crop yield predictions. Scientists from leading organisations engaged in agricultural research like India Meteorological Department (IMD), Indian Agricultural Research Institute (IARI), Indian Agricultural Statistics Research Institute (IASRI), ICRISAT, Universities etc. as well as members of crop related projects working at the Space Applications Centre participated in the workshop.

To ensure uninhibited discussion on various problems related to operationalisation of remote sensing based crop yield modelling, the workshop was organised as a 'brain storming' forum. So the emphasis was on discussions and exchange of views instead of the usual ritual of presenting paper in quick succession. There were five technical sessions covering physiological parameters, agrometeorological aspects, meteorological yield models, inputs from remote sensing and the concluding session. Each session featured a lead paper by an eminent authority to highlight the state of the art and set the pace for discussions.

Some of the recommendations for future course of action in the country which emerged after the conclusion of workshop are as follows:-

1. IMD may take up an experimental trial of their model in an agroclimatic zone and also explore the possibility of incorporating vegetation index derived from NOAA data instead of technological trend terms used in IMD models.

2. Meteorological data be made available freely and liberally to research organisations, and their cost, if any underwritten by DST under Agromet Project.

3. Existing growth simulation models for wheat available with Water Technology Centre, IARI, may be studied and possibility of inclusion of remote sensing informations in the model be explored.

4. Possibility of using previous-year remotely sensed data for stratification for choosing crop cutting sites by the Director of Economics and Statistical should be explored in combination with agroclimatic zoning.

5. Possibility of using remotely sensed data in the ICRICSAT Sorghum model be explored.

6. For creating a wider national data base in the country, ICAR's All India Coordinated Project on Agrometeorology is recommended to include spectral measurements on crops in additions to the ongoing programme of measurements.

An extremely well-compiled bibliography on crop yield estimation distributed at the workshop won a word of praise.

For further information in this context, please contact Dr. R R Navalgund, Head, LRS/RSAG/ Remote **Sensing Area, Space Applications Centre, Ahmedabad** 380 053.

SECOND LAXMINARAYAN CALLA MEMORIAL LECTURE

The second Laxminarayan Calla Memorial lecture was delivered by Shri P A Raj, Vice-chairman & Managing Director of the Sardar Sarovar Nigam. Shri Raj delivered a talk on "Sardar Sarovar Project - A Lifeline of Gujarat."

The measures taken by the State Government to sort out the environmental issue in the areas affected owing to construction of Narmada dam were outlined by Shri P A Raj.

He said 19,386 hectares of the total 27,184 hectares of the cachment area brought under treatment had so far been identified for taking priority measures. The soil and moisture conservation works, which were undertaken as part of the measures, comprise nala bunding and fence building for protection against biotic interference. The fence building would be in the form of either trench-cum-line hedge or stone wall. The catchment treatment measures in 5,483 hectares of non-forest lands had also been planned. Soil conservation steps would have counter bunding, terracing, nala plugging, pasture development and afforestation. A systematic programme for implementing this has also been chalked out.

Referring to compensatory afforestation, Mr. Raj said under the guidelines of Government of India it had been decided to raise compensatory forests in no-forest areas of 4,650 hectares in nine villages of Kachchh district in lieu of the forest lands diverted for the project. The forest area required and allowed to be diverted for the project was 4,523 hectares. Moreover, 12,729 hectares of degraded forest lands would be afforested in the compensatory afforestation programme. There would be in all afforestation of 235 hecters in the vicinity of the dam. The implementation programme is spread over a period of five years, including a year of advance preparation. Planting and nursery would be done from the second and third year, he added. The State Government has recently taken a decision to spare all Government wastelands for development of forests to the Sardar Sarovar Nigam.

The limits of the existing wildlife sanctuary - Soolpaneshwar Sanctuary - had been extended up to the reservoir shore line to provide free access to water for animals, increasing total area of the sanctuary to about 447 square km. With fencing and other conservation measures, the area would in fact become a rich medium for preservation and protection of flora and fauna. Similarly other sanctuaries in the project's command area would also be benefitted.

Allaying fears about spread of diseases like malaria, scabies, dysentery and diarrhoea owing to the project, Mr. Raj said availability of ample fresh water after the impoundment would improve the hygienic habits of the people, minimising the incidence of scabies, dysentery and diarrhoea. Most of the health problems here were related to bad sanitation, which would not be the case now.

---o---o---o---o---

CONGRATULATIONS Dr. Baldev Sahai and Dr. Ajai!

The Fertilizer Association of India has given an award to Dr. Baldev Sahai and Dr. Ajai, in the discipline of agricultural sciences (1987-88), for their article titled **Applications of Remote Sensing Techniques in Agriculture** published in **Fertilizer News**. Our heartiest congralutations to Dr. Sahai and Dr. Ajai.

ECOLOGICAL CHANGES IN THE MARINE NATIONAL PARK

Multidate satellite data were used to assess the ecological changes that have occurred during 1975-88 period in the part of the Marine National Park (285 sq kms) situated near Sikka in the Gulf of Kacchh. Visual analysis of satellite data for the years 1975, 1982, 1985 and 1988 was carried out at 1:50,000 scale. It was observed that the coral reef area which was 116 sq km during 1975 and 83 sq kms during 1982 reduced to 53 sq kms during 1982-85 period. The mangroves decined from 138 sq kms during 1975 to 50 sq kms during 1982 to only 33 sq kms during 1985. In 1988 the area occupied by mangroves increased to 47 sq kms.

The reason for the degradation of coral reefs is due to the deposition of mud over the reef area, - thus converting them into mud flats. The decline in mangroves was due to their use as fuel and fodder by the inhabitants. Till 1985, the rate of degradation in coral reefs, as well as mangroves, could not be reversed or even halted even though the area was declared as a National park. However, the coral reefs and the mangroves of the National park have shown significant improvement from 1985 to 1988 - observed as a markrd increase in their areas. This could be because of the preventive measures taken by the authorities.

From the satellite data analysis the areas of various Wetland Categories in and around Sikka are shown in Table - 1.

The rate of change in the mangroves and coral reefs over a thirteen year period is shown in Table - 2.

For more details on this study, contact Dr S R Nayak, MWRD/RSA, Space Applications Centre, Ahmedabad - 380053.

Table - 1

(Area in Sq km)

Categories	1975	1982	1985	1988	Change (Sq km)	Change (%)
Mudflats	7.7	125.6	163.2	116.10	108.4	+1407.79
Coral Reef	116.6	83.6	53.1	77.69	38.91	-33.37
Mangroves	138.5	50.0	33.4	47.65	90.85	-65.59
Dense	58.4	21.8	23.4	29.47	28.93	-47.53
Sparse	80.1	28.2	10.0	18.18	61.92	-77.30
Salt Pans	8.4	13.7	17.5	17.6	9.2	+109.52

Table - 2

Components	Annual Rate of Change in %		
	1975-82	1982-85	1985-88
Mangroves	-9.13	-11.1	+14.22
Coral Reefs	-4.04	-12.16	+15.43

---o---o---o---o---

NEWS FROM GEER FOUNDATION

The Gujarat Ecological Education and Research Foundation, Gandhinagar has set up some facilities for analysing remotely sensed data. Some information on the foundation's activities are given below:

1. PROCOM-2 has been installed in the premises of the GEER Foundation at GB-11, Sector-9, Gandhinagar. Any member of the society would be welcome to take the advantage of this instrument for interpreting the satellite data they desire to do.

2. GEER Foundation has also undertaken a research project on ecological aspects of industrialisation and urban spread between Ahmedabad and Vapi region of Gujarat State. The main thrust of this project will be to study the changes in the landuse over a period of 10 years using the satellite data. This information will be compiled along with the information of air and water status in this region for bringing out the total ecological changes in the region due to urbanisation and industrialisation during the last 10 years.

For more details on the above contact Director, GEER Foundation, GB-11 Sector-9, Gandhinagar - 382009.

NOW AVAILABLE

Proceedings of the Symposium on **Remote Sensing in Agriculture**, Ahmedabad, February 27-28, 1988.

Edited by Baldev Sahai, Space Applications Centre, Ahmedabad

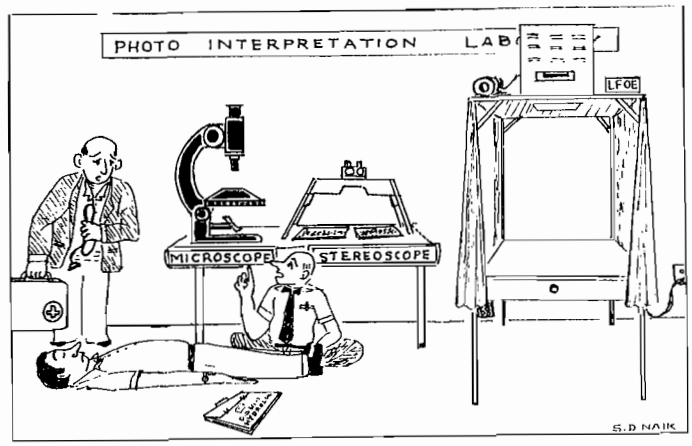
The proceedings contains articles on Sensors; Data Products and Information Systems; Crop Production, Yield Modelling and Crop Stress; Land Use and Land Degradation; Soil Mapping and Soil Moisture and a report on the panel discussion on Development and Management of Agricultural Resources in Gujarat

The cost of the proceedings is Rs. 200/-.

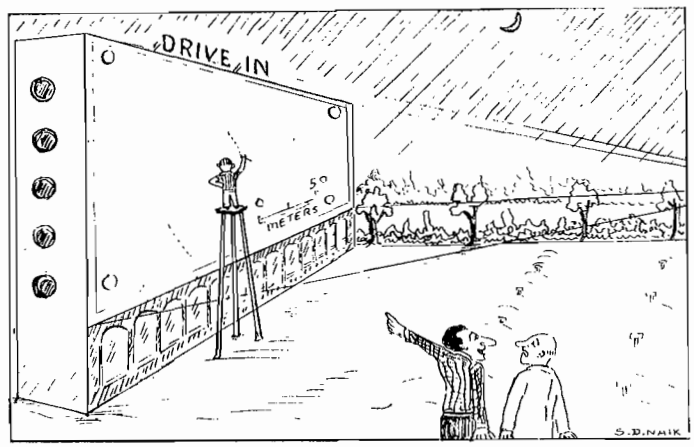
Orders may be placed with The Secretary, ISRS Ahmedabad Chapter, C/o. Remote Sensing Area, Space Applications Centre, Ahmedabad. The money may be sent through MO/Cheque/DD in favour of ISRS-Ahmedabad Chapter payable at Ahmedabad. Outstation cheque should include Rs. 6/- towards bank charges.

Members of the Indian Society of Remote Sensing can buy a copy of the proceedings for their personal use by payment of Rs. 50/- (plus postal charges).

REMOTE HUMOUR



I simply told him that this equipment we have procured for Micro-watershed studies from Landsat imagery



Whenever High Magnification Enlarger (HME) goes out of order he comes here for image interpretation

---

BOOK POST

If undeliverd, return to:
Secretary,
ISRS-Amedabad Chapter
c/o Space Application Centre
Ahmedabad - 380 053

Edited by : R P Dubey, Mukund Rao, J K Garg, Space Applications Centre, Ahmedabad - 380 053
D M Pancholi, Central Designs Organisation, Gandhinagar.

Printed at : Library, Space Applications Centre, Ahmedabad - 380 053.

---

done quite a good job. For quite some time we had been using the ground based methods - mainly drilling - to estimate the water availability. But from the last 2-3 years, we have had a good tie-up with the Indian Space Research Organisation (ISRO) in Ahmedabad to prepare the GW potential maps using Landsat-TM data. ISRO has done an excellent job in preparing the maps showing the potential areas. These maps have been used right away in the field for deciding on exact drilling areas. We have also used the maps for costruction of check dams and other water harvesting structures at various locations in the river systems. To sum it all, we can say that these maps came handy to us in the difficult times of drought and they have been useful in mitigating the effects to whatever extent was possible.

As far as the drainage problem of Ghed area, the maps from ISRO have been used to study the overall drainage system based on which we are making a master plan for ameliorating this problem. We hope this will be fruitful and we shall see a change in the Ghed area in the near future.

In Mahi-Kadana area, in 1985-86 more than 36,000 hectares was waterlogged with almost 3-5 ft of water on the surface. However, of late there has been a considerable understanding of the irrigation practices and the trend of drawing excess water seems to be declining. We are also trying to see that this does not happen in the yet to come irrigation systems. What we feel is that,it is very difficult to make an assessment of this problem from the ground. Remote sensing could make a great contribution here - mainly because of the synoptic view and also its sensor capabilities. It is very essential for us to have a systematic assessment of these problem areas, rather I would say it is of prime importance because there is an associated problem. For example in Mahi, we have now taken up a massive effort of making a network of drainages, channels, deep tube wells etc. so as to allow the logged water to flow away. But the implementation is a bit difficult as there is considerable resistance on the part of the farmers to give land for such schemes and that too when they have given away land already for canals etc.. Of course, it is also a problem for them. So, you see, we must have precise and repeated information on not only the identification of problem areas but also for the monitoring of conservation measures taken up in the water logged areas. As a result of this major problem, we are now trying to bring in some legislation by amending the presently available Bombay Irrigation Act, 1879 so as to bring in the following:-

- Ask farmers to form a group/team - say a team of about 30-40 farmers who can then apply for water needs rather than all the 30-40 applying separately for the water

- Assess the water needs based on soil condition, climate, and farming practice and then release water on volumetric measures. This we hope will bring in a semblance of judicious usage of water as farmers will have to pay for each litre they use. May be the wastage would be much less. Further, by releasing the irrigation at critical crop growth stages (as against the present practice of rotation cycles) we hope they will be able to get good and better results also.

- Introduction of rotational water system in the canal regulator. This will mean that the last man in the area will get the water first and then the rotation will start from the end to the head regulator.

- Revision of water charges so as to be able to make good the operation cost, if not parts of the capital cost. Actually, the funding agencies - mainly World Bank insist that we should recover at least 1% of the capital cost but we are yet to finalise this aspect.

With these, we hope to improve the operation and also allay the fear of the farmers about water availability. I am sure you shall all see the results of all this in the future years to come.

We have taken steps to recover the land from the salinity ingress effect and it may interest your readers to know that out of 1,00,000 hectares of saline land almost 18,000 hectares have been recovered. Thirty-five villages in the area are now getting sweet-water to drink. But there is a lot to be done. Here too, remote sensing information has helped to provide us actual information of the existing damage. We also hope to use the data for monitoring the efferts of the conservation measures that we take.

We have taken steps to reduce the ingress by constructing embankments along the sea and thus utilise the reclaimed land to productive use. Here also we feel remote sensing data can help us in the study and monitoring of this process.

We have been involved in the National project for the delineation of these wasteland areas and also suggest measures to improve these lands so that they can be taken up for various uses - irrigation, afforestation, industry, rehabilitation etc. The mapping of the wastelands is being done in collaboration with ISRO, Ahmedabad and from our side the Gujarat Engineering Research Institute (GERI), Vadodara is involved. I am told that out of the 11 identified districts, the mapping has already been done for seven districts using the satellite images.

The estuary of Mahi is very wide and the tides of the Gulf were entering the estuary to almost 50 km into the river. This sort of a monitoring of the estuary conditions, tidal effects etc. cannot be done on the ground. Remote sensing techniques are best-suited for this sort of a problem and we are involved in a project with ISRO, Ahmedabad to study this aspect, not only in Mahi but also in the Narmada and Sabarmati estuaries.

Q. What is the status of the remote sensing centre at Gujarat and also its plan in solving the problems of Gujarat.

A. Many of these problems, and also those related to minerals like lignite, graphite, marble etc., have been taken up seriously by the Gujarat Government, way back in 1985, based on a letter from the Secretary DOS to the Government of Gujarat (GOG) in which he called for a collaboation for some of the major problems using remote sensing techniques. This letter gave a big boost and the assignment was taken up in areas of ground water exploration,

wasteland etc. The GOG also recognised that a nodal agency must be set up to take up these tasks related to remote sensing and liase between ISRO and other departments of the GOG. This nodal agency is now existing as the Remote Sensing Cell in GERI, Vadodara. This agency will be well equipped with instruments/equipments for analysing the remotely sensed data and is also to be manned by trained personnel. The GOG has no lack of trained personnel at all. We have 62 officers well trained for using remote sensing techniques in the various departments. Out of these 62, the services of about 15 officers from 7 departments have already been placed with the nodal agency, who have been working there for the last 3 years under the guidance of Director GERI who is himself trained in the use of remote sensing techniques. This nodal agency is already involved in about 7-8 projects for solving some of the problems of Gujarat.

Q. You have been laying stress on the aspect of monitoring the effects of various conservation measures that you have taken. Is the nodal agency doing anything in this regard?

A. Today, the agency is in its infancy as against some of the counterpart agencies in other states. So it is too early to ask them about monitoring aspects. Initially, they have started off well and had done some spade work - all in consultation with ISRO. They are studying these problems and coming to grips with it. I feel the "monitoring stage" is yet to come - but this will be done in the near future. But we completely agree on the importance of monitoring activities and we shall do it soon.

Q. One of the hot issues nowadays is the Narmada project. There is one group of people who make it out to be an ecological and environmental disaster. There is such a hue and cry being raised about it. On the other hand there is the group which makes it out to be a revolution in the developmental efforts of the state. What, in your perspective, is the actual situation? Can remote sensing techniques help to make an assessment of the pros and cons of the project - may be based on the valuable experience of waterlogging and other problems of the existing projects over Mahi and Tapi?

A. May be you are asking the wrong person about all this. I am not an authority to speak on these aspects. But as an Engineer - a concerned engineer at that - let me tell you something. Yes, there is a lot of hue and cry. But, I can emphatically say that there is no cause for worry. Just imagine, there are more than 100 countries in the world who have constructed more than 20,000 irrigation projects. Out of these about 10,000 are just in one country - the United States of America. Can you imagine the land submerged, the forests destroyed and other ecological attributes for the 10,000 dams in USA? When the USA and other developed countries have recognised the need for tapping the river water and have gone in a big way, I don't understand why there should be a hue and cry here. What has all this done to them? They are now reaping rich harvests and have a large stock of food grains and are able to better manage the problems of the people. I really find it difficult to believe that there have been no ecological inputs there at all. How can it be?
We are the third best in the world in the dam building activity. At the present, only about 40% of the river waters have been tapped in the country and we have constructed about 2000 dams for this. But there is still a major part of the river which is flowing away unutilised - about 60% of the availability. Yes, one has to be careful about the environment. You can ask for certain assurances about this and consciously ensure that the damage done at one place is made up somewhere else. For example around the Periyar dam in Tamilnadu excellent afforestation has been done and it looks so green everywhere. There are even wildlife in these forests. Fishing is a major activity in the reservoir. So, you see there are benefits which I feel are much more than the so-called damage. But it has to be well-planned and lot of efforts have to go in. I feel that it is the reverse that is true. Dams do not degrade but improve the ecology or the environment. The impounded water of a dam can be used for all the purposes that the enviromentalist can think of - for forests, for fishing, for agriculture for drinking, for power etc. Therefore, I feel that all this outrage by the environmentalists is just unnecessary and is just a one-sided view of the whole thing. These people sit in closed-door offices and raise a hue and cry. I feel that if the environmentalists go out and meet the engineers, officials etc. and they all join together and constantly interact, then I am confident that there will not be a single project which would be called an invironmental disaster and we shall have no problem for the future.

I also feel that it is wrong to assume that the engineers are not being conscious of environment. We know the place of birds, animals, flora etc. in the system. But, we value the human life the most and place it at the top of the system. Our main concern is to provide for the humans at large. I feel that there should be 6000 more dams in India to tap the remaining 60% of the water. It will then give us a complete handle on the developmental activity and you will not have to see the face of drought as we saw recently.

Q. Coming over to the Chapter aspects, what is your suggestion regarding the activities of the Chapter?

A. I feel that there must be a process of continuous dialogue between the members so as to make a cohesive impact on the activities of the state. It is not just enough to organise a seminar once in a way. These do not serve the complete purpose at all. This must be followed up with continous interaction between the members - who are engineers, geologists, agriculturists, soil-scientists, remote sensing experts etc. I feel that we should have one-day meetings every quarter and repeat these at different places. I feel it should be a process of continous hammering by the members at the various utilising and remote sensing techniques. We must see that the techniques are known to a majority of the officials. We should try to expand horizontally to involve as many people as possible.

Indian Society of Remote Sensing
Ahmedabad Chapter

NEWS LETTER

Vol. 3, No. 2-4 and Vol. 4 No. 1 01 January, 1990

Dear Members,

Back in 1976 I vividly recall my predicament when I was to appear at Space Applications Centre for the interview of a post related to 'remote sensing'. Neither I nor any one of my colleagues knew what exactly this 'remote sensing' was. Since then a sea change has taken place. Today an average well informed Indian probably has at least a faint idea of remote sensing. It indeed is a great transformation. But how has this happened? Through this issue of Newsletter we bring you a peep in the history of remote sensing in the country. Our theme is to concentrate on 'who' has played a pioneering role instead of a giving a chronnology of 'what' events took place. So we have here flash back of history as captured through the eyes of Prof. P R Pisharoty whose pioneering endeavours have immensely enriched this branch of knowledge and led directly to the present bloom.

It is our privilege to dedicate this issue of Newsletter to Prof. Pisharoty who is fondly called 'Father of Remote Sensing in India'. He was kind enough to talk to Newsletter about not only past but also the present and future of remote sensing and meteorology in India. He also has some tips for success in life for scientists along with philosophical aspects of life and work and implicit recommendation of 'Guru-Shishya' tradition. We proudly reproduce his views in the opening pages.

A bit of nostaliga is sometimes refreshing and can be illuminating too - particularly when it is reminiscences of Dr. T A Hariharan who retired in February 1989 as Chief Scientist, Remote Sensing Area. Dr. Hariharan has been associated with remote sensing since early days and has pioneered the sensor development activities and headed Meteorology Division for a long time. We are sure that his reminiscences will make an interesting reading.

And lastly we will once more request you to share your feelings with us on various articles or issue of Newsletter as a whole. We will also welcome your contributions under the heads of views, opinions, research notes, suggestions, or glimpses of personal achievement etc. apart from regular columns. So please communicate.

We would like to acknowledge the cooperation from Shri V Tamilarasan former Editor of ISRS Newsletter in conducting this interview and Dr. M B Potdar in framing the questionnaire for the interview.

- Editor

CONTENTS

*	Inter view with Prof. P R Pisharoty	2
*	Dr. T A Hariharan - Biographical Sketch	7
*	Some Reminiscences	8
*	List of Members	9
*	INSA Awards	9
*	Society Announcement	9

INTERVIEW

Prof. P R Pisharoty, Professor Emeritus, Physical Research Laboratory, Ahmedabad is a meteorologist of world eminence and is a recipient of International Meteorological Organisation Prize 1989 awarded by World Meteorological Organisation. He has also made pioneering contributions towards the emergence of remote sensing in this country, due to which he is fondly called 'The Father of Remote Sensing'. Born in February 1909 in Kerala, Prof. Pisharoty was a research student with Sir C V Raman. He later obtained his Ph. D. from University of California at Los Angeles (UCLA). He has been closely associated with various national and international meteorological projects. On his suggestion, Government of India has procured a supercomputer for medium range weather forecasting. In the field of remote sensing, Prof. Pisharoty was instrumental in carrying out the first experiment in the country and helped in propagation of this budding technology for various applications. He also headed Remote Sensing and Meteorology Division of Space Applications Centre at Ahmedabad. Prof. Pisharoty has authored about 100 research papers and 50 popular science articles. His recent publications are 'Meteorology for Indian Farmers' and 'The Satellite Story'. A recipient of Padamshri award in 1970, Prof. Pisharoty is currently Vice President of India Meteorological Society. As a mark of respect and gratefulness Indian Society of Remote Sensing recently felicitated Prof. Pisharoty on his 80th birth day.

The grand old man granted us this interview with a smile. We met him in his PRL Office where he continues to lead an active life with no visible dent of years gone by. He spoke in his characteristic inimitable style of presentation with humourous touch, ample gesticulation and forceful, demystifying logic - the qualities which have endeared him to so many spell - bound audiences.

Throughout the one-and-half hour length of the interview, we listened him with rapt attention of mesmerised kids listening to grandpa's old stories. Thanks to our dispassionate tape recorder, we reproduce here the interview - an essence of 30 years' history of remote sensing and the life and letters of a visionary. Much of this reproduction was painstakingly pruned by Prof. Pisharoty himself.

Q. Could you tell us how remote sensing technology was introduced in India?

A. It began with a very small observation when the Indian Ocean Experiment was done - we had a revelation in 1963-64 that the ocean surface temperature of the Arabian Sea off Bombay was about 30°C - sometimes higher than land temperature during the monsoon. This was subjected to a lot of doubt. I always believe that an observation is correct. There is a tendency amongst scientists to have an hypothesis and not accept anything that is not in confirmation with that hypothesis. That is wrong. So, we had the feeling that the monsoon had got a large dependance on the sea surface temperature (SST), particularly off the west coast of India. When I came to PRL, in 1966 after retirement, this was uppermost in my mind and Prof. Sarabhai asked as to what could be done in Monsoon studies. I said that the sea surface temperature has to be measured and it is not possible to make it using thermometers in ships. This has to be done using an aircraft making use of infrared (IR) techniques. That was the beginning.

Prof. Sarabhai said that's fine. Let us do it. I told him that the equipment for this will be costly and we have to develop it and it may cost $ 25,000. Please bear in mind that the total budget for space activities was less than a crore of rupees. He agreed readily and said if 8% returns can be promised for the investment then crores can be invested. He found that a French Laboratory was taking an IR scanner for measuring SST from aircraft. He had contacts with those people and suggested that we make a similar one by doing a collaborative development effort based on the same lines. The technique was to duplicate the efforts on the scanner and have one ready for ourselves and so that a duplicate is being developed along with the original. Dr. T A Hariharan and one more Engineer were recruited and sent to Paris. They developed the scanner and brought it to India. This was all in 1971.

Q. That is all about the first technical development. How did the idea of land applications originate?

A. It was around the same time (1968) that there was an UN Conference on "Peaceful Uses of Outer Space" in Vienna of which Prof. Sarabhai was the Scientific Chairman. In that conference there were 2 papers on Remote Sensing. That was mainly connected with aerial photographs of vegetative cover and to discriminate soldiers in green khakhi uniform moving about in the Vietnam green forests. The IR reflectance of the vegetation is different from the IR reflectance of green Khakhi. Both are visibly green but the IR reflectances differ and thus are registered differently in IR photograph. The green khakhi has low reflectance and vegetation a high reflectance.

These two - IR for SST and IR for vegetation were found to be of use and we found that this could be applied in our country also.

Originally, the photographs were for camouflage

detection but later became a part of remote sensing (RS) of vegetation and other land features like water bodies, buildings etc.

After hearing the 2 papers, Prof. Sarabhai asked me to take it up for introducing it in our country. At that time the US was not much ahead of us in RS applications - but only in technology. They had also started experimentation in a small way. They knew that vegetation came up as red and water as blue and so on. Incidently, that's why it is called False Colour IR film. Originally it was called **Camouflage detection film. For a long time it** was classified and when we started on a project here we could buy only limited quantity and not in bulk as was required for the project. For that the President's sanction was necessary in those days.

Q. How was the problem of trained manpower and government funding handled?

A. As we wanted to introduce this in India we thought that a large number of people must be exposed to it. For a subsequent conference on RS, at Ann Arbor, Michigan we wanted a large delegation to attend and learn the various aspects. Dr. Sarabhai had this vision that one man cannot absorb everything and nor will those people be impressed about our commitment to RS. If about 5-6 people were sent, they would feel that we were serious. So we collected a group. Shri Kale was there, one Mr. Subramanyan (alas! he is no more) of Atomic Minerals Survey Department was there. The GSI said that they were not interested. The agriculture department was also not enthusiastic, however Dr. M S Swaminathan said that if all expenses were met by us, he would spare one person. So that's how Dr. Dakshinamurthy came in. We all went there and saw the things in US - at different centres for various disciplines - agriculture, forestry, micrometeorology etc. After attending the Conference at Ann Arbor, we came back with the state-of-the art in RS as it existed in US then.

The people working on RS at Ahmedabad were nil. Only two engineers were there for the scanner. It was felt that the Government must be convinced about the usefulness of the RS activities. RS was a new technology and people had to be convinced. People said RS is not something new but it is just Astronomy. Prof. Sarabhai decided to meet the PM - outside office hours, after dinner at her residence. So we went with a set of colour slides on RS and 2 projectors - so that if one fails the other can be used (redundancy even there). There were 4 or 5 people for the meeting; Dr. Sarabhai, Prof. Ramanathan and myself were there to make the presentation on the application of Remote Sensing in Agirculture, Oceanography, Geology etc. The Cabinet Secretary, Dr. M S Swaminathan and Shri Haksar were also there.

After our presentation, we came back. Prime Minister just heard us and said nothing. I asked Prof. Sarabhai about it, he remarked: "that doesn't matter, PM didn't object and that means she approves".

Q. Could you tell us something about the first RS experiment in India and subsequent developments?

A. After the presentation at PM's residence Prof. Swaminathan told me about the coconut wilt disease in Kerala. He asked if RS technology could be used for detecting the disease early. I rallied that perhaps we could. That is how the first experiment on **Coconut Wilt-Root Disease employing remote sensing technology was started.**

We had no equipment. We wrote to the US (NASA) requesting for the help of a scientist who would come to India with a set of cameras and false colour films for this experiment. We required an aircraft also and there was a helicopter supplied by USSR for use by Thumba Rocket Launching Station. For the project, the Kayamkulam Coconut Research station was chosen as it had coconut plantations and was near Thumba. It was under IARI and they were also asked to collaborate. The Chief Scientist of the Research Station also came into the project and so we had a team of scientists and a team of people to take the photographs. My job was only to collect all these people together. For navigation, we resorted to setting up small fires in the fields. They served as control points. These 'ground-places' were in a pattern (single, square etc.), so as to be easily identifiable.

We had the remote sensing survey carried out and we saw that some of the crowns looked different and the difference was because of the disease. Those crowns appeared 'less red' than the ones that were unaffected. The juice of the leaves of 'less red' trees were taken and were examined under an electron microscope by IARI and the virus was seen in them. So before the farmers could see the appearance of the disease on the tree this methodology could be used for detecting the wilt root disease. However, this technique could not give any cure - but that was not our job, we were only to detect it and we detected it. Our experiment was a great success thus an 'acceptance' was found for RS.

Prof. Sarabhai had other ideas regarding 'acceptance' of the technology. He invited a large number of Parliamentarians, Heads of department in New Delhi, for a lecture on RS. I was asked to give a lecture about the RS technology to them. He had invited them personally (about 200 invitations - but only 100 turned up). The lecture was in the Constitution House, New Delhi. In a sense the audience was impressed. Prof. Sarabhai knew that an acceptance by those people was desirable for the success of the application of remote sensing in India.

So **that was the beginning and was a mark for us to take off.**

Soon after that we had the False Colour IR films

imported in small quantity. And we planned experiments for Agriculture in Karjat. Dr. Madhavan Unni was there and we had aerial surveys. Films were obtained through our friends in USA. It was not ISRO who was buying it. We saw the onion plantations, rice fields, the wheat fields, sorghum fields etc. all looking different.

There were other problems also. Every time an aerial picture was taken the Ministry of Defence wanted to know what we had taken. They had to see the pictures and clear them before scientists could study the pictures.

The next was the project "ARISE" in Anantpur. Dr. Baldev Sahai was the Project Leader. That was the time when there was levy on rice. So the farmers had reported less area under rice. But the photographs showed the reality. Thus, the RS technique was more 'accepted' and people realised that they cannot "bluff" as that would be called off.

Soon after that Dr. M S Dhanju was the Project Leader for carrying out a similar experiment in Patiala and there was no problem at all. People had realised the efficacy of this technique and had reported correctly. By the mere fact that this sort of inventory is possible, benefits accrued immediately.

The technology got accepted generally and rapid developments took place thereafter. Even at the start, Prof. Sarabhai envisaged that ISRO should not be the end user. The Secretaries of all user departments were informed about this tool and told that they should decide how best to use this technique. The NNRMS concept is an expansion of that idea.

Around that period, UK was putting up a satellite. They offered space for a 40 kg payload for RS. They were told that Prof. U R Rao would use the 40 Kg payload for his experiments and that a 40 kg payload for RS was not sufficient. We would wait till we get a capability to put a sufficiently large payload (about 1000 Kg). An inadequate use might act as a negative factor in getting satellite remote sensing accepted in the country.

So we had to wait till 1988 for this. But the waiting was worth it. So this is the part of my story.

Q. You had certain perceptions earlier about the future of RS in India. Does it match with what it is now?

A. What we are now is almost 80% of what we had perceived earlier. I feel that our animal population can also be detected by RS. We have crops, water etc. but what about our animal population? I wish that we have a programme where the total number of animals - cattle, wild life etc. can be enumerated, e.g. elephants. There is a lot of poaching - killing elephants for the ivory. One animal means about Rs. 20,000/-. Elephants are ideal "black-bodies". The present resolution in satellite imagery may not be adequate to detect these huge "black-bodies". RS can be from aircraft, helicopter etc. Further, elephants move in herds and so it should be possible.

The forest area has been mapped but not the volume of wood in a forest. You can cut down trees and map the degradation but what about the volume of wood. This could be done from aerial photos. Such information is hardly available. We should do something on this line.

Another area is in the villages. Presently, there are land ownership records and these change so much that the records are not updated so as to include the changes. Based on aerial photographs these could be well-maintained for every village. Even the satellite photographs over Delhi are fairly revealing. It is possible to launch smaller satellite at lower altitudes which provide better resolution. The moment we have our own satellite launching capability we can have this kind of satellites for close observations. That would be helpful in accurate mapping of land boundaries and in checking unlawful violations.

Q. Since 1970 we have thermal scanner. That has not really been used for earth resources. Even Landsat TM has thermal channels but these have not been effectively used. What do you think are the reasons for that?

A. Remote sensing is a developing field; apparently scanning the sea for SST with an IR scanner on aircraft has been superseded. Now we have new sensors; new satellites which provide the information. The exercise of building airborne thermal scanner boosted our morale and gave us confidence in ourselves. Although at that time it was a copy cat business but it was worth it in term of confidence building.

Other day at Haryana, I had shown a picture from SPOT satellite of Dehradun and IRS picture on same film. It was difficult to distinguish between the two. We may be patting our back but it is a deserved patting.

Q. Don't you think that one of the reasons why IR has not been used is because we are trying to get quantitative information from RS. Compared to qualitative applications like mapping, monitoring etc., most of the problem areas in RS relate to the aspects where quantitative information like SST, yield, acreage etc. is derived from RS.

A. This is basically because users were primarily not interested in quantitative information to the extent they ought to have been. Like ancient medical practice, somebody has temperature and that was enough. Now they say 102° F and don't concern themselves with 102.28°. So it is the flaw of the way science has developed. Remote Sensing has a close analogy here. So most of information derived

was qualitative which was reasonably good. But IR comes in the range of quantitative realm. It could have effectively been used for night surveillance. But now it has been superseded by multispectral data. Even now IRS is not operating during night as it does not have IR. Surveying during night has certain advantages. There are some areas where mercury is found and those surfaces will have higher temperature due to mercury vaporisation and diffusion. Here IR scanner will be more useful than satellite. For a mineral prospector this is quantitative information. Such temperature anamolies are of interest to GSI and the demonstration of this may lead to requirement of IR scanner. Accurate measurement of temperature over land surface has many other applications. For example in location of hot springs. This may have medical values and consequent business prospect - in form of selling 'Vichy' water, the kind of beneficially polluted 'Sulphur' water.

Q. How has the satellite meteorology evolved and what is the history of this discipline?

A. The observations for meteorology are taken from inhabited areas of the globe. But such areas are limited as there are deserts, polar regions, oceans, snow covered areas etc. for which data are not available. Data from these areas are also required for weather forecasting even one or two days ahead. Collection of data from uninhibited areas has been possible with the help of satellites. We would like to have more data than the satellite collects. Basically radiation measurement from earth's surface have been made use of for meteorological parameters like cloud top temperatures and cloud cover. Vertical temperature profile measurements came later. Now we are talking about humidity profiles. Now we have a lot more satellite data as compared to 1960s and the whole globe is covered by geostationary satellites. Our own geostationary satellite at present does not provide all the measurements, other satellites do. In future we will have all the capabilities.

Q. How is this satellite meteorology and super-computer fitting into the overall weather forecasting scenario in the country?

A. Since 1875 IMD has been forecasting weather with the help of synoptic weather charts which depict at an instant of time the prevailing meteorological conditions like winds, pressure, temperature, clouds, rainfall etc. in different parts of India. If a cyclone is out in the sea we could not know its location precisely till satellite pictures came in. If there is a rainfall pattern it will not repeat tomorrow - it will move. With the past experience we found out how it has been moving. If Calcutta gets rain due to cyclonic storm today, three days later the rainfall pattern would move westwards and Allahabad and Delhi get rain. This is past experience and we believe today also that it would behave similarly. So with the past experience we used to know how weather patterns move. That is known as synoptic meteorology. How it moves in our country may be different from how it moves elsehwere. Also the pattern observed over past ten years may not exactly repeat in another timeframe. There might be anamolies from average. But a qualitative estimation is certainly possible. However since a long time people have been questioning the entire premise. It is a physical phenomenon - created by the distribution of winds temperature, humidity, pressure etc. The equations of motion, of continuity and thermodynamics are known for over a century. If we apply these equations to every part of globe it should tell what will be the fate of weather next hour or next day. This is the basis for quantitative forecasting. Thus if we can compute the behaviour of each part of globe in the next day or two, it is numerical weather prediction. But soon we discovered that movements in one part of sphere are affected by adjoining and distant parts. Electromagnetic field shows similar behaviour. A magnet is affected by electric current flowing elsewhere. An electric current and the magnetic field produced by it have a great similarity with vorticity. I believe that in future we will be able to make better forecasts on the basis of this electrical analogy. computation of future weather is based on the assessment of weather prevailing elsewhere over the globe. Data for numerical weather prediction became available only after satellites came in.

As far computers are concerned, there are six partial differential equations to describe the course of a parcel of air. Now six different partial equations of all neighbouring parcels are also required. The globe has been divided into 500 grid points and five levels. Thus there are about a million partial differential equations to be solved. The mathematical equations are such that they can give forecasts only an hour ahead. Therefore if we want a 24 hour forecast, 24 million equations are to be solved in an hour or two. A good fast computer is required for that purpose.

In 1983 April Punjab had a 3 days rainfall, which spoiled the crop. Prime Minister was worried. Prof. Yash Pal was called to investigate as to what could be done to improve our weather service to farmers. The farmers were asked about the current weather forecasting service which was for 36-48 hours in advance. After initial hesitation they confided that this was no use to them as no action could be taken such a this short period. If the forecast to be useful it must be provided atleast a week in advance. I quoted the American and European approach where numerical weather forecasting using a supercomputer was providing forecasts upto 10 days in advance with good reliability. Prof. Yash Pal asked me to write to PM. In a half page note I explained the need of a supercomputer for medium range forecasting. Since we have a satellite and arrangements for global data reception, we need a supercomputer which will cost 50 crores. It was accepted.

Regarding the question of expertise and training to take up this kind of numerical weather forecasting, I strongly defended the idea of indigenous effort against the view that an Indo-US collaboration was required. Afterall God did not tell Americans how to do numerical weather forecasting. Similarly I am confident that given the opportunity, Indian Scientists will also do the job. And it is also a must because the model developed by other established countries pertain to upper latitudes whereas we require models for tropical conditions. Luckily the Government of India accepted the proposal and has procured the super- computer. There was a question about the Super Computers location. A Committee was set up. It was in favour of Pune, which provided a better academic atmosphere and a better climate is necessary to take care of people, who will be mentally involved in this activity not doing a push button job. However a politcal decision has been made to locate the computer at Delhi. Eventually Indian scientists will be able to issue weather forecasts 7-10 days.

Q. Shall we also ask questions about your life and personal matters? You had an active research carrier spanning 40-45 years, how do you feel about this?

A. I have been very lucky. To pursue an active research carrier your domestic front should be happy. If you have got a sickly wife at home or a nagging wife, you cannot concentrate. My health has been reasonably good. That is also a matter of luck or circumstance. So I have been lucky. Scientific research or any other carrier requires hard work apart from brain power. I have been lucky as I got a good professor like Prof. Raman, who told me how to do research work. It has little to do with scoring first class marks in your exams.

Q. Could you tell us some reminiscences about Prof. Raman?

A. I recall many reminiscences with Prof. Raman. One of his questions in an interview was to ask for interview the length and diameter of a piece of pencil or some other handy object. This way he used to assess the faculty of mental estimation. Certain other innocuous looking questions were his favourites. Like, 'Why is glass transparent?' or 'Is rocksalt soluble?' If the correct answer is given he will ask further as to uses of rocksalt. He must know that rocksalt is transparent in infrared and is used for making prisms. And you cannot touch it as it would dissolve. I was a vacation worker with Prof. Raman where refundable deposit of Rs. 75/- was needed contrary to present day trend of getting scholarship for any work. In those days Rs. 75/- was a lot of money, about Rs. 2,000/- of today. He took me to the microscope and showed a mica sheet out of focus, which showed bands. The problem had been defined. He told me to go through a similar work of a German scientist running into 90 pages German. Looking at my blank face he told me not to worry and take help of German-English Dictionary. He further consoled me by saying that a person claiming to know German would take three days and that I might take 7 days. Thereafter almost every day before 8 am I used to go to him for guidance. He used to rise early in the morning and come to laboratory by 7 o'clock. We were 10 students there. In whichever room an individual was, he would enter and have discussion for half an hour.

After an year IMD asked for a man and he nominated me. To my querry that I am not the senior most person he gave the reason that I was 33 and at that age getting a Government service was not easy. For my Ph. D. degree he said you can get it later and regarding the temporary nature of the post he quipped, "Pisharoty, is life not temporary?". He also used to say "keep yourself warmer than what you need to be". That was the reason why he dressed always like a European. He believed that our handicaps could be overcome by greater thinking power and hard work. One day when I was depressed at the thought of some other lab having a powerful X-ray machine for crystallography, he asked me, 'What is the power of that machine?' I said '10 kw', and 'yours', I said '1 kw'. 'Then you put a 10 kw brain on it'. Such was the importance of brain power in his mind. He advised me in January 1942, to spend 10% of income on books and journals. I kept it up. But my wife started objecting to this scheme of spending a 10% chunk of income on books. My doctor told me, when you buy expensive books, buy a saree also. Since then there were no complaints. She may not be using all the sarees all the time, nor am I using the books always, but both are happy. If you are very much alert on your subject, your boss recognises it. In fact if he knows that you really 'know' the relationship becomes very cordial. Of course if you "show up", he will try to cut you down. Books and knowledge from them earns you affection and regard from your colleagues - junior and senior.

Q. Do you think there is need for motivation in life? Did you have such motivation?

A. Yes, I had motivation. Soon after my graduation, I realised that I am not going to be a rich man. What is the other alternative - to become rich in knowledge - whatever be the field. With that motivation I went to Prof. Raman who used to motivate with the triple virtues of ambition, courage and endeavour. Courage I did not have. But it is an essential ingredient for success in life. Because, even if you have a good idea you need courage to put it forward.

Q. In your presentation you quote so many 'shlokas'. Do you remember these or prepare in advance for the talk?

A. I prepare for it in the sense that I know where slokas appropriate to the context are to be found in my books and I look them up. I had an

advantage in this regard as I was exposed to a large number of Sanskrit 'Stotras' in my boyhood. My brother was educated in Sanskrit and used to enjoy reading from Sanskrit works of Kalidasa etc. Also large number of people who used to visit the temple repeated 'stotras'. My village had two houses - mine and a temple (of Siva). Thus I was exposed to Sanskrit in my early life. Later I was exposed to books like Brihadstotra, Ratnakara, Kalidas's works, Subhashita Ratna Bhandagara etc.

Q. Do you have any message for us?

A. Same as what Prof. Raman has often stated : Have ambition, courage and endeavour. And you can start any day. And there is no reason why you should not have a high ambition.

DR. T A HARIHARAN - BIOGRAPHICAL SKETCH

Dr. T A Hariharan was born on February 10, 1929 in Palghat, Kerala. He had his early education in his home town and had the distinction of standing first in B. Sc. (Physics) in Madras University in the year 1949. He took his M. Sc. degree in Physics in 1951 from Delhi University and soon started his career in research at the Indian Association for the Cultivation of Science, Calcutta. He moved over to the Department of Physics, Indian Institute of Science, Bangalore from where he took his Ph. D. degree in Physics in 1957. He continued his research work at IISc in a post- doctoral capacity on problems related to Molecular structure and advanced spectroscopic techniques. He joined the Karnataka Regional Engineering College and was Assistant Professor there for a couple of years.

Dr. Hariharan then joined the Space Science Center, University of California, Los Angeles to work on a NASA sponsored project as a Co-Principal Investigator. The objective of the project was to develop an optical instrument involving polarisation measurements which will enable to monitor aerosol effects on the Thermal IR measurements made in spaceborne atmospheric sounding.

After successful completion of the project, he joined the Space Science and Engineering Center, University of Wisconsin, Madison where he was involved in system studies on monitoring of typical anthropogenic environmental pollutants from space platforms using Raman effect as a possible technique.

Dr. Hariharn was invited to join ISRO in 1970 and was assigned to work at CNRS near Paris to build and bring to India a Thermal IR Scanner as part of a collaborative program initiated by Prof. Vikram Sarabhai.

Since his return to India in 1971, Dr. Hariharan was involved in the formulation of Indian Space Program Profile, in the early Remote Sensing experiments and in the preparations in the country for Landsat data utilisation.

Later he made many contributions to the overall ISRO programs in many capacities. He has been a member of many study teams, working groups and committees at ISRO and national levels. These include ADCOS, INCOSPAR, INCOSTEP, IMPA, INDO-USSR WG, ISRO-ESA WG, PAC (DST), INSA IGBP, RESPOND, IRS, IRS-1C, II etc.

He has been deputed abroad several times to various countries which include Brazil, USSR, USA, UK, Canada, France, W. Germany, Italy and Japan. He is a member of the Editorial Board of the International Journal 'Marine Geodesy', Editor-in-Chief of Journal of the Indian Society of Remote Sensing, Editor of INCA-87 Proceedings, Editor Proceedings, National Symposium on Application of Remote Sensing for Rural Development. He has also served as a referee to journals like Mausam, Indian Journal of Radio and Space Physics and Proc. Ind. Acad. Sciences.

In 1985 Dr. Hariharan was designated as Chief Scientist (Remote Sensing) with the powers of Deputy Director, SAC. He retired from ISRO on February 28, 1989 and he continues to be active with an assignment at Gujarat University.

ISRS-Ahmedabad Chapter records its appreciation of his services and wish him all the best.

SOME REMINISCENCES - T A Hariharan

The Remote Sensing Programme of ISRO has made phenomenal progress in just two decades since the first and famous experiment on the early detection of wilt root disease in Coconut palms in Kerala. Many may not know about the events that followed immediately after the first experiment. This was the time when I entered the scene and began my close association with Prof. P R Pisharoty.

My first assignment was to work at CNRS France to build a Thermal IR Scanner for India for Sea Surface Temperature (SST) measurement to help in prediction of monsoon. At that time an identical scanner was being developed by France to test a concept of a design for a future Geo- stationary Meteorological Satellite Payload.

Through this scanner we could bring to India some technology for indegenous Multispectral Scanner Development.

The second Remote Sensing Experiment we did has an interesting history. Mr. Blamont Denise was a student at Poona University for his M. Sc. degree in Geography. As part of his M. Sc. course he wanted to do a Remote Sensing Project involving aerial photography with CIR films in an agricultural village, Kedagaon about 60 km from Poona. He sought ISRO collaboration. The French Space Agency CNES assured him the services of a technician for photography and processing and also for providing the films (panchromatic, colour and false colour) and chemicals. ISRO agreed to provide three cameras, a helicopter, mounts for the cameras, processing facilities and all other logistics support and local hospitability.

Myself and my colleaue Dr. N V Madhavan Unni represented ISRO in this collaborative project. Luckily for us three Hasselblad cameras were available at PRL at that time. We arranged for a helicopter from the Naval Base INS Kunjali at Colaba Bombay, the frame for the Camera mount and the photo processing facilities were provided by TIFR and Poona airport and Poona University also provided some support. We had to work hard to coordinate between these various agencies.

To test the camera mount, we carried out a short flight in the helicopter from Colaba to a small Island in the bay and took some colour pictures. During the flight, the vibration was so much that I was afraid the cameras will get loose and fall into the sea. Fortunately it did not happen and only one lens cover flew off.

The French Technician Mr. Tamalet arrived with all the necessary materials and we faced some problem in clearing the customs. Mr. Tamalet could not speak English and that complicated matters further. I knew sufficient French to understand him but could not communicate to him in French.

After overcoming the initial problems, the experiment was conducted and we got excellent quality pictures.

Through this experiment we learnt the tricks of False Colour IR processing which could not be done in the country at that time.

Later we began plans for doing some experiment all by ourselves but this time we desired to use a Dakota instead of helicopter. We were using a Dakota at that time for our Scanner flights.

We selected some agricultural fields in Karjat near Bombay. We imported the films, chemicals etc. and also prepared a dark room in an apartment building which also housed the Remote Sensing unit.

We faced many problems. We needed security clearnace for aerial photography, clearance from civil aviation for flying the aircraft, a security officer has to be onboard the aircraft during photography, the processed films must be handed over to the security officer for clearance for use.

In the case of the Karjat experiment, by the time we could complete the formalities for the flying, the harvest was over and it was only bare soil on the fields.

We made one more attempt in another location south of Jaipur which also ended in frustration. Our next attempt was over Sriharikota and this proved somewhat successful. Part of the CIR imagery over SHAR adorned the front page of SAC Courier for a long time till it was changed by a SLAR imagery.

In the meantime we had imported many more Hasselblad cameras and returned to PRL the cameras we had originally borrowed. SAC was then ready for a major Project like ARISE. The cameras used to go bad often for want of proper maintenance. We sought the help of the agent through whom the cameras were imported but this was of no avail.

After consdierable negotiation we managed to send one of our Engineers for about 2 weeks to the factory in Sweden. During this short visit he managed to learn as much as he could and brought with him the appropriate tools which proved to be a great asset.

Since that time the defective cameras could be repaired and experiments could go on without interruption.

As is well known now many more joint projects followed ARISE and we entered the Space with Bhaskara and then on to IRS. With the formation of NRSA, Remote Sensing reached totally new dimensions with extensive resource surveys with advanced cameras along with MSS and Landsat data received and processed at NRSA.

Our efforts continued in the area of R&D and exploring new applications of Remote Sensing data which might lead to future operationalisation in the development of sensors and image processing techniques.

Society Announcement

NOW AVAILABLE

Proceedings of the Symposium on Remote Sensing in Agriculture, Ahmedabad, February 27-28, 1988. Edited by Baldev Sahai, Space Applications Centre, Ahmedabad

The proceedings contains articles on Sensors; Data Products and Information Systems; Crop Production, Yield Modelling and Crop Stress; Land Use and Land Degradation; Soil Mapping and Soil Moisture and a report on the panel discussion on Development and Management of Agricultural Resources in Gujarat.

The cost of the proceedings is Rs. 200/-.

Orders may be placed with The Secretary, ISRS Ahmedabad Chapter, C/o. Remote Sensing Area, Space Applications Centre, Ahmedabad. The money may be sent through MO/Cheque/DD in favour of ISRS-Ahmedabad Chapter payable at Ahmedabad. Outstation cheque should include Rs. 6/- towards bank charges.

Members of the Indian Society of Remote Sensing can buy a copy of the proceedings for their personal use by payment of Rs. 50/- (plus postal charges).

Dr. DADHWAL, CONGRATULATIONS AGAIN!

Dr. V K Dadhwal has been awarded INSA Young Scientist Medal 1989 for his research contributions in the field of agriculture. The award consists of a medal and a cash prize of Rs. 5,000/-. In addition the award also has a provision for research grant by the academy not exceeding Rs. 20,000/- including stipend for a JRF for a period of three years. Dr. Dadhwal had earlier won INSA Young Scientst Award 1987.

Life Members

A. Space Applications Centre, Ahmedabad 380 053

1. L-280 Dr. Ajai
2. L-436 Shri H I Andharia
3. L-131 Dr. M Bardhan
4. L-408 Ms S Beenakumari
5. L-442 Shri N P Bhatt
6. L-162 Shri O P N Calla
7. L-424 Dr. M Chakraborty
8. L-138 Dr. (Ms) Neera Chaturvedi
9. L-423 Shri H B Chauhan
10. L-398 Dr. V K Dadhwal
11. L-399 Shri B Das
12. L-124 Shri A R Dasgupta
13. L-170 Dr. Pranav Desai
14. L-140 Dr. P S Dhinwa
15. L-172 Shri R P Dubey
16. L-142 Shri R M Dwivedi
17. L-440 Ms Kavita Dwivedi
18. L-215 Shri J K Garg
19. L- Shri R C Garg
20. L-169 Shri R K Goel
21. L-295 Dr. K K Gupta
22. L-405 Dr. M C Gupta
23. L-013 Dr. R N Jadhav
24. L-282 Dr. George Joseph
25. L-414 Shri P Jothimani
26. L-422 Shri P P Kale
27. L-122 Shri M H Kalubarme
28. L-139 Dr. A K Kandya
29. L-410 Dr. M M Kimothi
30. L-126 Shri A V Kulkarni
31. L-407 Shri T J Majumdar
32. L-439 Shri T T Medhavi
33. L-141 Shri N S Mehta
34. L-412 Shri R Mehta
35. L-132 Shri Mukund Rao
36. L-121 Dr. M V Muley
37. L-430 Shri E S Murthy
38. L-401 Dr. K V G Murthy
39. L-432 Shri T V R Murthy
40. L-134 Dr. S D Naik
41. L-027 Dr. A Narain
42. L- Shri A Narayana
43. L-125 Dr. R R Navalgund
44. L-130 Dr. S R Nayak
45. L-483 Shri K N Padia
46. L-431 Dr. S Palria
47. L-417 Mrs. Anjali Bahugauna
48. L-120 Dr. (Ms) Sushma Panigrahi
49. L-129 Shri J S Parihar
50. L-127 Shri N K Patel
51. L-421 Shri R M Patel
52. L-438 Dr. P N Pathak
53. L-402 Shri S K Pathan
54. L-216 Shri N S Pillai
55. L-419 Dr. S S Pokharna
56. L-445 Dr. M B Potdar
57. L-413 Shri A S Rajawat
58. L-403 Dr. R Ramani
59. L-038 Dr. Baldev Sahai
60. L-444 Dr. A Sarkar
61. L-416 Shri M G Shaikh
62. L- Dr. K P Sharma
63. L-400 Mrs. Tara Sharma
64. L-404 Shri Rajeev Sharma
65. L-409 Shri S K Sharma
66. L-281 Dr. Shiv Mohan
67. L-418 Dr. V N Sridhar
68. L-411 Dr. V K Srivastava
69. L-127 Shri T P Singh
70. L-420 Dr. T S Singh
71. L-426 Shri H U Solanki
72. L-428 Mrs. Sudha Ravindranath
73. L-128 Shri V Tamilarasan
74. L-105 Shri P S Thakker
75. L-425 Ms Yogini V Vanikar
76. L-437 Shri S P Vyas
77. L-443 Dr. N K Vyas

B. Directorate of Geology and Mining, Ahmedabad

1. L- Shri J V Bhatt
2. Shri C K Joshi
3. Shri N Madhukar
4. Shri K K Naik
5. Shri J M Patel
6. Shri B P Pathole
7. Dr. D J Talati

C. Physical Research Laboratory, Ahmedabad

1. L-046 Prof. P D Bhavsar

D. Gujarat Maritime Board

1. L- Shri Vikasin Desai

E. Dept of Physics, Gujarat University, Ahmedabad

1. L- Prof. S D Verma

F. Dept of Forest, Ahmedabad 380 004

1. L- Shri J P Aggarwal

G. Indian Institute of Management, Ahmedabad

1. L- Prof. T Madhavan

H. Central Designs Organisation, Gandhinagar

1. L- Shri D M Pancholi

I. Gujarat Water Resources Development Corporation, Gandhinagar

1. L- Shri S C Sharma

J. Others from Ahmedabad-Gandhinagar

1. L-133 Shri G C Bhatnagar
2. L- Dr. Panubhai Bhatt
3. L- Shri D S Kamat
4. L- Shri P C Mankodi
5. L- Shri J F Mistri
6. L- Shri M M Patel
7. L- Shri M H Patel
8. L- Shri P Shukla
9. L- Dr. R T Shukla

Annual Members

A. Space Applications Centre, Ahmedabad

1. C- Ms Nita Ajwani
2. C-356 Shri A Arya
3. C- Shri I M Bahuguna
4. C-386 Shri U G Desai
5. C-372 Shri S Ilanthirayan
6. C-226 Shri K D Mallick
7. C- Shri S S Manjul
8. C- Shri B S Munjal
9. C-239 Dr. R Nandkumar
10. Shri Sandip Oza
11. Dr. M P Oza
12. C-277 Shri R M Pandya
13. Mrs. Parul Patel
14. C-007 Shri R S Rao
15. C-238 Shri N Ravi
16. C-351 Shri C L Roy
17. C-382 Shri S V C Sastry
18. C Shri G P Sharma
19. C-365 Shri A K Sharma
20. Shri S A Sharma
21. Shri J K Thesia
22. C-369 Miss Ketki Vora

B. Central Ground Water Board, Ahmedabad

1. Shri Arijit Dey
2. Shri P R Gupte
3. Shri S M Vohra

C. L D College of Engg, Ahmedabad

1. Shri J N Patel

D. M G Science Institute, Ahmedabad

1. Prof. V D Dave
2. Shri G B Pandya
3. Shri R D Shah

E. Public Health Dept, Ahmedabad

1. Shri J J Nazareth
2. Shri R N Shukla
3. Shri A V Soni

F. Gujarat Water Resources Development Corpn, Ahmedabad

1. Shri Vijay Ayachit
2. Shri H N Parikh

G. All India Soil and Land Use Survey, Ahmedabad

1. S C Dhar

H. Irrigation Department, Gandhinagar

1. Shri P D Dhruv

I. Directorate of Geology & Mining, Ahmedabad

1. Shri H M Shah

J. Others from Ahmedabad-Gandhinagar

1. C-220 Shri S Avarani
2. Shri H S Oza
3. C-235 Dr. G R Vekaria

BOOK POST

If undelivered, return to:

Secretary
ISRS-Ahmedabad Chapter
C/o. Remote Sensing Area
Space Applications Centre
Ahmedabad 380 053

Edited by : R P Dubey, Mukund Rao, J K Garg, Space Applications Centre
Ahmedabad 380 053
D M Pancholi, Central Designs Organisation, Gandhinagar

Printed at : Library, Space Applications Centre Ahmedabad 380 053

LRD/RSA G

Indian Society of Remote Sensing
Ahmedabad Chapter

NEWS LETTER

Vol. 4 No. 2 01 April, 1990

Dear Members,

In common parlance, 'fishing in troubled waters' is a serious accusation or a derogatory remark but the proverbial saying afterall seems to have a scientific basis. At least if one goes by the satellite images which have been used by the scientists of Marine Fisheries Project to forecast potential fishing areas on the basis of observed location of thermal fronts (or troubled waters ?). The idea of using sea surface temperature for locating fishing grounds is being used operationally for the first time in the country. This issue features a report on the modus operandi and some results. A short report on aquaculture site mapping having relevance to inland fisheries is also included to apprise you of the state of art.

Talking more about the fisheries as a theme of the newsletter, do you think that we ought to be world leaders in fisheries?. Why not ? For a country sitting atop a vast ocean, with long coastline, dense population, rice economy and a rich tradition of sea faring, it should have been natural. Extend the argument further and world food shortage should have simply disappeared. Unfortunately both have not happened. Lack of information is the main cause for inadequate harvest from underexploited and unexploited areas. Thus the marine fisheries project fulfills an important national requirement. Globally, the entire primary productivity of oceans is close to 300 billion tons while the world gets around 30 million tons of marine fish catch (inland fisheries contributing further one tenth of that). This vast untapped potential indicates a clear green signal for full steam ahead - at least from now till the day of 'greens' and assorted conservationists.

Lined up in this issue is a report on National Drinking Water Mission-a meticulously executed, neat end-to-end type job done with clock work scheduling and down-to-earth practical purposes. A Glimpse of GIS- that 'in thing' completes our scientific news/progress reporting.

On March 31, 1990, curtain was finally rung on the country's most ambitious and multi-faceted remote sensing applications programme - the Indian Remote Sensing Satellite Utilisation Programme (IRS-UP). Between an euphoric beginning of 1984 and a tapered ending of 1990, the programme achieved many things - scientific and otherwise. One of the biggest achievements of the programme was to help light many candles from one candle which shines in the institutional landscape of the country now dotted with flames of remote sensing - steady or flickering notwithstanding. In the next issue of Newsletter, we plan to take a closer look at IRS-UP, not from the angle of horizontal proliferation, but purely in terms of scientific achievements of its various components. So please do send in your inputs.

Lastly certain members like Dr. R.N. Jadhav have suggested the idea of starting a debate on some controversial issue, say, visual vs digital classification. All this to cajole you for a response. So any body firing the first salvo?.

- Editor

CONTENTS

*	Location of Potential Fishing Grounds from NOAA data	2
*	Coastal Mapping for Brackishwater Aquaculture Site Selection	5
*	National Drinking Water Mission	5
*	GIS Update	6
*	Sea Level Changes along Gujarat Coast	6
*	Excerpts from Annual Report	7
*	Report on Annual General Body Meeting	7
*	ISRS (AC) COUNCIL 1990-92	8
*	Remote Sensing Satellites	9

LOCATION OF POTENTIAL FISHING GROUNDS FROM NOAA DATA

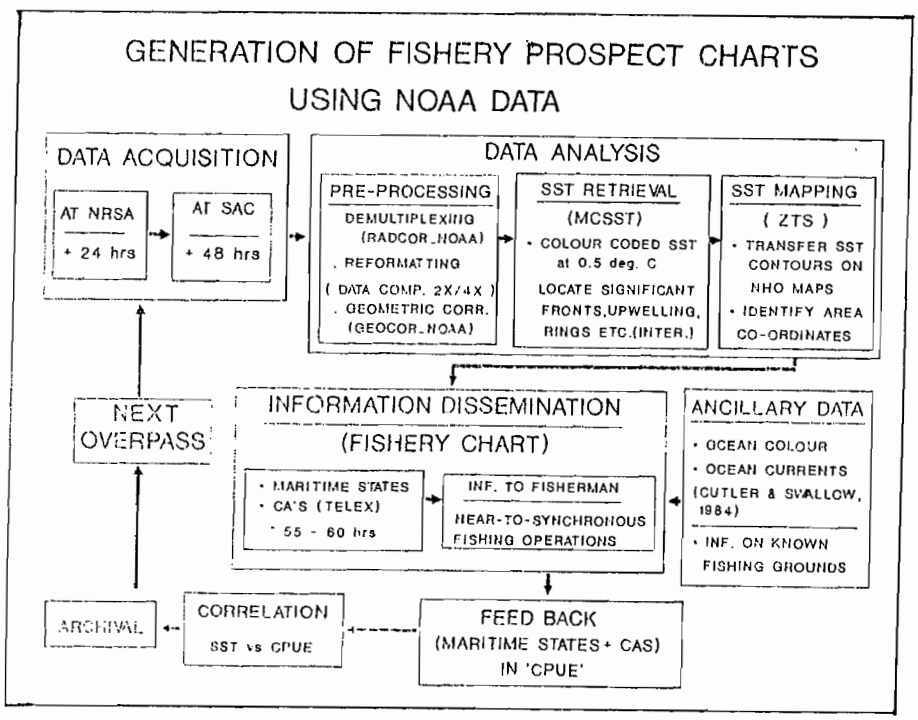
A project on Marine Fisheries under Remote Sensing Applications Mission is in progress with funding from the Department of Agriculture and Co-operation.

During the early part of this year (March-April) a fishery validation exercise was carried out in the Indian waters. Information about the potential fishing grounds based on the mapping of temperature fronts from thermal data of NOAA satellite were telexed to three maritime states. viz. Gujarat, Maharashtra and Andhra Pradesh. Feedback received, in particular, from the Commissionerate of Fisheries, Gujarat State, indicated substantially high catch of squids, prawns and fishes in the areas suggested off Dwarka, Porbander and Veravel. A point noteworthy was that this forecast proved quite useful as it came at a time when the fishing season tradionally being followed was almost over. It was also reported that the fishermen received the forecasts with enthusiasm as they had obtained positive results.

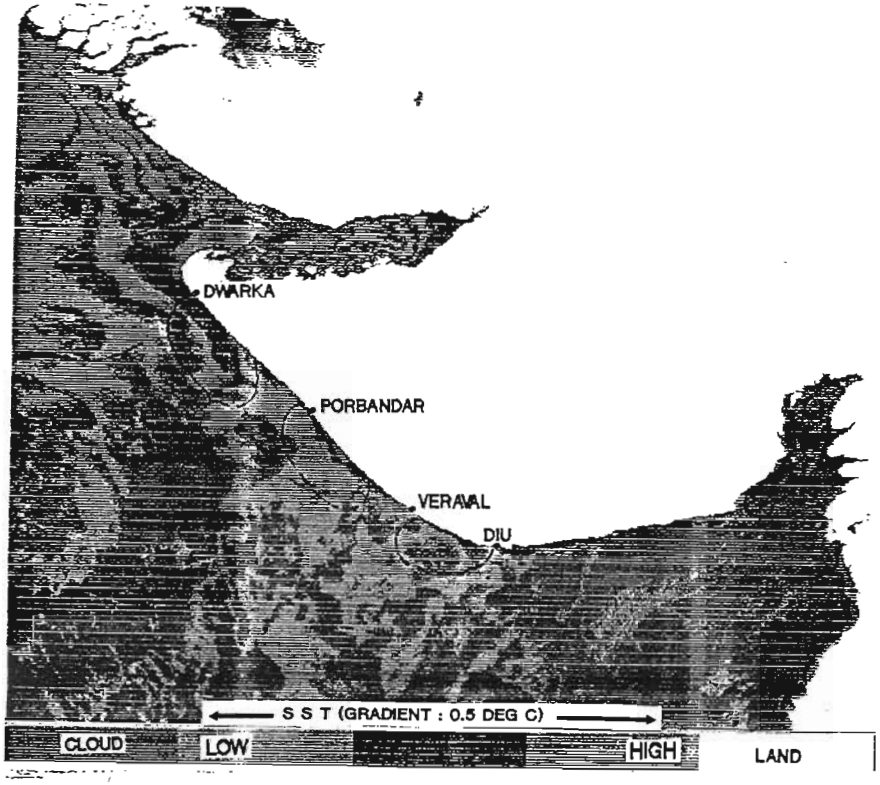
A similar exercise s in progress for the current fishing season and the location of potential fishing grounds is being sent to almost all the maritime states. The very first forecast sent to the Gujarat State for the current fishing season reported a catch of about 350 kg/boat/day and this was reported to be an excellent catch. Techniques have been standarised towards generating the "fishery prospect charts" from NOAA data on a stand-alone image processing system - ISROVISION developed by the Space Applications Centre.

As of today 57 fishery prospect charts for different maritime states have been generated and communicated for follow-up action.

The softwares transferred on ISROVISION system and used are Radcor-NOAA and Geocor-NOAA for image extraction, radiometric correction and geometric correction respectively. SST image at the resolution of 0.5° C and grid size of (2 x 2 km/4 x 4 km) is finally generated using the softwares like SST and COMP. Based on the location of surface thermal fronts in terms of their size, temperature gradient, spatial distribution etc., the potential



APRIL 18, 1989



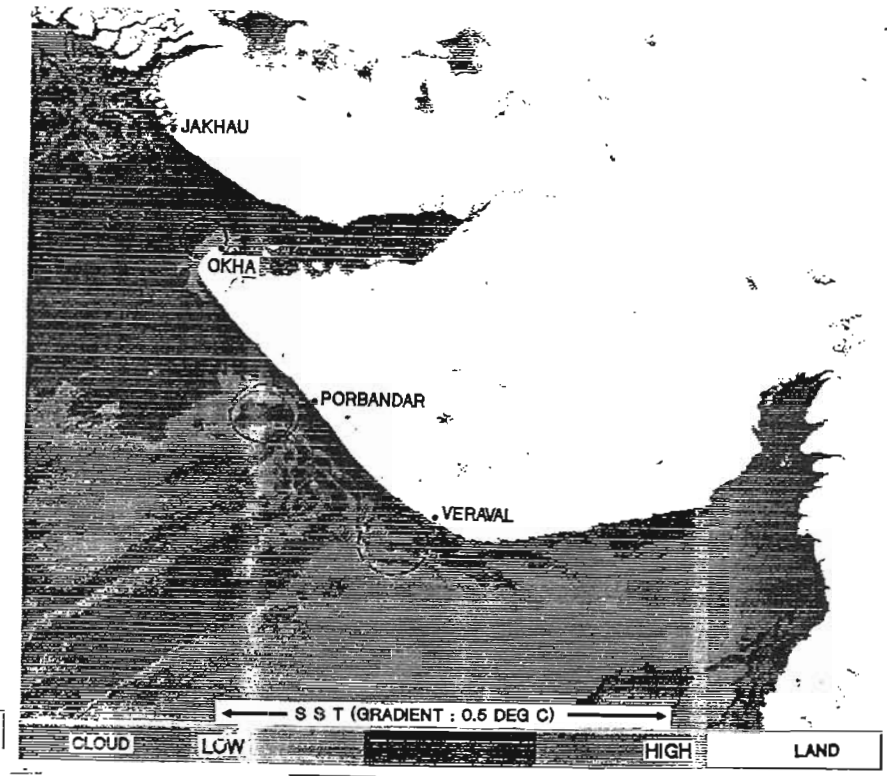
FEEDBACK

CATCH (In Kg/boat) AND ITS COMPOSITION UPTO 35 NM OFF THE GUJARAT COAST (COMMSSIONERATE OF FISHERIES)

LOCATION	CATCH COMPOSITION (IN Kg) SQUIDS & MISC.	PRAWNS & LOBSTERS	RIBBON & CATFISH	ACETAS & DHOMA	TOTAL
DWARKA	1200	65	100	3200	4565
PORBANDAR	800	30	80	2000	2910
VERAVAL & DIU	50	20	90	1200	1360

SATELLITE DATA USED : NOAA-AVHRR (APRIL 18, 1989)
FISHING PERIOD : APRIL 20-25, 1989
RSAM (DOS/MOA)

NOAA SST (OCT'28,1989)

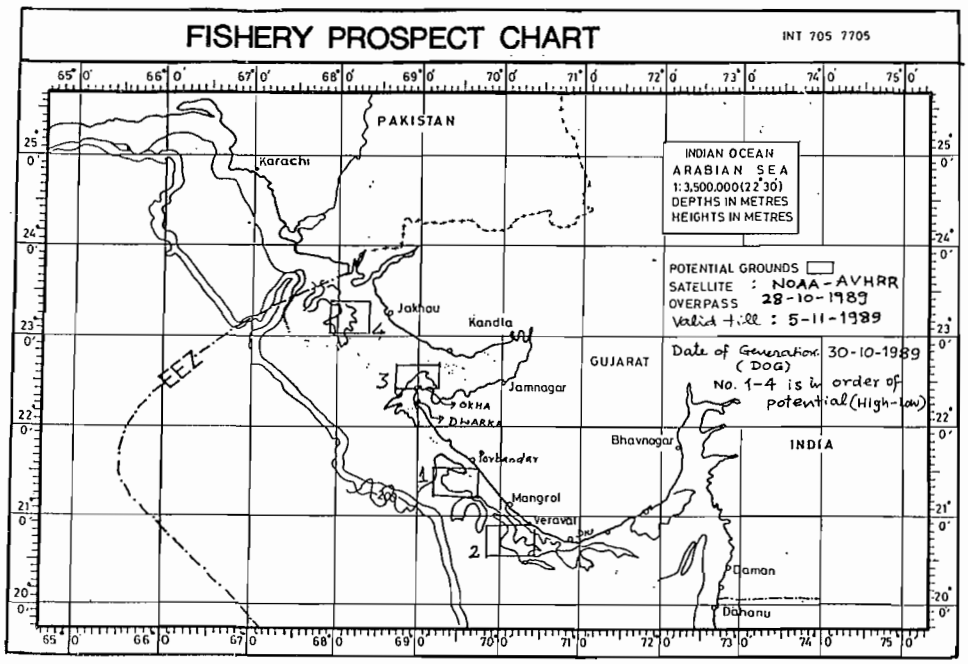


FEEDBACK

CATCH REPORTED BY THE COMMISSIONERATE OF FISHERIES UPTO 35 NM OFF THE GUJARAT COAST

LOCATION	NO. OF TRAWLERS	Avg. CATCH/DAY/ TRAWLER	Avg. CATCH/HAUL	RATING * **
JAKHAU	4	596	99.3	FAIR
OKHA	2	704	117.3	GOOD
PORBANDAR	1*	1675	-	EXCELLANT
VERAVAL	4	1412	235.3	EXCELLANT

SATELLITE DATA USED : NOAA-AVHRR (OCTOBER 28,1989)
PARAMETER DERIVED & USED : SEA SURFACE TEMPERATURE (SST) IN STEPS OF 0.5 DEG. C (SHOWN AS LOW-HIGH)
FISHING PERIOD : NOVEMBER 1-5,1989
* CANOE FISHING ; ** GIVEN BY FISHERIES DEPARTMENT
RSAM (DOS/MOA)



fishing areas in terms of window size -50 nm x 50 nm across front/s are communicated to almost all the maritime states through telex. This is followed by the detailed fishery prospect chart showing location of fronts and potential sites on a Naval Hydrographic Chart along with a fish catch format for the feedback. Most of the mechanised fishing vessels operated by the fishermen do not have any navigational aids except compass which approximately heips in conducting the follow-up for the forecasts. A validity period of about one week is kept for these forecasts. By and large it is observed that this holds reasonably well for well defined fronts at least for 3 days with slight change in its position but smaller front/s are found to undergo changes.

Mechanism of dissemination of information in particular followed by the Gujarat State is in terms of publishing the forecast details in the local daily published from Rajkot and through display of details at the Fisheries Terminal located at the major harbours.

A detailed feedback has been received from Gujarat, West Bengal, Orissa and a Central Govt. agency - CIFNET located at Cochin. In particular the feedback from Gujarat is given as ratings like excellent, good, fair and poor catch. By and large for the period during second half of September, early November and January good catch was observed and fair catches during late November, December and later part of January. Attempts have also been made to give rankings to the potential areas and as one such example of this can be seen in the image of November 28, 1989 that areas 1, 2, 3 and 4 (in order of potential) off Veravel, Porbander, Okha and Jakhau, reported an average catch (in kg)/day/trawler of 1412, 1675, 703 and 596 respectively.

For more details, please Contact: Dr. A. Narain, Head, MWRD/RSAG, Space Applications Centre, Ahmedabad 380 053).

COASTAL MAPPING FOR BRACKISHWATER AQUACULTURE SITE SELECTION (CMASS)

This project envisages preparation of coastal land use maps on 1:50,000 scale showing wetland and land use features of the adjoining shoreland (upto 1.5 km from the high water line) for selecting brackishwater aquaculture site selection along the coasts of maritime states of W. Bengal, Orissa and Andhra Pradesh. This project is being funded by the Ministry of Agriculture, Govt. of India, and work is being executed at the Space Applications Centre, Ahmedabad.

About 3000 ha area is to be selected around coastal villages for generating income and employment for the rural folk.

The major criteria for selection of site are availability of brackishwater source, nature of substrate, presence or absence of mangroves, shoreline configuration and presence of barren area.

Integration of remote sensing based data along with water quality data and infrastructure will be carried out through GIS for final site selection.

Pre-field maps for all three states (about 85) are already prepared.

(For further information please contact: Dr. S.R. Nayak, MWRD/RSAG, Space Applications Centre, Ahmedabad 380 053).

——o——

NATIONAL DRINKING WATER MISSION

Scientific Source Finding is one of the integral elements of the National Drinking Water Mission (NDWM) which has been launched with the objective of providing safe and sustained water supply to all the villages of the country. Satellite images are providing the basic information needed for the prupose. In carrying out this task, Dept. of Space has, apart from SAC and NRSA, involved many state remote sensing centres.

Objective

To prepare district-wise hydrogeomorphological maps for the entire country (447 districts) on 1:250,000 scale using satellite imagery.

Present status

i. Hydrogeomorphological maps on 1:250,000 scale for 447 districts have been prepared by March 31, 1990.

ii. Preparation of an atlas of hydrogeomrophological maps in A3 size for the entire country is in progress.

iii. Ground water prospective sites were also identified on 1:50,000 scale topographic maps for many mini-mission districts. Also prospective sites were demarcated on 1:50,000 scale for the problem villages in the states of Gujarat, Rajasthan, Sikkim, Bihar, M.P. and J&K.

iv. Sites for rain water harvesting structures (approx. 400) were identified in three mini-mission districts of Gujarat.

Steps taken for technology transfer

i. Technology has been transferred to State Remote Sensing Centres such as Andhra Pradesh, Assam, Bihar, M.P., Orissa, Himachal Pradesh and Tamil Nadu.

ii. Five training courses have been organised by SAC and NRSA. In all 106 participants underwent training.

- First course from October 27 to November 10, 1987 for 14 persons.

- Second course from December 5 to Dec. 9, 1988 for 26 persons.

- Third course from January 16 to February 10, 1989 for 13 persons.

- Fourth course from August 22 to Sept. 8, 1989 for 26 persons.

- Fifth course from Feb. 21 to March 3, 1990 for 25 persons.

iii. On-the-job training at SAC, Ahmedabad and at NRSA, Hyderabad was given to State officials from time to time. In all, 41 participants have undergone on-the-job training.

Feedback

Feedback received from various sources indicates that scientific source finding has resulted in success rates of 90 plus per cent in drilling tubewells in hardrock areas.

For further information, please contant:

Dr. Baldev Sahai
Group Director, RSAG and Mission Incharge (DOS), NDWM, SAC (ISRO),
Ahmedabad 380 053.

Sorry for missing the write up. Since leaving blanks is a bad practice, here is....

AN ODE TO HOPE

The promise was great,
prompt and fluid,
But alas! the jolly young fellow,
was all the time glued,
To the little video screen,
With a battery of unseen.

To us?
Well! he promised a peep,
In that real great treat,
where themes peel off layer-by-layer,
And the room is filled with info-air,

So hold your breath,
And forget the date,
Whenever it comes,
It's gonna be great!

SEA LEVEL CHANGES ALONG GUJARAT COAST

Prof. S.S. Merh
Department of Geology,
M.S. University of Baroda
Baroda 390 002

L.N. Calla Memorial Lecture, 11th December, 1989 Delivered under the auspices "Indian Society of Remote Sensing, Ahmedabad (Chapter), SAC (ISRO)

The Quaternary period comprising about 2 million years of Earth's geological history, also known as the Great Ice Age, was characterised by strong climatic variations. The beginning of the period synchronized with the first major glacial stage, and in the subsequent times it witnessed a succession of alternating glacial and interglacial stages.

The most important phenomenon related to these climatic variations, observable all over the globe, was that of the world-wide glacio-eustatic sea level changes, and a close relationship, existed between climatic stages and the eustatic sea levels; glacials marked fall of sea levels, while interglacials were the period of high sea levels.

The information pertaining to the sea level changes along the Indian coastline is sporadic and qualititative, and mainly pertaining to the strandline-generated erosional and depositional features.

West coast of India, especially its northern part, provides more information, not only on the various erosional and depositional features related to high or low strandlines, but some dependable radiometric dates are also available.

Different segments of the Gujarat coast have behaved differently during the Quaternary, and from the point of view of sea level record, its three segments, viz. Mainland coast, Saurashtra and the Ranns of Kachchh show interesting diversity. The mainland coast has preserved within its coastal land forms evidences of mainly late Quaternary sea levels.

A sequence of fluctuactions are believed to consist of (1) Early upper Pleistocene trangression + 40 m, (2) late upper Pleistocene regression - 20 m, (3) early Holocene trangression + 8 to + 10 m and (4) regression to the present sea level during Sub-Recent times.

Saurashtra has received the maximum attention, especially on account of the extensive development of miliolite rock which represents biogenic calcareous sands of Quaternary age.

The occurrence of sheet miliolites at different elevations has led many workers to invokes a succession of high strandlines during Quaternary.

Strandline fluctuation along Saurashtra coast has however been conclusively established. Obviously the coastline miliolite occurrences represent

wind blown beach dune complex paleoshore formed during a period of progressive withdrawl of a high sea, to be subsequently submerged under the Holocene rise. The sea must have gone down considerably to generate dunes of great dimensions and in large numbers, extending for several kilometers offshoreward.

In Saurashtra and Kachchh Minesterian sea was the source of the carbonate materials and the Wurm regression caused the aeolian lifting of the sands. Wurm stradline, a (al) of only 20 to 30 m was envisaged on the basis of bathymetric features and river valley entrenchments.

The only high strandline is that related to the last (Holocene-Flandrian) transgression. It is relevant to point out that almost all over the Indian coastline, features related to Holocene transgressive strandline occur at elevations upto 10 m above the present sea level.

———— o ————

EXCERPTS FROM SIXTH ANNUAL REPORT (1989-90)

o Total membership of the Chapter stood at 151 as against 154 last year. 3 life and 5 members have joined the Society this year. 5 life member and 6 members have left the Chapter and the Society, respectively. Members from the rest of Gujarat rose from 25 in 1989 to 35 in current year.

o The council met four times to transact the business of the Chapter. Out of these meetings, one meeting was held at Department of Physics, Gujarat University, Ahmedabad.

o A lecture on Vasundhara Project was organised on October 18, 1989 at Vikram Hall, Space Applications Centre, Ahmedabad. The lecture was delivered by Shri K. Krishnanunni, Director, Resource Analysis Division, Geological Survey of India, Calcutta.

o The Ahmedabad Chapter has been organising an annual Laxminarayan Calla Memorial Lecture. Third Laxminarayan Calla Memorial Lecture was delivered by Prof. S.S. Merh, FNA, Department of Geology, M.S. University of Baroda on Sea Level Changes along Gujarat Coast on December 11, 1989.

o A half-day Panel discussion on Problem of Salinity Ingress along Gujarat Coast was organised at Engineering Staff College, Gandhinagar on January 2, 1990. Shri D.M. Pancholi, Shri P.H. Vaidya, Shri N.I. Dhebar, Shri B.S.V. Subbaiah, of Water Resources Department, Government of Gujarat and Shri M.H. Kalubarme of the Space Applications Centre, Ahmedabad participated in the discussions.

o Only one issue of the Newsletter was published. All out efforts are required to bring out four issues of the Newsletter in a year on time. We suggest to modify the present structure of the Editorial Board. The new council can consider this matter.

o The sale of the Proceedings of SOARS is satisfactory. The publication of book 'Gujarat from Space' could not be completed in spite of repeated reminders to the authors.

o The extra-ordinary general body meeting was organised on November 10, 1989 at Vikram Hall, Space Applications Centre, AHMEDABAD as per recommendation of AGM held on December 30, 1988. These recommendations were not accepted by the Executive Council of the Society. However, they were placed before the AGM at Indore. We are awaiting the minutes of the AGM of the Society.

o This year greeting cards were printed by the chapter. It was well received.

———— • ————

ANNUAL GENERAL BODY MEETING

Annual General Body meeting of the Ahmedabad Chapter was held on April 23, 1990 at 1600 hours at Vikram Hall, Space Applications Centre (ISRO), Ahmedabad.

The meeting was presided by Dr. George Joseph, Chairman of the Chapter. The annual report for the year 1989-90 was put up by the Secretary and was approved by the members. Matters like the audited account of year 1988-89, the outcome of the recommendations of Extra General Body Meeting forwarded to ISRS, HQ., and delay in publication of the news letter, were discussed.

The chairman gave assurance to the members that all possible efforts would be put to bring out the news letter in time. He also requested the members to provide full cooperation to the editor.

The house expressed its appreciation and gratitude to Dr. Hariharan for his services as the Chairman of the Chapter.

The charge of the chapter was handed over to the new council.

The Chairman proposed to take up some activities where the application of the remote sensing technique should be taken to the implementation level. He suggested that waste land development activity can be one such area. The house agreed to this suggestion.

— o —

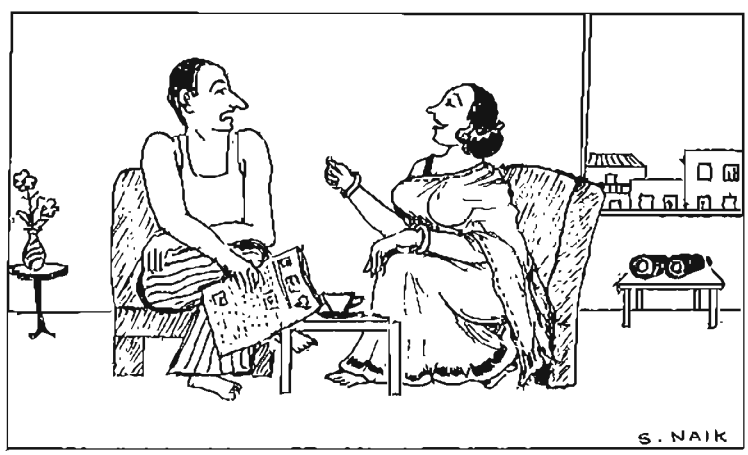
INDIAN SOCIETY OF REMOTE SENSING
(AHMEDABAD CHAPER)

EXECUTIVE COUNCIL 1990-92

1.	Dr. George Joseph	-	Chairman
2.	Shri D.M. Pancholi	-	Vice Chairman
3.	Shri T.P. Singh	-	Secretary
4.	Shri R.N. Shukla	-	Joint Secretary
5.	Dr. R.N. Jadhav	-	Treasurer
6.	Ms. Beena Kumari	-	Member
7.	Shri M.K. Rao	-	Member
8.	Dr. S.D. Naik	-	Member

Errata
In the list of life members published in January 01, 1990 issue of Newsletter, the name of Shri M.H. Rawal was printed as 'Shri M.H. Patel'. The error is regretted.

- Editor



I too did little remote sensing today! With your binocular I could watch all that was happening in our neighbouring flats this afternoon.

Indian Society of Remote Sensing
Ahmedabad Chapter

NEWS LETTER

Vol. 4 No. 3 01 July, 1990

Dear Members,

While its normally accepted that those who ignore history are bound to repeat it, it is surprising that those who make history do not always realize it except through occasional fits of nostalgia. This issue of Newsletter will give you ample scope for nostalgia and sense of history as it recapitulates the tremendous progress made in various application areas taken up during IRS-UP (Indian Remote Sensing Satellite-Utilisation Programme). In the world perspective, the remote sensing research and applications in this country have created new frontiers and it will not be an over-statement to claim that we have emerged as world leaders in applications. The tribute is rightly deserved by the leaders and the community of remote sensing scientists who followed the track tenaceously and who, when the track disappeared, refused to take a regressive step and instead, picked up the bits and pieces and paved their own path.

But there are grey areas of IRS-UP. Technology transfer for one. At a glance its baffling as to why, for example, some of the procedures developed in various disciplines were not simply lapped up by respective departments? This curious phenomenon seems to occur in a sequence of time warps. Let's look at it from a long shot of history.

Seracuse of Alexandria died a disappointed man because his invention remained totally unnoticed. The Sphere invented by Seracuse, when filled with water and heated, used to spin on its pivots as the steam passed from its tangential nozzles. It remained a toy-shop curiosity for another 2000 years when mankind re-invented it in the form of modern steam turbine. This productive technology had no use in Alexandria which at that time was teeming with so many people. Back home, resistance to absorption of the technology may partly be explained by similarities. Relative efficacy of technology and lack of awareness may account for the rest and need to be upgraded through our concerted efforts.

Of course, there has been excellent performance in most of the application areas and there are belated signs of thaw in others. But all this hardly gives scope for self congratulation, with leaders like Prof. U R Rao, Chairman ISRO, maintaining that 'we are nibbling at the edges of remote sensing technology'. So we march on.

Of late there seems to be a welcome change of hearts. Apart from old well-wishers of NL like Dr. Shailesh Nayak, many members, particularly the younger lot, are stirring up to make creative contributions to the Newsletter. I congratulate them all for their endeavours and appeal to all of you, once again, to communicate - be it a simple feedback or some scientific results of your personal, team or organisational work or any other interesting topic.

You will notice a discernible flourish in the present NL, particularly in terms of variety of coverage. A sense of humility forces me to acknowledge, even at the cost of sounding superfluous, that the inspiration for much of these changes has originated from the personal interest shown by Dr. George Joseph, Chairman, ISRS (AC). These changes are aimed at apprising you of a much wider convass covering significant directions of application research (Technology Trends), interesting application news (Newspix), developments of general interest related to space (Spacevistas) and those odd lots of curiosities and happenstances (Oblique Views). Any comments or suggestions?

Your contributions are invited for the theme subject of next issue of Newsletter which will be 'Forestry and Environment'.

- Editor

CONTENTS

- IRS-UP - A Trail of Achievements 2
- An Atlas of Success 5
- Technology Trends (Radar Altimetry, RS blooms in desert, 3-D imagery) 6
- Newspix (Change detection, Wind surfing sites, Iron oxide ratio) 7
- Spacevistas (Electromagnetic Launcher, INSAT-1D, Shuttle retrieves satellites) 7
- A Puzzle 8
- Oblique Views (The deadly space, A mistake worth Rs. 500 crores, Art in Space) 8
- ISY 1992 8
- SPOT-2 in orbit
- A Sobering thought 9
- Acknowledgements 9

IRS UTILISATION PROGRAMME -

A Trail of Achievements

A total of sixteen projects were identified under IRS Utilisation Programme on applications of remote sensing to various resource disciplines. Depending on the status of technological preparedness, the projects were categorised as fully or quasi-operational, experimental or techniques development. Thus projects on mapping of floods, soil, land use etc. were categorised as operational while crop production, forests, water quality etc. came under experimental category and crop yield and condition under techniques development. Eight projects under operational category were entrusted to NRSA and remaining to SAC. Execution of all the projects was done in close collaboration with concerned agencies/organisations of Central/State Governments or other relevant institutions. Specific achievements of the projects for which SAC was the lead agency are given below.

I. EXPERIMENTAL APPLICATION PROJECTS

1. Crop Production Forecasting

To develop and evaluate the technology for crop production forecasting, using IRS data, experiments were conducted on following crops in different districts, as listed below.

Crop	State	Districts
Wheat	Haryana	Karnal, Kurukshetra
	Punjab	Ludhiana, Patiala
Rice	Orissa	Cuttack, Puri
Groundnut	Gujarat	Amreli, Junagadh
Sorghum	Maharashtra	Solapur, Ahmednagar, Pune

a) Wheat

Districtwise acreage estimates were made in 1983-84 and 1984-85 using Landsat MSS data. Techniques were developed for systematic sampling and overlaying of district boundary on satellite image for obtaining crop acreages. Sampling procedure employing two-stage stratification and sample segment approach were devised, implemented and tested for large area (state-level) acreage estimates. Other studies carried out on wheat crop related to comparison of TM and MSS data for acreage estimation, identification of optimum acquisition dates and spectral bands for wheat, mustard, gram discrimination. It was found that data from 2nd week of February onwards was optimal for wheat acreage estimation and that inclusion of MIR (Midle Infrared) bands improved classification accuracy.

The procedure developed and various studies undertaken were used in a project under Remote sensing Applications Mission for undertaking wheat acreage estimation of Haryana, Punjab and parts of Madhya Pradesh, Rajasthan and Uttar Pradesh at Regional Remote Sensing Service Centres in collaboration with State Departments and Remote Sensing Centres at semi-operational level.

b) Rice

Districtwise rice acreage estimates were made for Cuttack and Puri districts of Orissa and Midnapur district of West Bengal. Two-stage stratification using a sample segment approach was designed for large area rice acreage estimation. This methodology has been successfully adopted under RSAM for rice acreage estimation in Orissa and Tamilnadu. Simulation study using Landsat TM data showed that in areas with low proportion of rice with fragmented distribution, 30 m spatial resolution data performed better, as compared to 60 and 90 m resoltuion data.

A comparative analysis of Landsat MSS and first four bands of TM revealed better performance of TM for rice acreage estimation. A detailed study on MSS, TM, LISS-I and LISS-II data after carrying out multisensor registration showed performance by LISS-I/LISS-II similar to first four bands of TM and very much improved performance of LISS-I in comparison to MSS.

c) Sorghum

District level acreage estimates were made for Solapur, Ahmednagar and Pune districts. Drought affected/low vigour Sorghum classification using NDVI image showed better performance than 4 band MXL. Atmospheric correction cosiderably improved the classification performance. In contrast to MSS, Sorghum acreage estimates from IRS LISS-I and Landsat TM data were close to BES figures which could be attributed to their higher radiometric sensitivity and signal to noise ratio. Investigations on NOAA-AVHRR data indicated some potential for large area Sorghum acreage as well as yield estimation.

Study on systematic sampling indicated that when sampling fraction is decreased from 25% to 6.25% results are affected by 1% only.

d) Groundnut

Using Landsat MSS data, groundnut acreage estimation was carried out at tahsil level in Junagadh district. Significant underestimation of groundnut acreages was observed. Analysis of TM data showed improved groundnut discrimination using MIR bands.

(Please contact Shri J S Parihar, LRD/RSAG/SAC for further details).

2. Forest Mapping and Damage Detection

Under this project, methodologies for mapping forest types, density and for monitoring

afforestation, deforestation and encroachment were developed and validated in several test sites, and a manual describing these procedures was compiled. A procedure for mapping rubber-growing areas was evolved and personnel from the Rubber Research Institute were trained to do this activity on their own.

Tree parameters were related with spectral indices in case of teak plantations in order to develop methodology for estimating production potential. Other achievements of the project consist of forest type and density mapping in Sikkim using both visual and digital IRS-1A data, and identification of potential afforestation sites near Bhopal (MP).

(Please contact Dr. R N Jadhav, LRD/RSAG/SAC for further details).

3. Water quality Monitoring

The studies under this project aimed at relating water quality parameters like turbidity to remote sensing data and investigating the water quality and spread of lakes and reservoirs. Visual and digital enhancement techniques were used for mapping of different turbidity levels and distribution of aquatic vegetation for various test sites. A chromaticity analysis technique was developed by project team and Secchi disc depth distributions in the lakes and reservoirs were mapped. Potential of IRS-1A LISS-II data for qualitative and quantitative mapping of turbidity levels in the Matatila reservoir was demonstrated and turbidity levels present in the Dal, Wular, Chilka and Pulicat lakes and Ramganga reservoir were mapped by employing visual and digital techniques. Changes in the water spread, turbidity levels, marsh area and aquatic vegetation were brought out by analysing the multi-temporal Landsat data for the Chilka lake and Wular lake.

(Please contact Shri V Tamilarasan, MWRD/RSAG, SAC for further details.)

4. Watershed Characterisation

The principal aim of the project was development of methodology for characterisation of watershed in terms of prioritisation for soil conservation measures, sediment yield estimation, runoff prediction and monitoring the status of natural resources.

Priority delineation for soil conservation measures was attempted in parts of the Dantiwada, the Upper Ganga and the Gandhisagar catchments. Two methodologies based upon sediment yield index determination and estimation of sediment yield quantitatively have been used. Results indicated that priority watersheds identified from Landsat data interpretation are in good agreement with those reported from conventional survey methods. This methodology has been used for priority delineation in the Indira Sagar Catchment, Madhya Pradesh at Watershed level.

Runoff prediction of studies in parts of the Dantiwada and the Gandhisagar Catchment revealed that the Landsat derived information on land use/land cover and hydrological soil groups could be used in hydrological models leading to run off prediction. An approach based upon SCS Curve Number Technique was followed for this purpose.

Land degradtion was investigated in the Chenab basin following a multidisciplinary approach of preparation of thematic maps. Similar study was attempted using IRS-1A data in parts of the Gandhisagar catchment.

(Please contact Dr. S D Naik, LRD/RSAG/SAC for further details).

5. Monitoring of Coastal Environment

Objectives of the project was to study tidal wetlands and coastal landforms and monitor coastal processes and water quality parameters.

Methodology employing visual techniques for the mapping of large area tidal wetlands in the estuaries, gulfs and deltas was developed. Wetland maps on 1:250,000 and 1:50,000 scale were prepared for a part of Gulf of Kachchh and Karnataka coast using Landsat TM and IRS data.

Evaluation of IRS LISS I and LISS II data, for wetland mapping, and shoreline changes has also been done. Various enhancement techniques and various combinations of band ratioing and principal component analysis were attempted for the Gulf of Kachchh, Karnataka and the Gulf of Khambhat using Landsat TM and IRS data, for wetland mapping. Digital classification techniques were employed for the wetland studies in the Gulf of Kachchh area.

Methodology employing visual techniques for mapping shoreline changes in estuaries, deltas and gulfs has been developed. Following similar approach, maps showing shoreline changes on 1:250,000 scale of 1985-88 for the Mahi and the Narmada estuaries prepared.

Planimetric accuracy of maps showing shoreline changes estimated using LISS II data on 1:50,000 scale was found to be 40 m. A draft manual describing procedures for mapping wetlands and shoreline changes has been prepared.

Chromaticity analysis was carried out for the Gulf of Kachchh, to find the correlation between Secchi disk and turbidity.

(Please contact Dr. S R Nayak, MWRD/RSAG/SAC for further details).

6. Marine Fisheries

The studies under this project were directed towards locating the fisheries potential areas in relation to oceanic parameters amenable to remote sensing based estimation like, ocean colour, pigment concentration, turbidity (suspended particulate matter), SST etc. by correlating their spectral signature with the fish stock and to extend the technique to other areas of the EEZ.

A software was developed for pigment retrieval from TM data and later modified for LISS-I data. Pigment retrieval accuracy achieved was about 60 per cent as compared to 68 per cent for TM.

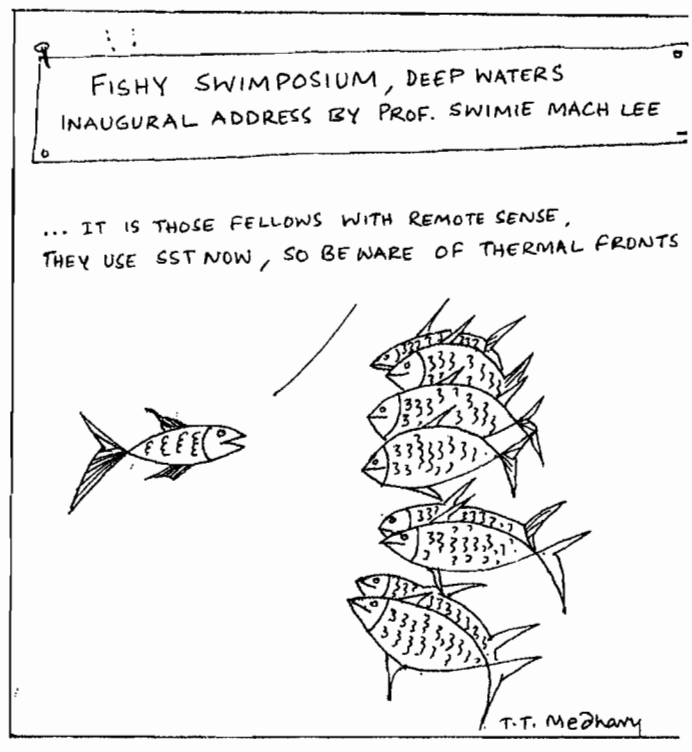
Techniques were developed for sea surface temperature (SST) mapping from NOAA-AVHRR using the multichannel sea surface temperature (MCSST) approach (operationally used for generating global charts on SST). A set of eight colour-coded Sea Surface Temperature (SST) images (1985-88) were generated from NOAA and geo-referenced fish catch data (high/low) was plotted. A good association was observed between the location of thermal fronts and fish catch.

A validation experiment was conducted during March-April 1989 involving the CAs and all the maritime states. SST was derived from NOAA-AVHRR and area coordinates of potential fishing grounds across temperature fronts and non-potential grounds falling in the uniform temperatures were communited for follow up action. One of the most significant achievement was the reported substantially good catches of shrimps, prawns and fishes in the areas north-west off Dwarka, west and north-west off Veraval by the Gujarat State.

(This technique is now being used operationally - See ISRS-AC Newsletter Vol. 4 No. 2.)

(Please contact Dr. A Narain, Head, MWRD/RSAG/SAC for further details.)

A MATTER OF VIEWPOINT.....



II. TECHNIQUES DEVELOPMENT PROJECTS

1. Crop Stress Detection

Various studies were conducted on detection and quantification of crop stress and condition using remote sensing techniques. Methodology was developed to detect moisture stress in wheat, groundnut and paddy crops. Three severity levels could be detected. Landsat MSS data of three years were used for condition assessment of groundnut crop in Vanthali taluka of Junagadh district.

Six-dimensional vectors, viz. wetness, greeness and brightness derived using Landsat TM data were used to monitor the condition of wheat crop in Indore district. Green Index Number (GIN) profiles have been generated on 2 x 2 km grid cells for two years and used for condition monitoring. Procedure based on multidate data has been used to differentiate flood-affected and moisture-stressed rice crop.

(Please contact Dr. Ajai, LRD/RSAG/SAC for further details).

2. Crop Yield Modelling

Relation of yield with spectral parameters derived from ground experiments and satellite sensors was the main focus of this project.

a) Ground based studies

Ground based experiments on wheat and paddy crops demonstrated in general a linear relation between yield and spectral indices (ratio NDVI etc.) but proportion of yield variability explained by these relations was found to be sixty to seventy per cent only. Incorporation of agrometeorological data improved the relation. Other study areas attempted under the project are related to submodel for leaf area index and procedures for deriving crop growth profiles and growth stage estimation.

b) Satellite Based Studies

Preliminary investigations on relating spectral indices with yield were carried out in districts of Karnal and Indore. Yields obtained from crop cutting experiments were related to NIR/Red ratio. In the spectral-yield relation of Patiala and Ludhiana districts, agrometeorological variables were incorporated, resulting in improvement in the relation.

Multi-year satellite data was used to develop district level spectralyield relations for wheat crop in Punjab and Haryana and for paddy crop in parts of Orissa. These relations were used to forecast district yields for wheat in Punjab, Haryana and for rice in parts of Orissa.

Some of the important procedures developed under the project relate to sensor-to-sensor transformation, normalisation of data of different acquisition dates using crop growth profile and integration of acreage and yield procedures.

Advanced investigations like relation of district wheat yields with parameters derived from crop growth profiles based on multi-date low resolution data (NOAA-AVHRR) were carried out for Punjab and Haryana states.

(Please contact Dr. R R Navalgund, Head, LRD/RSAG/SAC for further details).

(For further information on applications programme, please contact Dr. Baldev Sahai, Group Director, RSAG/RSA/SAC and for information regarding overall programme under IRS UP, please contact Dr. George Joseph, Dy Director (RS), RSA/SAC.)

---ooo---

AN ATLAS OF SUCCESS

July 27, 1990 dawned as an auspicious day for remote sensing applications and marked a fruitful culmination of dedicated efforts of scientists from SAC, NRSA and state remote sensing centres. An 18 volume 'Atlas of Hydrogeomorphological Maps of India" was formally presented on that day to Shri S R Sankaran, Secretary, Department of Rural Development by Prof. U R Rao, Chairman Indian Space Research Organisation/Secretary Department of Space at a function held at SAC. The atlas comprises district-wise RS based hydrogeomorphological maps of entire country prepared for National Drinking Water Mission. These maps contain quick clues of ground water occurrence and help in location of promising areas for elaborate hydrogeological/ geophysical surveys.

It all began in 1986 with the launch of National Drinking Water Mission. With a goal of providing 40 litres per capita per day potable water, the Mission envisaged a course of scientific source finding comprising three-pronged surveys based on remote sensing, hydrogeological and geophysical investigations. Department of Space undertook the responsibility for providing remote sensing inputs. Following a tight schedule, DOS scientists with other participants prepared hydrogeomorphological maps for all the 447 districts of the country at 1:250,000 scale by March 31, 1990. Methodology steps followed in preparation of these maps were procurement of Landsat TM/IRS LISS-II transparencies or prints, base map preparation, preliminary interpretation, ground check, final interpretation and final map preparation. Legends for the maps were prepared in consultation with Central Ground Water Board and NDWM. A major achievement of the project was to demarcate potential sites for thousands of problem villages within the stipulated 1.6 kms radius of each village. The task marks the firstever RS based thematic mapping of the country at 1:250,000 scale. The following table gives feedback on utilisation of these maps. With overall success rate crossing 90 per cent, it indeed tells a story of glorious success.

Summary of Feedback Received from Various States

Sr. No.	State	Total no. of bores drilled	Total no.of successful bores	Success %
1.	Gujarat	13667	12912	94.47
2.	Rajasthan	116	108	93.10
3.	Orissa	136	134	98.53
4.	Andhra Pradesh	216	169	78.24
5.	Bihar	1044	951	91.09
6.	Goa	628	560	89.17
7.	Karnataka	397	288	72.54
8.	Madhya Pradesh	290	282	97.24
9.	Meghalaya	112	99	86.39
10.	Uttar Pradesh	437	421	96.33
	Total	17043	15924	93.43

(For more detail, please contact Dr. Baldev Sahai, Group Director, RSAG, and Mission Incharge (DOS), Space Applications Centre, Ahmedabad 380 053.)

---ooo---

TECHNOLOGY TRENDS

Radar Altimeter for Surface Topography

A radar altimeter onboard an orbiting satellite sends a radar pulse vertically downward to the earth's surface (ocean or land) and measures the height of the surface from the time taken for return of reflected beam. Phenomenal accuracies are possible. For example, European Remote Sensing Satellite (ERS-1) to be launched this year carries a radar altimeter which can measure the surface heights with an accuracy of 10 cm from its orbital altitude of 800 km. In order to determine position of satellite and its orbit, ERS-1 carries ultra-precise microwave tracking system called PRARE (Precise Range and Range Rate Equipment). Primary mission of the ERS-1 altimeter is monitoring the sea level which shows considerable undulations appearing as bumps and depressions on the earth surface due to local gravitational anomalies. While the ocean/sea level changes are an important indicator of possible global warming due to greenhouse effect, the altimeter data, by furnishing details of gravitational anomalies due to underlying rock types and structures, has considerable potential for locating off-shore oil bearing structures. ERS-1 altimeter will provide the ocean surface measurement of entire globe once every 35 days on a wire-mesh type entertwining lines of nadir trace of spacecraft orbit.

Radar altimeter operation. *Measurements by ERS-1.*

A future ESA mission called Aristoteles will attempt one step further - mapping directly the gravity field on earth for every 1° x 1° surface element from a short-life, low-altitude (200 kms) polar orbit. The satellite will carry a sensor for gradiometry, i.e. measurement of smallest acceleration differences (Source : Earth Observation Quarterly).

Remote Sensing Blooms in Desert

The Sahelion region of sub-Saharan Africa has caught the fascination of US and European scientists. One reason behind this attraction is the fact that these harsh lands continue to defy human ingenuity by forcing a sequence of droughts and famines on an already miserable populace. March of civilization in fact seems to have stopped at the door step of these parched stretches where nature seems to be hell-bent on perpetuating its own brand of apartheid. No wonder these lands have emerged as fertile breeding grounds for new ideas in remote sensing for agricultural applications. New techniques of integrating data from diverse sources, concerted campaigns using different satellites with diverse resolutions and periodicities, multiple years studies on condition and yield assessment of major crops, newer application areas like agrarian system studies and forest biomass estimation are some instances. The scientific endeavour in this region has already assumed international dimensions with involvement of NOAA (USDC) from USA and members of European community with west and central African states (Source : Earth Observation Quarterly).

3-D Imagery

A consortium of British scientists led by a team from University College of London (UCL) has developed a fully automated technique for producing three-dimensional images by a computer.

The information originates from a pair of satellite photographs of the area taken from different angles. The new system automatically matches easily identifiable features within the picture and by use of geometry the heights of these features can be determined. This data can be then used to create a colour image of the terrain height. The new system relates patterns of images to produce a three-dimensional representation of the object in question, making it possible to view the mountain range from any angle, to travel there along any path or even to fly over the area and see a bird's eye view.

The UCL team led by Dr. Jan Peter Muller has already used data from SPOT (French satellite "System Pour L'Observation de la Terre") to produce imaginary journeys over Marseilles, the Kamchatka Peninsula in the Soviet Union and the Ius Chasma network of the planet Mars. In practical terms the program has many applications : at Kings College Dental School, London, researchers are using the system to predict the result of the effects of facial surgery from the information given by several photographs of the patients-head, and a

joint NASA/Soviet Academy of Science project will use it to build up a topographic map of volcanoes in Kamchatka.

In the future civil engineers will be able to determine the optimum route for roads or railways and produce a three-dimensional representation of the environmental impact of the planned construction. Oil, mineral and gas companies will be able to explore terrain models of potential sites without the expense of sending inspection teams and, by relating images to the readings of strains and stresses on the earth's surface, it will be possible to predict more accurately areas in danger of an earthquake (Source:Indian Express).

---ooo---

NEWSPIX

(1) **Change Detection for Urban Landuse**

Band 7 image of Landsat TM was used to detect changes from 1985 to 1988 in Los Angles county. By assigning blue and green to 1985 image and red to 1988, the composite image brought out grey areas without any changes , cyan colour areas with high reflectance in 1985 and red colour areas with high reflections in 1988. To this change scene, further information is added about the landuse categories derived from routine procedure. Applications, like urban area delineation are possible.

(2) **Wind surfing sites from TM data**

A private company has started using TM prints for suggesting probable windsurfing sites to vacationeers. The comapny uses these image as available maps of the river are quite old.

(3) **Iron Oixde Ratio image**

This image is created by using ratio images derived from all six reflective TM bands. Peculiar property of this image like highlighting the areas with mineral alteration has applications in tagging the areas for further mineral exploration (Source : EOSAT).

---ooo---

SPACEVISTAS

Electromagnetic Launcher

Sandia National Laboratory of USA plans to construct a 800 m long electromagnetic gun (precisely an accelerator) to launch small satellites in polar orbits. In this gun, coils of electromagnets would induce current in 450 kg aluminium armature and acclerate it through a series of such coils. At the end of barrel, armature shoots off with a 400 kgs projectile at 6 km/s speed. Once above the atmosphere, a rocket will fire to inject a 100 kgs payload in orbit. Rockets like PSLV on the other hand will deliver a very small fraction of weight in orbit. Through a continuous research under SDI (Star Wars) the technology for electromagnetic launchers has been developed. Engineers have to however sort out very high acceleration, of around 1000 g encountered by any payload which by today's standard are designed to withstand something like 10 g's. Aerodynamic heat shielding of the satellite will be another problem, because of ultra-high speeds in lower layers of dense air.

The launcher currently being built with a fund of $ 1.3 billion will be quite cost-effective - going by per pound launch cost for 10,000 launches as compared to the cheapest conventional option. Applications envisaged are provision supply to space station and launching of thousands of satellites for cellular telephone network (Source : Scientific American).

INSAT-1D

INSAT-1D spaecraft the last of first generation multipurpose satellite series, was launhed on June 12, 1990 by the Delta launher of McDonnel Douglas from Florida, USA. The satellite built by Ford Aerospace Corporation, of USA has like its predeessors, 12 C-band transponders, 2 high power S-band transponders and a very high resolution radiometer which can take weather pictures within visible and infrared bands (Source : ISREL).

Shuttle Retrieves the Satellites

Palapa and Westar VI were launched by Space Shuttle in February 1984 but faulty apogee motors left the satellites in low earth orbit. The satellites became property of insurane underwriters. The insurers in a bid to reduce their loss took help from NASA and Hughes, and retieved the satellite using Space Shuttle in November 1984 and sold both the satellites back to their original owners. Both the satellites have been sent back to their orbits in the month of April 1990. (Source : ISREL).

---ooo---

A PUZZLE

This particular puzzle, adapted from a source to be disclosed in the next issue of NL, has relevance to classification accuracies. Try to figure out and send your answers to NL.

A certain VIRAX test for detecting the presence of X-virus in Chicken has 99% reliability. Consider a population of chicken suffering from infection of X-virus in the proportion of one infected chicken out of 1000. If the VIRAX test is applied on one particular chicken from this population and the result is positive, what is the probability that the chicken is actually suffering from X virus?

OBLIQUE VIEWS

The Deadly Space

British scientists Fred Hoyle and Nalin Vickramsinghe have advanced 'panspermia hypothesis' which asserts that virus and bacteria floating in space sowed the seeds of life on earth. The correlation of flu and sunspot cycle is their main evidence, which they say is supported by last 200 years' date. This year's peak of 11-year sunspot cycle is (fortunately for them) also associated with epidemic occurrence of flu. During peaks of sunspot cycle, viruses hurl to earth with greater force. Hoyle and Vickramsinghe maintain that NASA knows about germs in space but wants to keep mum (Source : Scientific American).

A mistake worth Rs. 500 crores

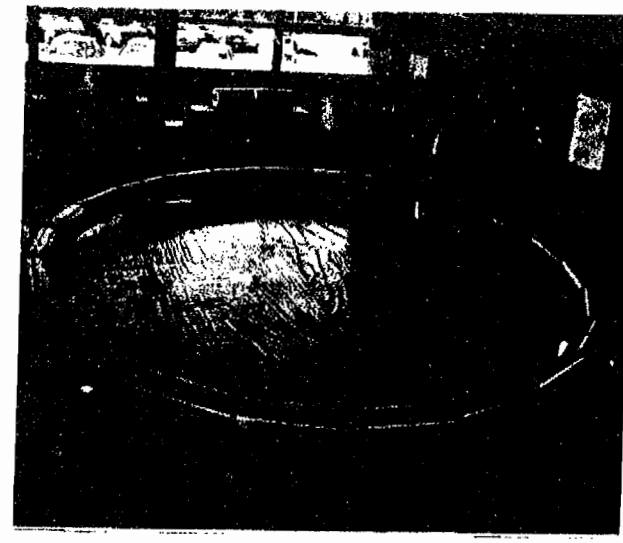
On February 22, 1990, Ariane rocket exploded after take off with a loss of two Japanese satellites amounting to a huge total loss of more than $ 250 million. All because of a 3 x 2 cm cloth left inside one of the water delivery pipes. The board of experts conducting the enquiry cleared the launcher from any design faults and attributed the explosion to a simple human error. (Source : ISREL).

Art in Space

Space is a frontier for high technology. The popular image of space is one of satellites, missiles, planetary probes and all that. But now space is also becoming a medium for artistic expressions. One of such space-borne artistic objects will appear in the morning and evening skies in the form of small white ring by the year 2000. It will consist of a 1 km dia inflatable ring made up of light-actuated hardening resin and metal matrix structure. It will show up in the sky as a small circle or ellipse for about 10 min period in the morning and evening.

Other forms of art will manifest through remote sensing technique. Next time you many look at such a Landsat image in which a human eye is actually looking back at you. This image with an eye has been created by positioning a series of plane mirros in the shape of one-and-half mile long eye. The mirror tilt has been so adjusted as to saturate the respective pixels. The result is a Landsat image containing a human eye. A similar experiment on SPOT satellite has generated an image containing a nice, square white patch created by a white plastic sheet of 200 x 200 feet square spread on the ground. The patch shows up not just an artistic object but also serves the purpose of calibration.

If you tend to dismiss 'the art in space' as a cheap gimmick, the persons behind these ventures have a point worth your considertion. They argue that such deviations generate public interest and serve the cause of further advancements in space research and technology through public support



An orbiting ring made of a new kind of fabric. A similar ring of 1 km diameter will be launched in space in the year 2000.

The image manifests the human presence into the cosmos. The sculpture of mirrors, a mile and half across, placed in a California desert are visible in this Landsat image.

(Source : Technology Review).

ISY 1992

1992 has been declared as International space Year (ISY). There are world-wide preparations by professional societes and organisations who have chalked out a series of ISY projects. Space Agency Forum for International Space Year (SAFISY) is coordinating the planning for ISY in 1992. Third annual meeting of SAFISY was held in Kyoto Japan during May 1990, which was attended by participants from more than 20 countries and 44 space related agencies. Numerous international projects undertaken for ISY pertain to the categories of Earth science and technology, Education and Applications and Space science. SAFISY discussed various projects including PEACE remote sensing mission proposed by India.

Members of ISRS (AC) may consider contributing on local level to ISY 1992 under the aegis of Soceity. Any suggestions? Get in touch with Secretary ISRS (AC).

---ooo---

SPOT-2 IN ORBIT

SPOT-2 the successor of French remote sensing satellite SPOT-1, was launched on January 22, 1990 from Kourou, French Guiana, using ARIANE-40 launcher. After carrying out necessary orbit adjustments and in-orbit check out, the satellite was declared operational on March 21, SPOT-2 is virtually identical to SPOT-1, and is positioned in a circular polar orbit, diametrically opposite to SPOT-1 orbit. With SPOT-1 continuing to be in service, the combined SPOT acquisition capability has been doubled and repeat coverage of any point on earth surface is currently once in 13 days (instead of earlier once in 26 days). This will apply to about 4/5th of the global landmass covered by real time acquisitions from 13 operational Spot receiving stations, since both the tape recorders on SPOT-1 have failed. Image geometric and radiometric qualities of SPOT-2 are comparable to SPOT-1 and constants for absolute radiometric calibration and cross calibration relative to SPOT-1 have been worked out. The following table gives details of SPOT-2 image characteristics.

(Figures in brackets indicate specified values and 1B, 2B and 1S are processing levels).

1.	Location Accuracy (deviation in pixel coordinates)	650 m (1500 m, 1B)	14 m (20 m 2B)
2.	Scale distortion (distortion of distances)	0.07% (0.1% at 1B)	
3.	Anisomorphism (distortion of object shape)	0.07 (0.1% at 1B)	
4.	Channel-to-channel registration (multi-spectral mode)	0.15 pixel (0.3 pixel at 1B	
5.	Image registration (acquired 26 days a part)	2.5 m (5 m at S1)	
6.	Relief plotting accuracy (accuracy of determining elevation)	7 m (10m-0°/+27°)	3.5 m (10m-27°/+27°)
7.	Modulation Transfer function homogeneity	Better than 10% in all bands	
8.	Absolute Calibration	6% accuracy	

(Source : SPOT IMAGE)

A Sobering Thought

(Remote Sensing is indeed a sobering branch of knowledge. Read the following poem and think of multi-resolution images. The poem titled 'Geography Lesson' by Zulfikar Ghose is quoted from 'Telescope' Ed. E. Williams, Edward Arnold, London, 1974).

When the jet sprang into the sky,
it was clear why the city had developed
the way it had,
seeing it scaled into six inches to the mile
There seemed an inevitability
about what on ground had looked haphazard,
unplanned and without style
when the jet sprang into the sky.

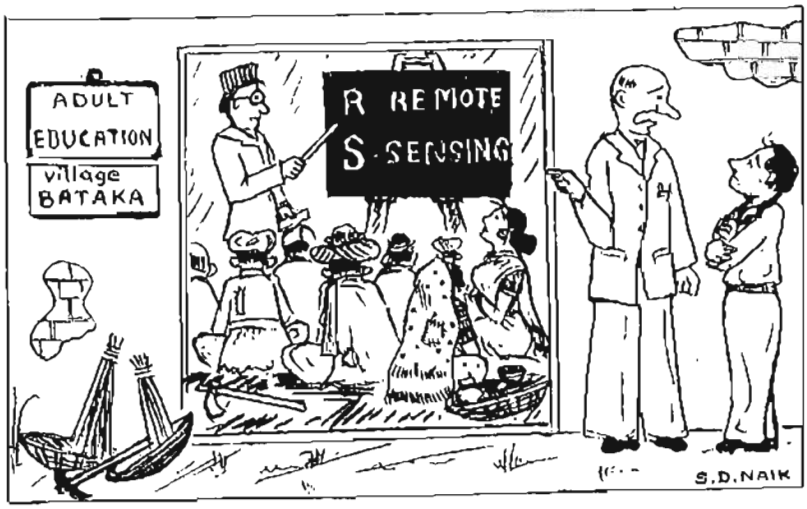
When the jet reached ten thousand feet,
it was clear why the country
had cities where rivers ran
and why the valleys were populated.
The logic of geography -
that land and water attracted man
was clearly delineated
When the jet reached ten thousand feet.

When the jet rose six miles high,
it was clear that the earth was round
and that it had more sea than land.
But it was difficult to understand
that the man on the earth found
causes to hate each other, to build
walls across cities and to kill
From that height it was not clear why.

Acknowledgements

* Editor would like to thank Shri T. E. Shivaprakasam, Zonal Director, Fishery Survey of India, Bombay for the appreciaition of the Newsletter, as conveyed thorugh one of the SAC colleagues.

* For the present issue of NL cooperation from many members including Dr. Shailesh Nayak (3-D imagery), Dr. P S Desai and Shri A S Rajawat (An Atlas of success) is acknowledged . Cartoon credits are due to Dr. S D Naik, Shri T T Medhavy and Ms Beenakumari.



When I asked you to take up projects for rural development I didn't mean this.

BOOK POST

If undelivered, return to:

Secretary
ISRS-Ahmedabad Chapter
C/o. Remote Sensing Area
Space Applications Centre
Ahmedabad 380 053

Edited by : R P Dubey, Mukund Rao, J K Garg, Space Applications Centre, Ahmedabad 380 053

D M Pancholi, Central Designs Organisation, Gandhinagar

Printed at : Library, Space Applications Centre Ahmedabad 380 053

Indian Society of Remote Sensing
Ahmedabad Chapter

NEWS LETTER

Vol. 5, No. 1 & 2 01 April 1991

Dear Members,

On 18th March, 1991, the sun as usual set on the dusty horizon of Ahmedabad. But the evening became memorable for the Ahmedabad Chapter of ISRS as it marked the successful completion of the open-house celebration of third anniversary of IRS-1A launch. In celebrating the landmark event of Indian Space Programme, the Chapter has discovered a new meaning to its existence and a sense of confidence in its abilities - to finance, publicise, organise and execute a mass awareness programme of an unprecendented level. All this was hardly foreseen during September 1990 meeting of Council when Chairman ISRS-AC proposed the idea in measured and essenceful tone. But as time went by, strategies and tactics were laid out and the actions snow balled. That the crescendo was demanding and the public response was overwhelming should be clear to you from Secretary's report and visitors comments recorded in this issue of Newsletter.

The theme subject of 'Remote Sensing in 1990s' will be dealt in the next issue of the Newsletter.

- Editor

C O N T E N T S

	Page No.
o **Chapter Activities**	
- Third Anniversary Celebration of IRS-1A launch	2
- They Came, They Saw and They Said	3
- Glimpses from the Exhibition	4
- Remote Sensing for National Development (Fourth L N Calla Memorial Lecture)	6
o **Technology Trends**	
Data Handling	6
o **Spacevistas**	
- Electricity from Space	6
o **Newspix**	
- Interesting RS Applications	6
- A PC to teach you remote sensing	7
- RS Directory	7
o **Oblique Views**	
- Landsat Island	7
- Cocaine and Remote Sensing	7
- Model Yodel	7
o **Book Review**	7
o **List of Members**	8

THIRD ANNIVERSARY CELEBRATION OF INDIAN REMOTE SENSING SATELLITE (IRS-1A) LAUNCH

One of the major utilisation areas of space technology is Remote Sensing - the observation of the earth's surface from orbiting satellites. In India this technology is being used operationally in many areas to generate information about earth resources. With the launch of IRS-1A on March 17, 1988, India joined the select group of nations having an operational remote sensing capability. IRS-1A completed three years of successful operation in orbit on March 17, 1991.

The Ahmedabad Chapter of the Indian Society of Remote Sensing is actively involved in promotion of remote sensing technology in Gujarat. In order to give awareness about the utility and capability of remote sensing technology among common people and students in particular, the chapter celebrated the third anniversary of IRS-1A launch by holding a two-day exhibition and a popular lecture at Bhai Kaka Bhavan, near Law Garden, Ahmedabad, on March 17-18, 1991.

The techniques of remote sensing was explained through posters and write-ups in two languages, viz. English and Gujarati. The exhibits were specially designed and prepared to suit the occasion. Models of the satellite and the launch vehicle were also displayed which made the exhibition an added attraction. Applications of remote sensing was explained using simple and interesting illustrations to arouse interest among the students community and also to demonstrate the utility of the technique to the citizens. Resource areas like agriculture, forestry, hydrology etc. were covered. A short duration video film on "**REMOTE SENSING**" was also screened continuously so that people could watch in batches.

A lecture on "Remote Sensing for National Development" was delivered by Prof. P R Pisharoty, Professor Emeritus, Physical Research Laboratory, Ahmedabad, in the auditorium of Bhai Kaka Bhavan on March 17, 1991. A souvenir containing articles on remote sensing technology in Gujarati, Hindi and English was brought out. An IRS-FCC image of Ahmedabad city along with its corresponding interpreted map was also printed for the occasion. The souvenir and the colour picture-cum-map of Ahmedabad were distributed to the people who attended the lecture and also on selected basis, to the visitors in the exhibition. The exhibition was visited by a large number of people including groups of students and their teachers from various schools and colleges of the city.

Indian Society of Remote Sensing - Ahmedabad Chapter

Executive Council 1990-1992

Chairman	:	Dr. George Joseph	Member	: Dr. S D Naik
				Shri J V Bhatt
Vice-Chairman	:	Shri D M Pancholi		Shri J M Patel
				Shri M K Rao
Secretary	:	Shri T P Singh		Miss Beenakumari
Joint Secretary	:	Dr. R R Shukla		
Treasurer	:	Dr. R N Jadhav	Editor (Newsletter)	: Shri R P Dubey

THEY CAME, THEY SAW AND THEY SAID

Voices of spontaneity from the visitors to the Exhibition

FROM BELOVED STUDENTS:

The Eye in the Sky was an eye opener indeed! What we study in books has been demonstrated - Ms Shalini Narula, Shalini Bagh K V.

Damn interesting! Good for students - Raj Kurup, A G School.

Very informative, the demonstrations were also very simple - Anuja Mehta, M. Sc.

Was very good but the language was difficult - Vinay V, Amruta M School.

The demonstrations and explanations have enriched our knowledge - Ms Papur.

I came to know about many things which I was unaware of - Gargi Mathews, F A H S School.

Has opened a new science for me and my friends - Firdaus Amrut School.

Has given me lot of knowledge about satellite, maps and other things - Y Dubey.

We want programs regarding this (remote sensing) in our school during the first terms - Gupta, Rajasthan Hindi High School.

This type of exhibition should be organised every month in different parts of the State so that large number of people know uses of a satellite. I would like to become member of your Society - Pandya Deepak.

Thanks for educating us about a technique which we were unaware of - Students from Jain School.

Quite interesting and good for students. Request to make more expansive and interesting in future - Santosh, A G School.

When we came, we were not knowing about remote sensing. Now we know a lot - Students of Rachana School.

Quite fascinating and interesting - Sandip Goyal, Rachana High School.

For the first time I have seen an exhibition about satellite - Kartikeya Dave, Rachana School.

Congratulations for wonderful work! All the best for future projects - Prashant Dubey.

KUDOS to all who are responsible for bringing India ahead in this field. Such exhibitions should be taken to educational institutions so that students are encouraged to pursue their higher education in this field - Rajesh Kaul, L D Engg College.

We thank the staff of ISRO for arranging such an interesting exhibition - S Gupta, FAHSS.

FROM HONOURABLE CITIZENS

The introduction is very impressive but finer details need more explanation. On the whole (it is) quite informative - Aruna.

Such valuable information should be put to more use for country's welfare - R N Batenwala, L&T Ltd.

Very informative. Can't miss it - Jignesh Parmar.

Very informative but the technical details are beyond comprehension of a layman - K K Naik.

We have really collected more information (than we knew from other sources) by visiting the exibition - Teacher, DBM Shala, Kankaria.

You should have a cassette explaining basics of RS technology and the language of explanation should be Hindi - Narendra, Dr. J N N Govt Polytechnic.

Was very informative so far as the usage of satellite in various fields is concerned - Teacher, R B Vidyamandir.

Very informative especially for the younger generation - A N Vora.

A must (to know about RS) for every citizen of India. Please make a film and go to schools. You never know, one great future scientist may be hidden in that school - Sushma J.

A very good effort to communicate to the curious public and students about various aspects of remote sensing endeavours made by our scientist in a very simple and concrete manner. Public at a large will be benefitted from such exhibitio - B K Sinha, Asstt Prof. of Psychiatry, Dept of Psychiatry, New Civil Hospital.

Why is this exhibition only for two days? If it had been for a longer period many more students could have been benefitted - Hemendra Bhatt, Shreyas Foundation.

Literature on RS should be prepared in Hindi, English and Gujarati and sent to High Schools and higher secondary schools of Gujarat State - B N Patel, Asst. Conservator of Forests.

FROM DIGNITARIES

Very educative and informative. Well done! - Prof. P R Pisharoty.

A very well-organised and informative exhibition - Shri Pramod Kale, Director, SAC.

A well-organised effort. Should be made into a mobile one and taken to different parts of Gujarat - Shri O P N Calla, Dy Director (SCA), SAC.

Innovative, Unique and Excellent! - Prof. S D Verma.

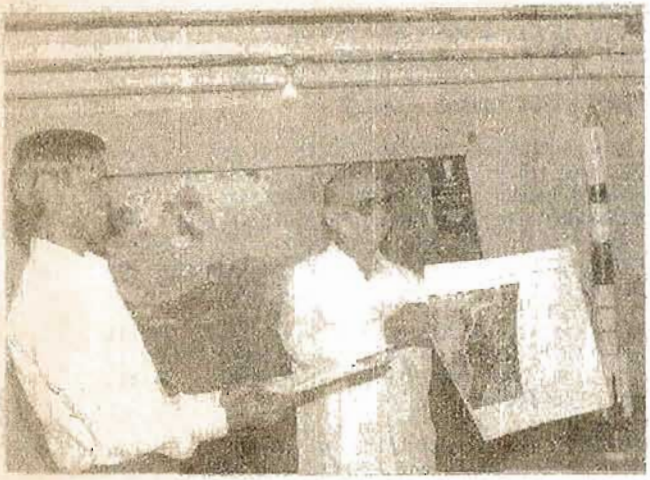
Very informative and useful even for a layman - Dr. D G Faldu, Director of Agriculture.

Nicely planned exhibition. Even a layman can

(CONTINUED ON P.6)

Inauguration of the exhibition by Shri O P N Calla

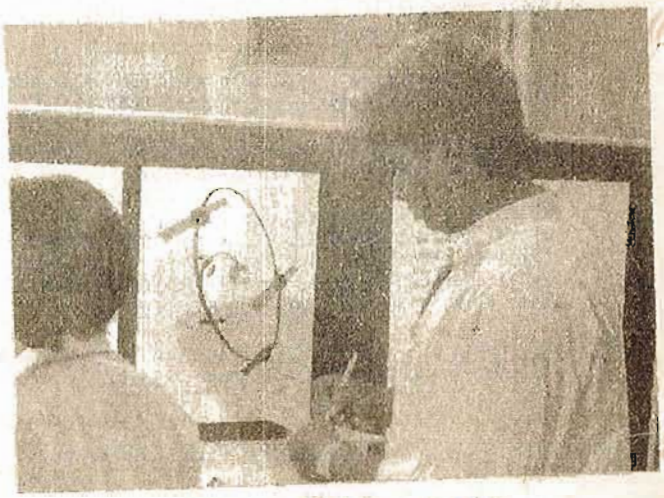
Putting finer points of RS across to a group of young visitors



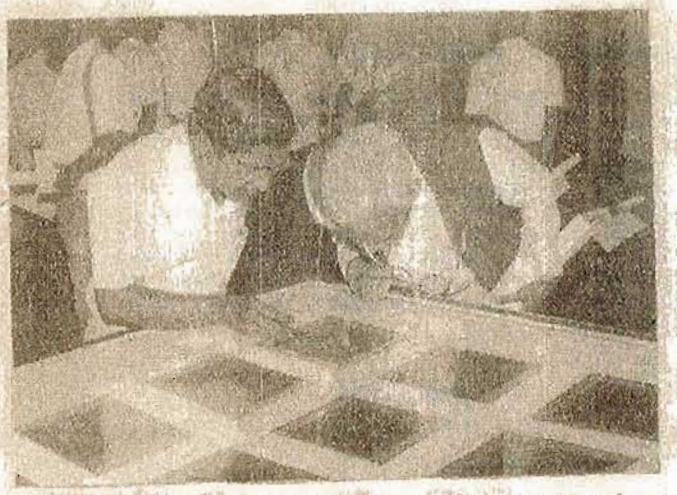
Release of Souvenir and image-cum-map of Ahmedabad

Telling all about the presiding deity of the day - IRS-1A

Shri Pramod Kale, Director SAC takes a round of exhibits, flanked by Dr. George Joseph, Chairman ISRS-AC and Shri O P N Calla

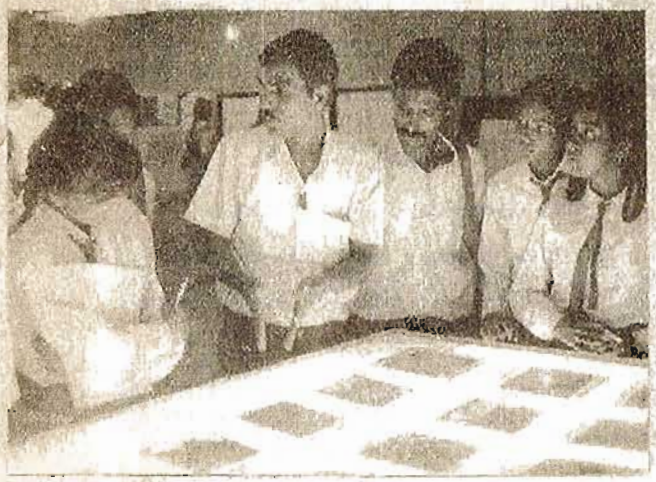


A solitary moment of concentration



A senior citizen dwelves into the finer points of RS

Prof. Pisheroty delivering the public lecture



Shining a star into their eyes

A section of the attentive audience during the public lecture

A view of dias in the evening

And the end was all smiles

understand what is remote sensing - C K Joshi, Director, DGM.

This is an exhibition which stands as a testimony to our young scientists who have adapted modern technique of remote sensing - N Madhukara, ex-Director, DGM.

Very enlightening - K S Kothari, HOD Science, Firdaus Amrut School.

- o x o -

Fourth Laxmi Narayan Calla Memorial Lecture
SAC Campus, January 11, 1991

REMOTE SENSING FOR NATIONAL DEVELOPMENT

Prof. B L Deekshatulu
Director
National Remote Sensing Agency
Hyderabad

Remote sensing is important for national development in a number of ways. First of all, it can provide timely and cost effective information about the spatial distribution of various natural resources and thus help in increasing the productivity of the nation. Secondly, spatial and temporal nature of the remote sensing endows it with capability to evolve environmentally safe yet economically viable system for natural resource management, in contrast to traditional connotation of 'exploitation' associated with natural resources. Lastly, RS can pre-empt disasters and help in conservation measures.

Integration of remote sensing with conventional methods can yield valuable resource information in a much better way. For example, a plan for integrated area development will require various thematic inputs - the spatial one being amenable to RS techniques, others can be obtained from conventional sources.

Remote sensing can be defined alternately as the science of using electromagnetic spectrum to know 'what is where' and how much of 'what is where'. Applications of remote sensing pertain mainly to earth's atmosphere, ocean and land and to-date, the level of cooperationalisation achieved in these areas is low, medium and high, respectively. While repeat coverage of large areas is obvious advantage of remote sensing, it suffers from certain drawbacks like drudgery of visual interpretation and need of high skills in training the computer for digital classification.

Familiar areas of application of remote sensing include agriculture, soils, land use, environment, drought monitoring, water resources, forestry etc. Some of the challenging applications of remote sensing to be taken up in near future or already initiated pertain to yield forecasting of major crops, monitoring of desertification, grassland mapping, timber volume estimation using multistage sampling etc. (Summary based on notes taken during the actual presentation - Editor).

TECHNOLOGY TRENDS

Data Handling : Goodbye to CCTs?

The large amount of data churned out by sensors onboard satellites will finally have an answer in an efficient, compact data recorder called rotary recorder likely to be available by 1996. As compared to magnetic tapes which record data linearly, the rotary recorders will encode data, on compact optical disks, at a much faster transfer rate. It will grace, not only the onboard facilities but also make life easy for those who purchase the data in the form of bulky CCTs. (SPACE NEWS).

SPACE VISTAS

Electricity from Space

An Italian tethered satellite will be dragged through the space by a 99-km long cable attached to Space Shuttle during December 1991. As the tether cuts across the earth's magnetic fields electric power will be generated. This is one of the many electrodynamic experiments to be conducted during joint-US Italian mission. The latter, apart from 520 kg satellite, is also making a deploy device which will hold the satellite in shuttle cargo bay and reel it in and out (Space News).

NEWSPIX

Some Interesting RS Applications

° A fertiliser company used Landsat data to delineate regions of low fertility and target those regions for enhanced sales, as the returns to farmers were assured.

° A big farmer knows from RS data that potato crop yield is depressed and holds his stock till the prices rise from $ 80 to $ 130 per ton at the end of harvest and end with a profit of $ 750,000.

° In the state of Arizona RS enforcement departments spends $ 10,000 on Landsat images to catch any illegal diversion of irrigation water - down to a single field (US, of course).

° Earthsat, an US firm, offers crop forecasting service in the form of monthly printed reports called CROPCAST. It also offers an interactive data base, a PC-compatible file, called CROPDIAL which can stack upto 12 layers of information and display multiple, interacting images on the screen.

° Water temperature anamolies are helpful in location of potential fishing grounds. It is also possible to predict the fish species by their preferred temperature ranges. For example, Salmon is found in waters of 49-51° F range. Satellite based SST charts can reduce the search time by 20 per cent - but the Nimbus charts at $ 1000 are prohibitive. (Source : Space Inc by Tom Logsdon).

A PC to teach you Remote Sensing

At a modest cost $ 185 per module, one can learn the key concepts through a PC compatible software package called 'Introduction to Remote Sensing'.

Developed by Australian Key Centre for Land Information Studies, this prize-winning course teaches to non-computer specialist the physical aspects of remote sensing and the spectral signatures presented in two separate respective modules. Modules have assessment and progress monitoring option suited to, not only first year students but to professionals as well. The program runs on PC systems with EGA graphics, a colour monitor and hard disk. (Source : CSIRO Space Industry News).

RS Directory

International Space University has adopted an Australian proposal to establish an international computerised directory of remote sensing topics and applications. Preliminary work on the directory has already begun and is likely to enter soon the production phase. (Source : CSIRO)

OBLIQUE VIEWS

Landsat Island

A team of cartographers used Landsat images to discover a new island off Canada's Atlantic Coast. This previously unknown island has been appropriately named as 'Landsat Island'.

Cocaine and Remote Sensing

US used RS data to map canobis crop producing areas in Mexico. Monitoring from the space helped reduce flow of drugs to insignificant levels. Colombia is now major drug supplier and it found that TM data can be used to identify cocaine-producing Cannobis crop grown by Slash and Burn method in forests. Even if the areas are camouflaged the detection is possible using refined systems. RS data can also help the law enforcement agencies by identifying the unchartered landing strips (RSS Newsletter).

MODEL YODEL

Twinkle, twinkle, crop pixels,
We always wonder, 'How many quintals?'
You shall yield very low,
That's what our models show,
But in the field you yield so high,
Will you ever tell us why?
Twinkle, twinkle, crop pixels,
We always wonder, 'How many quintals?'

(Contributed by Shri T T Medhavy, LRD/RSAG/RSA/ SAC)

BOOK REVIEW

SPACE INC - YOUR GUIDE TO INVESTING IN SPACE BY TOM LOGSDON, CROWN PUBLISHERS INC, NEW YORK 1988 (PRICE $ 22.50).

The book explores a wide range of industrial and commercial possibilities of space and the related technological developments. Set in popular tone of writing the book presents in an interesting and informal manner the immense potential of space enterprise in coming years. The author opens the book with a rosy picture of huge revenue of $ 65 b to be earned by private companies by the year 2000. The three attractions of space viz. microgravity, hard vacuum and wide-angle view of the planet earth will give rise to a variety of indispensible manufacturing and service sector enterprises - starting with exotic pharmaceuticals, glasses and semiconductors on one hand to communication and remote sensing and launch services on the other. Almost exhaustive list of possible subcomponents of various enterprises are given in lucid and readable details. The topics covered are manufacturing, communication, remote sensing, navigation, rockets, space station, retrieval and repair services and 21st century world view.

About remote sensing author opines that it will be $ 2 billion annual business and experience a growth rate of 10 per cent. The business of RS will primarily be centred around such key activities like sale of data (prints, tapes, transparencies), sale of value-added (enhanced, annotated, gridded, merged with collateral data etc.) products and specialised services/softwares/hardware for resource disciplines, following primarily the lead enterprises in oil, gas and mineral sectors. Expert systems, GIS and sale of resource information are the areas likely to experience intense developments, where private enterprise will flourish. Zenith of enterpreneurship is indicated by the resolve of one US company - Space America - to launch its own private RS satellite.

Even if you are not serious about 'pennies from space' and do not feel heady about typical American hi-tech, the book is worth its value for the immense sweep of perspective on almost all possible space endeavours and the sheer joy of reading its dramatised, catchy and explanatory openings to many otherwise complex topics.

- Editor

Congratulations Ms Beenakumari!

Ms Beenakumari won first prize in Fourth Hindi Competition at both SAC and DOS level for Essay writing, noting and drafting held during September 1990.

List of Members

Life Members

Space Applications Centre

Dr. Ajai
Shri Andharia HI
Ms Bahuguna Anjali
Ms Beena Kumari S
Shri Bhatt H P
Shri Buch A M
Shri Calla O P N
Dr. Chakravorty M
Dr. (Ms) Chaturvedi Neera
Shri Chauhan H B
Dr. Dadhwal V K
Shri Das B
Shri Dasgupta A R
Dr. Desai Pranav
Dr. Dhinwa P S
Shri Dubey R P
Shri Dwivedi R M
Shri Garg J K
Shri Garg R C
Shri Goel R K
Dr. Gupta K K
Dr. Gupta M C
Dr. Jadhav R N
Dr. George Joseph
Shri Jothimani P
Shri Kale Pramod K
Shri Kalubarme M H
Dr. Kandya A K
Dr. Kimothi M M
Shri Kulkarni A V
Dr. Majumdar T J
Shri Medhavy T T
Shri Mehta N S
Shri Mehta R L
Shri Mukund Rao
Dr. Muley M V
Shri Murthy E S
Dr. Murthy K V G
Shri Murthy T V R
Dr. Naik S D
Dr. Narain A
Shri Narayana A
Dr. Navalgund R R
Dr. Nayak S R
Shri Padia K N
Dr. Palaria S
Mrs. Palsule S S
Dr. Pandey P C
Dr. (Mrs.) Panigrahi Sushma
Shri Parihar J S
Shri Patel N K
Shri Patel R N
Dr. Pathak P N
Shri Pathan S K
Shri Pillai N S
Dr. Pokharna S S
Dr. Potdar M B
Shri Rajawat A S
Dr. Ramani R
Dr. Sahai Baldev
Dr. Sarkar A
Shri Shaikh M G
Dr. Sharma K P
Mrs. Sharma Tara
Shri Sharma Rajeev
Shri Sharma S A
Shri Sharma S K
Dr. Shiv Mohan
Dr. Srivastava V K
Dr. Sridhar V N
Shri Singh T P
Dr. Singh T S
Shri Solanki H U
Mrs. Sudha K S
Shri Tamilarasan V
Shri Thakker P S
Ms Yogini Vanikar
Dr. Vysa N K
Shri Vyas S P

Anual Members

Space Applications Centre

Shri Arya A
Shri Bahuguna I M
Ms Bhagia Neeta L
Dr. Desai U G
Shri Gopalkrishna B
Shri Illanthirayan S
Ms Kharod Ketki
Shri Mallick K D
Shri Manjul S S
Shri Munjal B S
Shri Nandkumar R
Dr. Oza M P
Shri Oza S R
Shri R M Pandya
Ms Patel Parul
Shri Rao R S
Shri Ravi N
Shri Roy C L
Dr. Sastry S V C
Shri Shah Malaykumar
Shri Sharma A K
Shri Sharma S A
Dr. Srivastava P K
Dr. Joseph K S

All India Soil & Landuse Survey, Ahmedabad

Shri Dhar S C
Shri Shani K M

M J Science Institute, Ahmedabad

Shri Pandya G B
Shri Shah R D

Gujarat University, Ahmedabad

Dr. S D Verma

Gujarat Archeological Survey, Ahmedabad

Shri M H Raval

Department of Forest, Ahmedabad

Shri Aggarwal J P

Directorate of Geology and Mining, Ahmedabad

Dr. Joshi C K
Shri Naik K K
Shri Pathole B P
Shri Patel J M
Shri Talati D J

School of Planning, Ahmedabad

Ms Anjana Vyas

Physical Research Laboratory, Ahmedabad

Prof. P D Bhavsar

Institute for Studies & Transformations, Ahmedabad

Shri Nazareth J J
Shri Srinivasan D S R K

Others

Shri Avrani Shirish

Gujarat Engg Res Institute, Baroda

Shri Oza M S

Gujarat Maritime Board

Shri Desai V

Irrigation Department

Patel M M

Indian Institute of Management, Ahmedabad

Prof. Madhavan T

College of Engineering

Dr. Vekaria G R

Central Design Organisation, Gandhinagar

Shri Pancholi D M

Gujarat Jalseva Training Institute, Gandhinagar

Shri Baumbrah C S
Dr. Shukla R N

Gujarat Water Resources Dev Corpn, Gandhinagar

Shri Sharma S L

Shri Thakur S V

Public Health Department, Ahmedabad

Shri Patel I N

Central Ground Water Board, Ahmedabad

Shri Vohra S M

M S University, Baroda

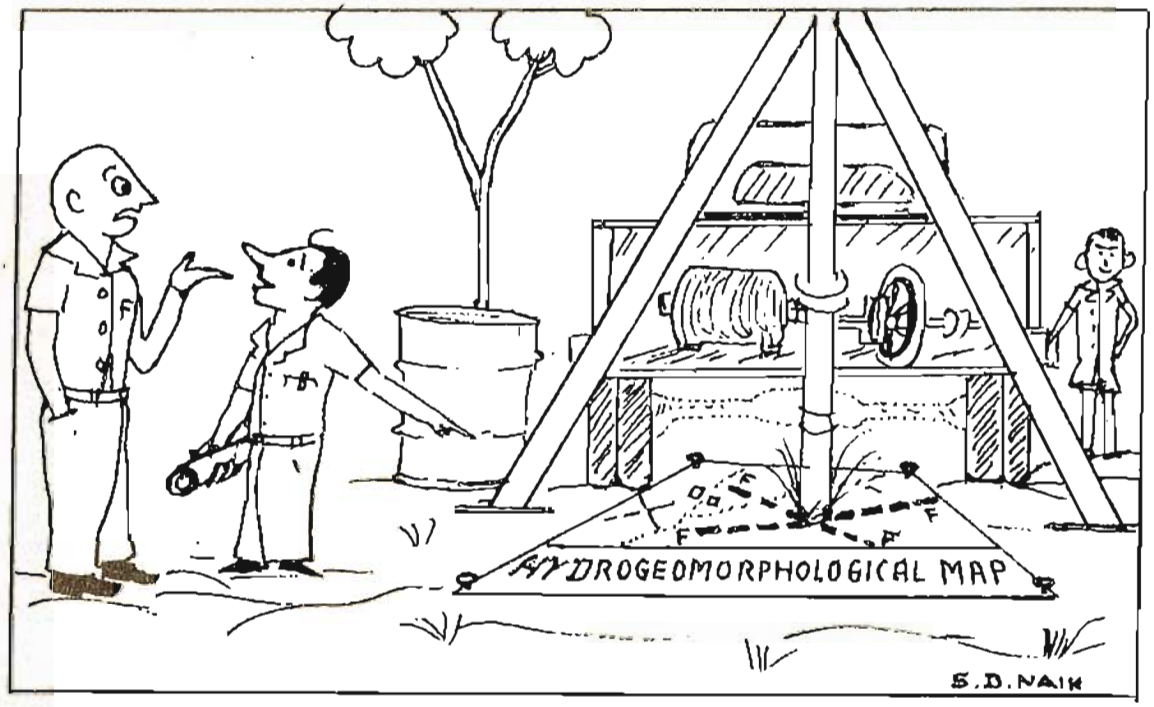
Dr. Mankodi P C

Industrial Extension Bureau, Ahmedabad

Shri Bhat J V

Others

Shri Shukla P
Shri Kamat D S
Shri Shukla R T
Shri Madhukara N
Shri Bhat P
Shri Mistry J F
Shri Bhatt P



This time we wanted to take bore exactly at the site suggested by us.

BOOK POST

If undelivered, return to:

T.P.Singh
Secretary,ISRS-AC
C/O, Remote Sensing Area
Space Applications Centre
Ahmedabad 380 053

Edited by : R.P.Dubey, Mukund Rao, J.K.Garg, Yogini Vanikar, Space Applications Centre, Ahmedabad.
D.M.Pancholi,Central Designs Organisations, Gandhinagar.

Printed at : Library, Space Applications Centre, Ahmedabad

Indian Society of Remote Sensing
Ahmedabad Chapter

NEWS LETTER

Vol. 5, No. 3 01 July, 1991

Dear Members,

Under theme subject of 'Remote Sensing in 1990s' every effort has been made to build up a skeletal yet up-to-date scenario, but the extensive nature of the subject prevents us from claiming it either to be exhaustive or thorough. You may kindly send your inputs or corrections/additions to this theme.

Survey on remote Sensing and space has been compiled from many sources. This includes a number of Newsletters (CSIRO, EOSAT, ISRO Newsletter like ISREL, Space Spectrum) regularly provided by Dr. George Joseph (Chairman ISRA-AC and Associate Director SAC) and publications like Space News, American Aerospace, Remote Sensing Society Newsletter, ITC Journal, Remote Sensing in Canada, ESA Journal etc. Certain sources were pointed out by Dr. V K Srivastava, Shri J S Parihar and Shri K M Mathur.

Your inputs will be awaited also regarding role of remote sensing in Agriculture which will be theme subject for the next issue of Newsletter.

- Editor

CONTENTS

Page No.

TECHNOLOGY TRENDS

o Survey of Remote Sensing in 1990s 2
- General Outlook 2
- Commercial Outlook 2
- National Scenario 2
- IRS-1C Specifications 2
- World Scenerio 3
  * Asia 3
  * Australia 4
  * Europe (ESA, France) 4
  * North America (USA, Canada) 4
  * South America (Brazil) 4
- RS Satellite in 1990s 5
- Highlights of RS Satellites 6

o SPACE VISTAS : GLIMPSES OF 1990s 6
- Space Education
- Space Materials
- Space Stations
- Aerospace Planes
- Fuelless Manoeuvres
- Planetory Probes

o NEWSPIX 7

ISY Plan 7

o ERS-1 7

o IRS-1B Launch 8

o Remote Sensing in Military Surveillance 9

o Annual Report 11

o ISRS Award 11

+ o Launch Day Forecast-8 Some New Definitions-10

TECHNOLOGY TRENDS : SURVEY OF REMOTE SENSING IN 1990S

GENERAL OUTLOOK

For remote sensing, if 1970s were the era of probing and awakening, 1980s an era of experimentation and consolidation, then 1990s will be one of rapid technological advancement, operationalisation and unprecedented commercialisation. From a marginal existence of a fledgeling branch of technology, RS in 1990s will move to a stature of indispensibility. Going purely by numbers, there were only about half-a-dozen RS satellites at the end of 80s. The figure will jump two-fold or more by the end of 1990s. If one adds the level of sophistication likely to be incorporated in the RS satellites of 1990s, the net capability would have enhanced many more times. The picture is simply rosy.

Many of the satellites in this decade will continue to be designed to serve the cause of national development. But market mechanism will start riding this basic consideration, even for uninitiated, developing countries. Of course, on the other end of scale, will lie the nations or private firms whose sole purpose will be commercial. Most of these satellites will be tuned to serve the cause of local, regional or national level applications. On global front, an exciting new development of 1990s (and even beyond) will be spearheaded by United States of America under its Global Change Research Programme. It includes Earth Observation System (EOS) consisting of a series of platforms and probes to be launched in 1990s. The US program under the aegis of international effort called 'Mission to Planet Earth' will truly measure the pulse of earth by monitoring the thin veneer of life - supporting shell called biosphere.

COMMERCIAL OUTLOOK :

The World View

Remote Sensing of erath resources is likely to turn out a whopping $ 10 bn world business by the end of decade. Current world-wide sales of RS data have already touched $ 800 m and it is likely to reach an estimated high of $ 2.4 bn by 1994. Expected annual growth rate of RS business is forecast to be anywhere between 20-30 per cent. Conservative estimates in past pegged the potential RS market at $ 2 bn.

An important pointer to future of RS business, particularly in developed countries is the growing tendency towards increasing privatisation. So one discerns a range of priorities in programs of different countries - ranging from a Australian model of pragmatic mix of roles for private sector, government organisations and academic institutions to an Uncle Sam style lassaiz-faire of free enterprise in not only various sectors of RS endeavours but in space related activities in general - with NASA and Government acting as catalytic agents.

Secotorwise trends show a steady growth for companies engaged in enhancement and analysis of satellite data. Steep growth is predicted for GIS sector and value-added products and equipments - thanks largely to declining computer prices. Private firms in western countries are currently engaged in both supply of equipment as well as services. Sale of RS data to private firms and local agencies is increasing. EOSAT and SPOT image forecasts for 1990s show that while sales to federal governments accounted for more than 80 percent of total data sales during late eighties, it will come to down to barely 35 per cent by mid 1990s.

Indian Society of Remote Sensing - Ahmedabad Chapter

Executive Council 1990-1992

Chairman	:	Dr. George Joseph	Member	:	Dr. S D Naik
					Shri J V Bhatt
Vice-Chairman	:	Shri D M Pancholi			Shri J M Patel
					Shri M K Rao
Secretary	:	Shri T P Singh			Miss Beenakumari
Joint Secretary	:	Dr. R N Shukla			
Treasurer	:	Dr. R N Jadhav	Editor (Newsletter)	:	Shri R P Dubey

National Scenario

The country has a comprehensive application-driven remote sensing program encompassing development of sensor payloads, satellites, launch vehicles, data reception and dissemination facilities. Department of Space, the focal point of these developments, is also engaged in development of support technologies like equipment for ground investigation, visual interpretation and digital image processing and softwares for image processing and GIS. A fledgling remote sensing industry in the country has emerged due to efficient transfer of these technologies and their mass production to cater to both the in-house as well as the user needs. Apart from steady growth of the industries based on support technologies, 1990s is also likely to see the emergence of applications-based enterprises - largely due to vigorous promotion drive from DOS. Regarding RS satellites, the country will soon launch IRS-1B which will be similar to its predecessor IRS-1A. A quantum jump in operational capabilities will be achieved with the launch of IRS-1C which will feature a package of three sensors and vastly improved resolutions - bringing the country at par with the advanced nations of the world. A similar follow-on IRS-1D and satellite with microwave sensors MRS-1 and next generation satellite IRS-II are slated for late 1990s.

- o x o -

IRS-1C/1D SATELLITE SPECIFICATIONS

Weight	: 1360 Kgs	3-Axis Stabilised	
Power	: 872 W	Orbit	: 817 Kms
Data	: X-bands	Sun Synchronous	
TTC	: S-Band		

IRS-1C/1D PAYLOADS - SPECIFICATIONS

	LISS-III Multi-spectral Sensor (um)	Wide Field Sensor (WIFS) (um)	Panchro-matic Sensor (PAN)(um)
Spectral Bands	0.52-0.59 0.62-0.68 0.77-0.86 1.55-1.75	0.62-0.68 0.77-0.86	0.50-0.75
Spatial Resolution	23.6 m	188 m	< 10 m
Swath	141 Km	770 Km	70.50 Km
Radiometric Resolution	128 grey levels	128 grey levels	64 grey levels
Revisit Capability	24 days	5 days	5 days

(Source : IRS Newsletter)

RS SATELLITES IN 1990

WORLD SCENARIO :

ASIA

ASIAN PERSPECTIVE OF SPACE

Amongst Asian countries, 1990s are likely to see a surge in space activities, largely related to immediate benefits, with the exception of Japan which, with USA, Europe and USSR, will engage in sophisticated space activities. While China is going to concentrate on booster business and development on the lines of long March rocket, Republic of Korea will enter the business of satellite construction. Thailand, and Indonesia will focus on remote sensing and communication related applications.

JAPAN

Advanced Earth Observation Satellite scheduled for 1995 launch is a major satellite project of Japan. It is likely to ride the H-II Mini Shuttle (HOPE), the prestigious vehicle under development at the National Space Development Agency of Japan (NASDA). A tracking and data relay satellite is another related development likely to materialise by end of decade. (Aerospace America).

SOVIET UNION

Soviet Wisdom

Soviet stipulate to augment their MIR-1 space station by two modules called specktor and Prirode. These modules scheduled for 1994 launch by Soviety Shuttle Buran will carry microwave and infrared sensors to measure the ozone layer and atmospheric pollutants.

RS Data from USSR

Soviet imagery are acquired from 5 m resolution KFA-1000 camera onboard MIR space station and Resurs satellite through film recovery capsules.

Current practice of selling these photographic products will change. Once EOSAT takes over as marketing dealer for these images and stands selling them after digitisation and enhancements. With resolutions reaching as sharp as 2 m, these images, the best in civilian area, will give a run to main market contender the SPOT. (Space Spectrum).

SOUTH KOREA

First RS satellite is likely to be launched by 1993 for survey and monitoring of fishing and farming resources.

INDONESIA

Indonesia and the Netherlands are jointly developing Tropical Earth Resources Satellite (TERS) to be launched in 1990s. It will acquire data four times a day in the equatorial belt of ± 10° latitude using a pointable sensor, in order to obtain cloud free images.

AUSTRALIA

This continental country foresees RS a prime tool for gathering information about its natural resources, particularly the mineral resources. It has plans afoot to use the space-based sensor data in a big way from Earth Observation System (EOS) planned by US and its partners in space station mission. The country does not envisage to launch its own RS satellites in immediate future but it has armed itself with an impressive array of expertise through the sustained effort of Central Scientific and Industrial Research Organisation (CSIRO) office of space science and applications which works closely with other departments and private firms. The country has earth stations for data reception, has developed aerial CO2 laser sensor for mineral exploration, is marketing powerful softwares for image processing (PC-compatible, micro BRIAM, DISIMP) and has plans to start its satellite launch vehicle development, apart from the famous Cape York space project.

EUROPE

EUROPEAN SPACE AGENCY

ESA has an ongoing earth observation program for land and ocean applications, apart from meteorological satellites. Apart from ERS-1 and 2, ESA has planned to contribute to manned space station program through Columbus polar orbiter which would carry microwave and spatial sensors.

FRANCE

After launch of SPOT-1 and SPOT-2 in 1985 and 1990, the French plan to launch SPOT-3 which has been already completed and awaiting the launch date which is most likely to be April 1993. SPOT-4 is presently under construction with the prime contractor of SPOT series, Matra Marconi Space of Paris. Next generation of SPOT satellite is likely to reach the Space by 1998. Although final decisions have not been taken, the next generation SPOT will have 5 m resolution and capability for high data rate for transmission of high resolution pictures. Incidentally SPOT image expects to attain self-sufficiency by 1998 and thus fund the fifth satellite or 1st next - generation satellite from its own revenue (SPACE NEWS).

NORTH AMERICA

UNITED STATES OF AMERICA

Under its Global Change Research Program, US plans to monitor the global environment, using Earth

Observation System which will comprise of numerous remote sensing satellites to be launched during next 15 years at a total cost of $ 30 bn. It will comprise two series of polar-orbiting platforms packed with different types of sensors. EOS will also includes Space Probes - the satellites which will be placed in different orbits either due to inherent sensor requirement or for prototypes testing. As many as 14 satellites are likely to be launched during 1990-96 period, as per current plan of NASA. Some of the EOS satellites are characterised below.

Satellite/Sensor	Mission Objective/ Characteristics
Upper Atmospheric Research Satellite (UARS)	Study of ozone layer (1991 launch)
Ocean Topography Experiment	Ocean Circulation Pattern (1992 launch)

Imaging spectrometers to be orbited under EOS open other exciting new possibilities for detailed 'in situ' spectral behaviour analysis (See HIRIS Newsletter, Vol. 4, No. 4).

CANADA

With healthy allocation of more than $ 2 bn, Canada maintains a high profile in space. Its main RS lead lies in Radarsat, a polar satellite with sophisticated radar sensors. Due for launch in 1994, the spacecraft is being built by a Canadian private firm, at the total allocated budget of nearly $ 400 m under the program of Canadian Space Agency.

SOUTH AMERICA

REMOTE SENSING SATELLITE OF BRAZIL

First RS satellite of Brazil will be launched in 1992. The 115 kg satellite will be placed in orbit by an Ariane rocket as the Brazilian programme of launch vehicle development envisages the readiness of vehicle by 1993 or 1994 (COSSA).

HIGHLIGHTS OF FUTURE RS SATELLITES

Sr. No.	Satellite	Mission Objective	Sensor Characteristics
1.	IRS-1B (India)	National Natural Resource Mapping	LISS I & II sensor, same as IRS-1A
2.	IRS-1C (India)	National Natural Resource Mapping	- 4-band multispectral sensor (visible-MIR) (23.5 m resolution) - Panchromatic (10 m resolution) - Wide field sensor (Wifs) (180 m resolution)
3.	IRS-1D (India)		
4.	ERS-1 (ESA)	Monitoring Ice Fields and Ocean	- C-band Synthetic Aperture Radar (30 m resolution) - Radar Altimeter - Scatterometer - Scanning Radiometer (IR)
5.	ERS-2 (ESA)	Continuity of ERS-1 Service	Same as ERS-1
6.	ERS-1 (Japan)	Agriculture/Forestry Fisheries/Coastal Mapping	- Optical (visible-infrared) 7-band CCD based sensor - SAR
7.	Advanced ERS-1 (Japan)	-	- Sensors from US, France, Japan
8.	Radarsat (Canada)	Ice field mapping	- C-band SAR - Polar Sun Synchronous orbit - Many operating modes and beam control
9.	SPOT-3 (France)	Natural Resource Mapping	Same as SPOT-1 & 2
10.	SPOT-4 (France)	-do-	-do-
11.	Landsat-6 (USA)	-do-	- Enhanced Thematic Mapper (ETM) (6 bands in VIS-MIR, 1 in TIR) - Panchromatic Sensor (15 m resolution)
12.	Landsat-7 (USA)		- Modified ETM (6 spectral bands) - Panchromatic (15 m resolution) - 4 Thermal bands (60 m resolution)

RS SATELLITES IN 1990S

Country	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
India	IRS-1B		IRS-1C			IRS-1D	IRS-II/ MRS-1			
USA		LSAT-6				LSAT-7				
	<----------				EOS					---------->
France			SPOT-3			SPOT-4		SPOT NEXT GEN		
Japan		ERS-1			Advanced ERS					
Canada				RADARSAT						
Europe (ESA)	ERS-1			ERS-2						
Brazil*		RS Sat								
USSR*		RS Sat (Digital)								
South Korea*			RS Sat							

* First RS satellite of Brazil, First USSR satellite with digital imaging capability, first satellite from S Korea.

+ EOS Earth Observation System will comprise a series of satellites during 15-year period.

SPACEVISTAS : GLIMPSES OF 1990s

SPACE EDUCATION

Shortage of trained manpower for space endeavours in private and public sector is one of the likely problem areas - for the decade and even beyond. It is generally believed that the decade and the coming century will see a shortfall in trained manpower (science and engineering) to the tune of 30% in US.Remedial measures assume multiple dimensions, sometimes according to country-wise perceptions. For example US finds the divergence between engineering and policy/management branches as headeache and plans to introduce multi disciplinary courses to get its future graduates trained. European countries seem to have a more livelier way of promoting education at broad and informal as well as formal level. Examples are: German system of appreciceship in space industry, French way of hands-on education in RS for tenth graders, teacher training, public awareness programs, and clubs with rocketry experiments.

SPACE MATERIALS

Aluminium and its alloys are the work horse materials for today's payloads and spacecraft structures. Search for better materials accruing such advantages as reduced cost, high structure-to-payload rates and reduced launch cost, and almost equivalent strength continues. One of the promising materials is beryllium, which offers 1.4 times more strength and 40% reduction in density as compared to aluminium. Still more promising category of materials are advanced composites. The most ubiquious composite may be RCC (Reinforced Cement Concrete) but the modern composites being developed under highly guarded secrecy in terms of their structure, material combination and processes; promise to be the wonder materials of tomorrow. These will excel any of the known properties of metallic/non-metallic materials and offer unsurparssed advantages in aerospace industry. (ISREL + other sources).

SPACE STATIONS

A dream-like home in the vicinity of stars is indeed a tempting idea. But no one will do that just for the sake of sheer romance. Not even for national pride - although such high technology ventures do invariably turn up as show case for nation's economic and technological prowess. High-cost and high-risk nature of manned as well as unmanned space stations is pushing the nations towards more and more international alliances. They plan to do it simply because benefits are immense - in terms of earth observations, microgravity manufacturing and vacuum advantages of deep space.

Major player in the game of space stations is USSR with its MIR-1 space stations already orbiting happily since 1986. US with its partners will steal that lead with its proposed Freedom space station. European community wants to join with their mini-add-on space station called Columbus. All these projects are plagued by recurring financial allocation problems and occasional howl of protest from those marginalised group of scientist who feel the pinch of funds- swallowing nature of space stations. But these are the indicators to the shape of things in 1990s and beyond.

AEROSPACE PLANES

Biggest problem with rockets is that they carry and use oxygen - enormous loads of it, while still passing through the lower layers of atmosphere where oxygen is aplenty. It is like someone travelling through India with his own cow. Aerospace planes proposed and being built by different countries overcome that problem by travelling through air like a jet plane with superior fuel efficiency and changing to rocket mode only in thinner layers of atmosphere or in space. Of course such a plane is multi-billion dollar proposition as it incorporates various advanced R&D elements. Once built these planes will cut down the launch cost by ten times from the present rate of $ 3000 per pound. Some of the proposed aerospace planes and their lead countries are X-30 National Aerospace Plane (NASP) - USA, HOTOL (Horizontal Take Off and Landing) - Britain and Saenger (Germany).

The passenger versions of these planes (US calls it Orient Express) will cut down the travel time drastically (Tokyo to New York in 2 hours).

FUELLESS MANOEUVRES

Soviets, at Institute for Space Research are developing one of the most economical spacecrafts 'Regatta' which could serve as general platform for earth resource satellites in post-1995 phase. 'Regatta', named so because it will use small solar sails for attitude control and stabilisation,could be rolled for general sales for a paltry $ 15 m, launch and payload included.

PLANETARY PROBES

Magellan

NASA probe launched in 1989 to map the Venus surface using synthetic aperture radar, 70-250 m resolution image received since September 1990 revealed a lot about Venus.

Galileo

NASA probe launched in 1989. It will examine earth's magnetic field, map the moon's toside in near-infrared region and reach Jupiter in 1995.

ISY PLAN

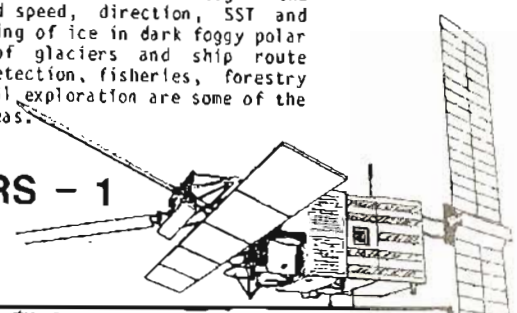
Following are the ten projects to be undertaken during International Space Year (1992) in order to evaluate the health of earth using satellite remote sensing.

1. Enhanced greenhouse effect detection
2. Ocean variability and climate
3. Polar strateospheric ozone
4. Land cover change
5. Productivity of the global ocean
6. Global tropical forest monitoring
7. Sea surface temperature
8. Polar ice extent
9. Global change encyclopaedia
10. Global change atlas

ERS-1

First European Remote Sensing Satellite (ERS-1) of European Space Agency was launched on July 16, 1991 by ARIANE launcher from Kourou, French Guiana. The 2384 kg satellite has been placed in polar sun-synchronous orbit with inclination of 98.5° and perigee of 767 km and apogee of 787 km with mean local time at descending node (equatorial crossing) of 10.30 with a 3-day repeat cycle. Built by Dornier Germany around a 'multimission platform' similar to that of SPOT programme, the satellite carries a set of active microwave sensors and complementary sensors for remote sensing and environmental monitoring of oceans, ice and land. The real time SAR data available for 10 minutes per orbit will be relayed to ground sations (Landsat-type receiving stations, including India) in X-band. Apart from SAR regional service, there is a provision for low bit rate global service which can be availed through onboard storage. Some selected products called fast-delivery products will be generated and delivered within 3 hours from observation. ESA plans to evaluate engineering and geophysical performance of the satellite during commissioning phase of 3 months. Onboard sensors like laser corner reflector, PRARE package, altimeter and microwave sounder can be used to compute the orbit down to decimeter level.

Built with a total cost of 730 MAU (1 Accounting Unit = ± 1.2 US $), ERS-1 programme will lead to a number of commercial/operational applications. Weather and sea-state forecasts through the measurements of wind speed, direction, SST and water vapour, monitoring of ice in dark foggy polar regions for study of glaciers and ship route planning, oil spill detection, fisheries, forestry and agriculture and oil exploration are some of the likely application areas.



ERS-1 PAYLOAD

C-BAND ACTIVE MICROWAVE INSTRUMENTATION (AMI)	- SYNTHETIC APERTURE RADAR (SAR) with two operating modes : . Full imaging mode : SAR mode . Sampled imaging mode : Wave mode - WIND SCATTEROMETER : Wind mode
+ Ku-BAND RADAR ALTIMETER	
+ ATSR/M . Infra-red Along Track Scanning Radiometer (ATSR) . Two-frequency Microwave Sounder (M)	
+ S/X BAND PRECISE RANGE AND RANGE RATE EQUIPMENT (PRARE)	
+ PASSIVE LASER CORNER RETRO-REFLECTORS	

Geophysical Measurements and ERS-1 Performance Parameters

Main Geophysical Parameter	Range	Accuracy	Main Instrument
Wind Field - Velocity	4-24 m/s	± 2 m/s or 10 % whichever is greater	Wind Scatterometer & Radar Altimeter
- Direction	0-360 deg	± 20 deg	Wind Scatterometer
Wave Field - Significant Wave Height	1-20 m	± 0.5 m or 10 % whichever is greater	Radar Altimeter
- Wave Direction	0-360 deg	± 15 deg	SAR Wave Mode
- Wavelength	50-1000 m	20 %	SAR Wave Mode
Earth Surface Imaging - Oceans - Coastal Zones Sea-ice - Land	80 km (minimum swathwidth)	Geometric/Radiometric Resolutions at 30 m 2.5 dB at 100 m/1 dB	SAR imaging Mode
Altitude - Over ocean Polar Ice-Sheets	745-825 km	2 m absolute ± 10 cm relative	Radar Altimeter
Altitude Range		± 10 cm	PRARE
Sea Surface Temperature	500 km swath	± 0.5 °K	ATSR (IR)
Water Vapour	in 25 km spot	10 %	μW Sounder

IRS-1B Launched

IRS-1B the 'follow on satellite' of the IRS series was launched by Vostok Rocket from the Soviet Cosmodrome at Baikonur on 29th August, 1991 at 12:18:44 hours. In sharp contrast to the severe cold weather during the launch of its predecessor IRS 1A the weather during 1B launch was in its pleasant twenties.

Like its predecessor the journey of the satellite to its abode in space went off with clock-work precision. The following table shows the details of the critical events.

IRS-1B LAUNCH HIGHLIGHTS

Critical Events	Date	Orbit No.	Time (IST) HR-MIN-SEC
Vostok Life-off	Aug 29,91		12-18-44
First stage separation	Aug 29,91		12-20-44
IInd stage separation	Aug 29,91		12-25-54
Nose cone jettisoning	Aug 29,91		12-28-49
IRS-1B injection and separation	Aug 29,91		12-30-15
Deployment of solar panel	Aug 29,91	1	12-32-15
Sun acquisition	Aug 29,91	1	--
Earth acquisition	Aug 29,91	4	--
3-Axis stabilisation	Aug 29,91	4	--
S-band data link test	Aug 29,91	6	22-01-30
LISS-1 operated in normal mode	Aug 30,91	14	10-43-55
X-band data link test	Sep 6, 91	112	10-40-35
LISS-II A&B operated in normal mode	Sep 6, 91	113	12-15-14
LISS-1 & II A&B simultaneously operated in normal mode	Sep 7, 91	126	10-35-45
Completion of orbit manoeuvres for attaining IRS referencing scheme	Sep 27,91	--	--

After the soviet launcher completed its designated taks of putting the satellite into a near circular orbit (see table 2), the functions of IRS-1B satellite started. With the smooth deployment of solar panels the energy source for all the satellite function was guaranteed. Satisfactory functioning of all the major systems of the satellite, ensured sun-acquisition, earth acquisition and 3-axis stabilisation of the satellite. In the night the S-band link tests, a pre-requisite for LISS-1 operations, were successfully carried out. On 30th August the first image from the IRS-1B satellite was received at about 10-44-30 hours. Same day the data received was converted into photographs.

Table 2 : Orbit Parameters - IRS-1B

	At Injection	After Orbit Manoeuvres
Semi-Major Axis	7263 Kms	7282.38 Kms
Perigee	851 Kms	891.50 Kms
Apogee	918.27 Kms	916.90 Kms
Inclination	99.24°	99.14°
Time Period	6167 Sec	6191.69 Sec
Eccentricity	0.0046	0.00175

The LIS-IIcameras were switched on for the first time on 6th September and on 7th September both LISS-1 and LISS-II cameras were simultaneously operated. With this all the sub systems of the satellite had been successfully checked out. The fine tuning of the orbit to achieve the designated path row referencing scheme was then initiated.

The orbit manoevers were completed by 27th September. The IRS 1B satellite is now performing its picture taking tasks regularly such that it is 11 days behind the IRS-1A satellite with respect to path calender. Thus the repetitivity has now come down from 22 days to 11 days. The initial phase performance evaluation exercises are in progress and the data from both IRS 1A and 1B is now available for users.

(Contributed by Shri A S Kiran Kumar, Head, Sensor Systems Division, EOSDG/RSA, Space Applications Centre, Ahmedabad)

Launch Day Forecast for IRS-1C and 1D

IRS series of satellites seem to be tuned to the family of Dr. R R Navalgund (Head, Land Resources Division, RSAG-SAC). How else can one explain the sheer incidence of launch dates of IRS-1A (March 17) and IRS-1B (August 29, 1991) coinciding with birth days of Dr. R R Navalgund and Dr. (Mrs.) Veena Navalgund respectively. And if past is any indicator to the future, IRS-1C and 1D should maintain the launch dates of April 2 and March 3, the birth dates for Navalgund's daughter and son respectively. You might aptly guess that back home, instead of usual 'Happy Birthday to You' Navalgunds might be celebrating those dates with blasting chorus of 10-9-8-7.....

REMOTE SENSING IN MILITARY SURVEILLANCE

Aerial photography has been used for surveillance and mapping purposes since the early part of the century. Remote sensing techniques have mainly been used for non-military applications such as geology, agriculture, forestry, hydrology, etc. since world war II, which are of importance to mankind. Nevertheless, their use in military surveillance continues unabated and is being exploited to the full. Today, when superpowers are strengthening their military resources and planning defense strategies it is anybody's guess as to how they are getting the stock of the military resources of the other country. In the recent gulf war, the United States made an extensive use of reconnaisance satellite imagery over Iraq and Kuwait to plan attack missions and assess bomb damage. Tracking of mobile scud launchers at night was done using infrared and radar data. This brings to light the vulnerability of today's armies to the remote sensing technology. Today, space-based military assets prove a decisive factor in any war.

The Soviet Union has till date launched 2000 Cosmos satellites majority of them for military purposes and approximately half of these have been surveillance satellites. Soviet imaging reconnaisance satellites employ capsules which are recovered intact with film at the end of the missions which are of short durations. The United States developed photographic reconnaisance satellites within the 'Discoverer' program. Close-look and area surveillance satellites also appeared in early seventies. Big Bird satellites provided close-look imagery with a resolution of atleast 300 mm from heights around 160 km. KH-11 satellites have 150 mm resolution from a height of 250 km.

Commercial Satellites

Commercial imaging satellites have only limited usefulness, in news or tactical intelligence gathering because of two limitations- timeliness and resolution. The most critical factor for successful military operations is rapid data return. Data delayed by days or even hours can be useless for tactical operations. However, commercial satellites with modest resolution sensors have been used for several specific applications like monitoring nuclear proliferation, assessing nuclear missile sites and monitoring underground nuclear tests. They have also been used for crisis decision-making, multilateral peace-keeping and treaty verification, and cross-border conflicts. Data from these satellites is useful in strategic studies of neighbouring countries by countries which cannot afford to launch their own surveillance satellites. Even with its own powerful array of spy satellites, the U.S. government has found commercial imaging satellites useful. The DOD used commercial satellite photographs from the French SPOT satellite to illustrate Soviet military developments in 1988. However, data from these satellites are insufficient for determining the functional or structural details of a target critical to effective military analysis. Most important, this level of detail is insufficient for interpreting the operational status of the object and hence its impact on military operations.

Reconnaisance Satellites

There are technological differences in altitude, orbit, inclination, resolving power etc. between reconnaisance and non-military satellite. The most important difference is in the resolving power which in observation satellites is only 1/200 to 1/1000 of that of military monitoring satellites. The perigee of military satellite is said to be about 150 km and resolving power upto a few cms. On the other hand non - military satellites orbit at an altitude of about 250- 900 km and have resolving power ranging from 10 m to a few kms. It is suggested that a minimum ground resolution of twenty feet is required for arms control inspection. A ground resolution of two feet is generally needed for studying man-made features of military interest. There are four main types of reconnaissance satellites, photo-reconnaissance, electronic reconnaissance, ocean reconnaissance and early-warning satellite. The first type carry photographic and television cameras, multi-spectral scanners, infra-red sensors and microwave radars. These provide information about hardware. Electronic reconnaissance satellites are also called electronic intelligence (ELINT) satellites or ferret satellites. They carry equipment designed to monitor and detect radio signals by the opponents' military activities. Ocean surveillance satellites are used not only to track naval ships but also to determine sea conditions. A better understanding of the characteristics of oceans enables the design of better sensors for submarine detection. Space-based sensors include radar that can see through clouds and infra-red detectors. Early warning satellites give warning of a surprise attack by ballistic missiles. The warnaing time is around 30 minutes. Such satellites using IR sensors can observe the launches of intercontinental ballistic missiles (ICBM) and transmit the information to ground station.

Visible and Infrared Sensors

Photo-reconnaissance sensors can perform well only during daylight and clear weather. 'Close-look' photography can make possible the detection and identification of most military targets on the ground. 'Area surveillance' cameras are employed under circumstances in which relatively low resolution when accompanied by a broad view gives more interpretable image than a high resolution photo of a limited area.

The resolution required for detection, recognition identification and description of various targets varies. Area-surveillance imagery in resolution range between 1-3 metres may be infrared as capable of providing precise or near-precise identification of most military targets, while close-look image in resolution range between 0.1- 0.5 metres would

enable one to get target description and analysis. Digital data from multispectral sensors allow for production of false colour composites which make the camouflaged objects more readily detectable. For example the human eye cannot readily percieve by looking at conventional colour photos the difference between ordinary green paint and a background formed by deciduous leaves, whereas false color infrared film renders the foliage bright red and the paint blue. It is also possible to differentiate the dead grass from green grass using their spectral signatures and thus detect the camouflaged objects from the surroundings.

Unlike visible sensors, thermal infrared sensors provide round-the-clock coverage. Infrared systems can view thermal signatures of targets. Because vehicle engines heat up targets, they show up in bright contrast to the background which is normally cooler. They detect the thermal emissions from the rocket plumes during the boost phase and provide an element of early warning to command centres. Infrared sensing techniques have the ability to sense movement of even relatively small heat sources, such as small groups of moving men.

ELINT

Not all surveillance is at visible or near-infrared wavelengths. Active probing of targets by radars carried onboard satellites in the side-looking or synthetic aperture modes can yield imagery of sufficient resolution for military purposes. Passive monitoring of electro-magnetic emanations from earth-based radars can provide information invaluable for the design of counter measures of electronic warfare. The interception of radio signals of coded messages and data is a standard electronic intelligence (ELINT) gathering technique. Elint satellites also known as ferrets act as 'ears' in space. They have many applications such as locating radio transmitters, eavesdropping on communications and monitoring the telemetry from missile tests. These satellites gather data on missile testing, new radars and many other types of communication traffic. Not only can they locate systems producing electronic signals but also measure the characteristics of the signals so as to be able to plan penetration of defences.

Arms Control Verification

There are many who consider that the 'open skies' policy initiated over ten years ago which ensures that agreements can be easily monitored by the use of space systems is a major contributor to continuing world peace on a global scale. Today remote sensing technique has been identified as a tool which allows identification and monitoring of military activities and developments in great details. It is because of space-borne surveillance that treaties like SALT have been made possible.

Radars, IR sensors and photographic sensors are used for the arms control verification process. These verification methods are efficient because the introduction of new missile systems has to go through research, development, testing, production and deployment phases. It is very improbable that the system could go through several or all of these phases without detection. Verification of chemical weapons can be done by monitoring from satellites the actual situation and state of objects (e.g location and territorial structure of facilities stockpile areas etc, and the operational status of production units) and relevant chemical substances in the atmosphere. Stockpile installations can in principle be identified by improved photographic techniques and high ground resolution.

Future Scenario

Despite the impressive record of performances of satellites in surveillance, there have been certain technical limitations. In the foreseeable future, non- scanning or staring sensors will remove many of the technical constraints that limit performance and reliability. The next generation of satellites will probably incorporate several new technologies- notably, mosaic sensors and advanced cryogenic coolers besides charge couple devices- which together promise an improvement of several orders of magnitude in resolution and signal-to noise ratio. CCD technology will enable the signal processing to be performed onboard the satellite and hence scale down the ground-based operation. The staring mosaic sensors will provide continuous coverage of potential launch points, providing additional warning time. To achieve maximum sensitivity of staring mosaic sensors the sensing element will require a powered cryogenic cooling system. To achieve the high resolution needed to detect and trace 'dim' objects from geosynchronous orbits, deployment of very large optical structures that incorporate adaptive optics and other technologies is envisaged.

Though it has been claimed that space reconnaisance has promoted disarmament/arms control, the military use of photo-reconnaisance has an intent which is rather aggresive. Whether the superpowers and increasingly the developing countries will use these techniques for wartime activities or for promoting international peace remains to be seen.

(Contributed by Mrs. Tara Sharma, LRD/RSAG/SAC, Ahmedabad).

Do you agree with Some New Definitions

If it moves, it is Biology

If it reacts, it is Chemistry

If it doesn't move, doesn't react and still works, it is Geology

If it doesn't work, call Physics

(Fun time definitions from anti-physics lobby of LRD/MWRD, Correction by pro-physics Editor)

INDIAN SOCIETY OF REMOTE SENSING - AHMEDABAD CHAPTER

Annual Report (April 1, 1990 to March 31, 1991)

As on March 31, 1991, the chapter has 1 honorary member, 100 life members, 40 orginary members, 7 sustaining members, 3 patron members and 35 members from outside chapter.

The council met three times to transact the business of the chapter.

Lectures, Exhibition etc.

- The Chapter has been organising an annual "Shri Laxminarayan Calla Memorial Lecture". The fourth in the series was delivered by Prof. G L Deekshatulu, Director, National Remote Sensing Agency, Hyderabad on "Remote Sensing for National Development" on January 11, 1991.

- Indian Remote Sensing Satellite (IRS-1A) completed three years of successful operations in the orbit on March 17, 1991. To mark the occasion the chapter organised following functions.

Interview on Doordarshan

Shri Pramod Kale, Director, Space Applications Centre and Dr. George Joseph, Chairman ISRS Ahmedabad Chapter were interviewed. The programme was telecast on March 14, 1991.

Exhibition

A two day exhibition was organised at the Bhaikaka Bhavan, Ahmedabad during March 17-18, 1991. The exhibition was inaugurated by Shri D P H Calla, President, IEIE. A souvenir was released on this occasion. The exhibits were open to public on both days from 1000 hours to 1930 hours. There were exhibits on science of remote sensing, satellite images of different parts of the country and its applications in various disciplines. Various models of satellite and launch vehicle were displayed. Video films were also screened. Large number of people, particularly students visited the exhibition. An image of Ahmedabad taken by IRS, a souvenir and a paper model of IRS were distributed to visitors.

Popular Lecture

- A popular lecture on the "Role of Remote Sensing in National Development was organised at the Bhaikaka Bhavan on March 17, 1991. Prof. P R Pisharoty, Professor Emeritus, PRL, delivered the lecture. Shri Pramod Kale presided over the function.

- A lecture on "Remote Sensing in Geomorphology" was delivered by Dr. S R Nayak, Scientist, SAC in the Department of Geography, Gujarat University.

R&D Activity

As per decision taken in the last AGM, an R&D activity has been taken up with a non-government organisation to demonstrate the role of remote sensing in wasteland developments. This activity is in progress in the Dholka Taluka of Ahmedabad district.

Publications

Three issues of the newsletter has been brought out this year and the fourth one is ready for printing. A souvenir containing article in Gujarati, Hindi and English was brought out on the occasion of IRS-1A celebration. A colour image of Ahmedabad city along with map was published.

ISRS Award

The Indian Society of Remote Sensing (ISRS) has instituted 'The Indian National Remote Sensing Award' to be given to the individuals for outstanding contribution in the field of remote sensing. The award consisting of Rs. 5,000/- (rupees five thousand only) in cash, citation and a medal is proposed to be given every year during the annual convention of the Society.

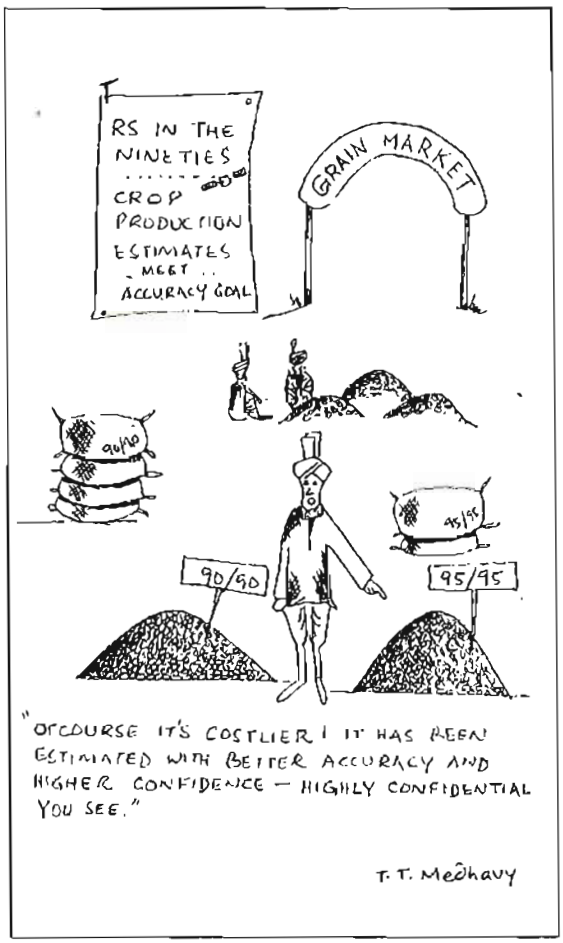
The areas considered for award are RS Platforms and Payloads, RS Data Reception, Processing, Dissemination and Interpretation, RS Applications including software and hardware development and system engineering and management in the field of RS.

Any citizen of India below 45 years of age as on December 31 of the year of award is eligible. The award is normally given for work primarily done in India and having relevance to India in particular and developing nations in general.

Nomination for the award can be forwarded by Presidents of scientific societies, Vice Chancellors/Dean of Universities including IITs, Directors of R&D organisations, State/Central Agencies, Cooperative and Private R&D organisations, Chairman of Space Commission, UGC, ONGC, members of Planning Commission and Secretaries of science/technology and related departments of state/centre.

Nominations in prescribed format should be sent before October 31 of the year to The President, ISRS, IIRS Campus, 4 Kalidas Road, Dehra Dun 248 001. The awardees will be selected by ISRS Executive Council and the award will be presented during annual convention of the Society.

Nominations have been invited for 1991. Details may be obtained from Society/Chapter, Headquarters.



BOOK POST

If undelivered, return to:

T.P.Singh
Secretary,ISRS-AC
C/O. Remote Sensing Area
Space Applications Centre
Ahmedabad 380 053

Edited by : R.P.Dubey, Mukund Rao, J.K.Garg, Yogini Vanikar, Space Applications Centre, Ahmedabad.

D.M.Pancholi,Central Designs Organisations, Gandhinagar.

Printed at : Library, Space Applications Centre, Ahmedabad

Indian Society Of Remote Sensing
Ahmedabad Chapter

NEWSLETTER

Vol 5, No. 4 and Vol.6 No. 1,2 and 3 01 Jul, 1992

Dear Members,

As a new committee takes over the editorial responsibility of your newsletter, it is time for the outgoing committee to say good bye. On behalf of the committee and on my own behalf, I would like to acknowledge the cooperation and encouragement received from you all. We also wish the new team all the success and sincerely hope that Newsletter will prosper in future.

- Ex Editor

On behalf of the new editorial committee and on my own behalf, I express our sincere thanks to the new executive council for their faith in assigning us the editorial responsibility. We take-up this responsibility knowing very well that we shall continue to get the encouragement and cooperation of our member colleagues. On our part, we shall try our best to continue the excellent work ,done so far, by our predecessors. As it should always be the case, we would try to make further improvements in the quality of the Newsletter both in terms of the get-up and contents. To start with, we have attempted to introduce the articles in languages other than english, a new column on notes about the members and certain changes in the text format. Your feedback on this aspect would be of immense help.

Much of the ground work for bringing out this issue had already been done by the outgoing committee. We sincerely acknowledge them for their efforts.

- Editor

Executive Council 1992-94

Chairman: Shri R C Garg

Vice-chairman : Shri C K Joshi

Secretary : Dr M V Muley

Joint Secretary : Ms Anjana Vyas

Treasurer : Shri T T Medhavy

Members

Dr J P Aggarwal, Prof A B Vora

Shri P S Thakkar, Shri A K Shukla

Shri A S Rajawat, Shri B P Pathole

Shri K M Saini, Shri R N Shukla

Shri Arun Kumar

Editor(Newsletter) : Shri R K Goel

In This Issue

Research Notes..... 2,3

Remote Sensing in Agriculture

Microwave RS

Macro level Information System

Glacier Atlas Of Indian Himalayas

Technology Trends..... 4

Newspix..... 5

Report on Chapter activities.. 6,7,8

About the Members..... 9

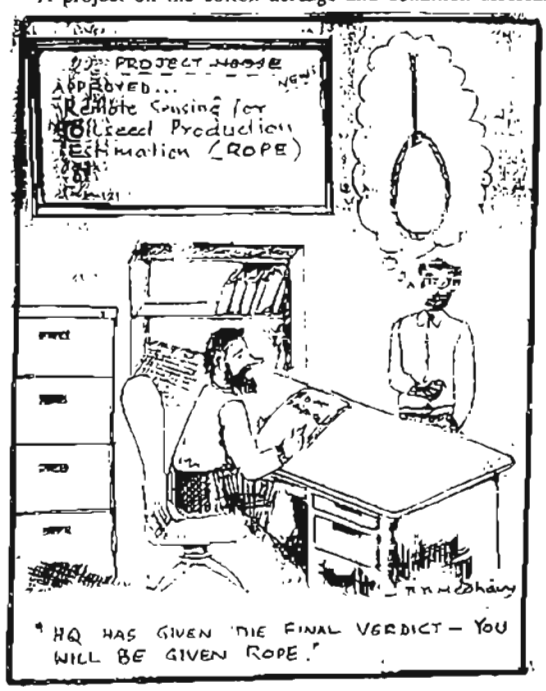
RESEARCH NOTES

Remote Sensing in Agriculture

Crop estimation using remotely sensed data has been operationally demonstrated in Crop Acreage and Production Estimation (CAPE) project of Remote Sensing Application Mission (RSAM). The project aimed at estimation of acreage and production for wheat, rice, groundnut, sorghum and mustard/rapeseed in different districts spread over nine states in the country. It provided pre-harvest acreage estimates meeting 90/90 criterion for wheat in northern plains region and for rice in Orissa. Moreover, production estimation using remotely sensed data was demonstrated for Punjab, Haryana and parts of Orissa. Attempts are underway for defining a successor to this project.

(For details contact Shri J S Parihar, LRD/RSAG/RSA/SAC)

A project on the cotton acreage and condition assessment in



selected districts of six states is in progress at SAC.

(For details contact Dr. Ajai, LRD/RSAG/RSA-SAC)

Microwave RS

Microwave Remote Sensing Techniques have been used for soil moisture assessment and crop identification. Ground based scatterometer experiments were carried out for the development of soil moisture model and paddy crop growth monitoring. It was observed that C-band sensor in near nadir incidence angle is optimum for soil moisture monitoring. For the paddy crop monitoring, higher incidence angle (40°) was found to be optimum. Further, a combination of linearly polarized data with cross- polarized data provided better information concerning to crop growth variables. X-band Airborne Synthetic Aperture Radar over parts of West Godavari districts were used for the assessment of crop identification capabilities of X-band data. The classification accuracies were improved by a margin of 10-15% when SAR data was analysed in combination with visible sensor data. In addition to this, other sensor data like ISRO-SLAR at X- band, SIR-B SAR data at L-band were also used for cotton, castor discrimination and identification of tea plantation. Plans have been made for the utilization of ERS-1, JERS-1 and SIR-C data for agricultural applications.

(For details contact Dr. Shiv Mohan, LRD/RSAG/RSA/SAC)

Macro level urban information system

A pilot project was carried out for realization of this system using a Geographical Information System (GIS) approach for Bombay Metropolitan Region (BMR). The project, executed jointly by SAC and BMRDA, was reviewed at Bombay on mar 24, 1992 by a committee comprising of the experts from Remote Sensing, Urban Planning and GIS. Among the participants were Shri P Subrahmanyan, Bombay Metropolitan Commissioner, Shri Pramod Kale, Director SAC and Dr. George Joseph, Associate Director, SAC.

The project was aimed at a) design/ organization of a spatial information system for BMR at 1:250,000 scale and b) demonstrating the concept of integrated analysis of spatial and non-special data, specifically oriented towards generating alternative scenarios for urban planning. Accordingly the analysis was carried out for suitability assessment (multiparameteric) for urban development, environmental sensitivity zones on the basis of air pollution data, landuse change, routing for the proposed new airport and growth profile of BMR for 2001.

The total work for the project was presented by the joint team of Scientists/ Engineers from SAC and BMRDA. A demonstration was also given to the review committee members with the created data base on the PC - ARC/INFO system at BMRDA.

The review committee observed that the approach developed and quality of work carried out was a demonstration of technological capabilities of integrating spatial and non- spatial data and GIS tool. They suggested that

* GIS database should be organized at large scales - 1:50,000 and 1:25,000.
* Land suitability analysis method should be refined by taking into account the economic factors.
* Environmental sensitivity analysis should be enhanced by incorporating the water quality parameters.
* Road network analysis should be expanded for minor roads.
* An attempt should be made to prepare a disaster management plan for a given area.

(For details contact Dr. K L Majumder, Head IPPD/IPDPG/RSA/SAC)

Members contributions

Majority of the contributions to the past issues of the newsletter has been from the members themselves. We greatly rely on continued inflow of the material in form of articles, event notes, review notes and institutional notes etc. Please send your contribution to the editor via secretary, ISRS-AC.

Glacier Atlas of Indian Himalayas

Space Applications Centre has prepared a galcier atlas of Indian Himalayas. In the atlas, glacier maps are given showing various features such as glacier boundary, ice divide snow line, ablation area, accumulation area and glacier-dammed lakes. At the end of atlas, basin-wise distribution of glacier areal extent and geomorphological type is given.

Chhote Sigri Glacier, Himachal Pradesh

The mapping were conducted on 1:250,000 scale and total 39 maps were prepared. False colour composite prepared by using Landsat and IRS satellite data were used. The study has shown total of 1702 glaciers covering an area of 23315 sq. km in the Indian Himalayas. In this study glacier identification system as suggested by UNESCO/ITS has been adopted. It is expected that this can provide compatibility with previous information and can help in monitoring various glaciers.

In this atlas basin-wise distribution of the glacial areal extent is also given. The areal extent were measured using electronic planimeter. This atlas provides valuable information regarding Himalayan glaciers which can be used for site selection of micro- mini hydroelectric power stations and understanding hazards from glacier-dammed lakes in states such as Sikkim. It is expected that this atlas can provide valuable inputs for drawing up management plans for Himalayan water resources.

(For details contact Shri Anil V Kulkarni, MWRD/RSAG/RSA/SAC)

હવામાન - ઉપગ્રહ

આપણાં ઇવનમાં હવામાન ઘણો જ અગત્યનો ભાગ ભજવે છે. આપણી ઘણી પ્રવૃત્તિઓ ઉપર હવામાનના ફેરફારની મોટી અસર રહે થતી હોય છે. આ દૃષ્ટિએ હવામાનના વાસ્તવિક વરતારાની આવશ્યકતા ઘણો અગત્યનો છે. ખાસ કરીને કૃષિ-પ્રધાન દેશ માટે હવામાનનો વિશ્વસનીય આગાહી મોટો આશીર્વાદ સમાન ગણી શકાય. દર વર્ષે પૂર, અતિવૃષ્ટિ કે અનાવૃષ્ટિ વગેરે વાવાઝોડાથી થતાં ફરોડો રૂપિયાના નુકસાનમાં હવામાન અંગેની સચોટ આગાહી દ્વારા ઘણો બચાવ થઈ શકે. હવામાન ઉપગ્રહ દ્વારા આ પરિસ્થિતિમાં નોંધપાત્ર સુધારો થયો છે, જેમ કે વાદળ ઢંકાયેલા ગાળામાં પણ હવામાનના ફેરફારો અંગે વિશ્વસનીય આગાહી કરવી હવે મુશ્કેલ નથી.

હવામાન ઉપગ્રહ કઈ રીતે ખાસ ઉપયોગી બને છે એ સમજવા માટે એ નોંધવું જરૂરી છે કે હવામાનની આગાહી કરવા માટે સમગ્ર પૃથ્વી ઉપરના હવામાનની વિગતવાર જાણકારી અત્યંત આવશ્યક છે. પરંપરાગત પદ્ધતિ, એટલે કે ભૂમિ - સ્થિત હવામાન મથકોમાં લેવાતાં અવલોકનો પૃથ્વી પરના માત્ર કેટલાક પ્રદેશો પૂરતા જ મર્યાદિત રહે છે. જ્યારે ૭૦ ટકાથી પણ વધારે ક્ષેત્રફળ ધરાવતો સમુદ્ર વિસ્તાર તથા રણ, વન અને જેમાં ઝાડ-પાન પણ નથી એવા દુર્ગમ અને માનવ વસ્તી-વિહોણા પ્રદેશો પરના હવામાન અંગે કોઈ જ માહિતી મળતી નથી. આ દૃષ્ટિએ હવામાન ઉપગ્રહ ખૂબ જ ઉપયોગી બને છે. પૃથ્વીની સપાટીની ૧૦૦ થી ૯૦૦ કિ.મી. ની ઊંચાઈએથી ફરતો હવામાન ઉપગ્રહ પૃથ્વીના દરેક પ્રદેશ પરનો ડેટા વારંવાર મોકલે છે અને આ રીતે પૃથ્વી પરના સમગ્ર હવામાન અંગે દિવસમાં એક કે બે વખત વિશ્વસનીય માહિતી પૂરી પાડે છે.

હવામાનમાં થતાં ઝડપી ફેરફારો અત્યંત ઝડપી અને અવિશ્વસનીય હોય છે, દાખલા તરીકે વાવાઝોડાને સમજવા વાવાઝોડા. આ પ્રકારના હવામાનના ફેરફારો વિષે માહિતી મેળવવા માટે પૃથ્વીની સપાટીની ઊંચાઈએથી ફરતો ઉપગ્રહ ખરેખર જ અપેક્ષિત રહેવે ઉપયોગી બને છે, પરંતુ ૩૬,૦૦૦ કિ.મી. ની ઊંચાઈએ ભૂ-સમકાલિક "ગિયર" ઊંચાઈએ મૂકેલો હવામાન ઉપગ્રહ આ માટે અત્યંત ઉપયોગી બને છે અને જે દ્વારા વાવાઝોડામાં માર્ગ કરે દર કલાકના ગાળામાં ઉપલબ્ધ થતી માહિતી મળે છે, જેનો ઉપયોગ કરીને વાવાઝોડાથી થતાં નુકસાનમાં ઘણો ઘટાડો શક્ય બને છે અને જાનમાલનો બચાવ મોટા પાયે શક્ય બને છે. આવો જ ઉદ્દેશ "ઇનસેટ" ઉપગ્રહ ધરાવે છે.

આવા હવામાન ઉપગ્રહો ઉપરાંત બીજા કેટલાક દૂર-સંવેદન ઉપગ્રહો જ હોય છે - આ અંગે ટૂંકો માહિતીલેખ અને ચિત્રોના રૂપમાં રજૂ કરવાનો વિચાર છે.

ડૉ. પરમાર પાઠક.

TECHNOLOGY TRENDS

INDIA

Airborne Synthetic Aperture Radar(ASAR)

SAC has developed a C-band airborne synthetic aperture radar(ASAR) for remote sensing applications. The bread-board model has been successfully flight tested on May 20, 1992. The system is installed on-board the Beechcraft Superking 300 aircraft belonging to the National Remote Sensing Agency(NRSA).

ASAR, a state of the art airborne imaging radar system, is capable of mapping 20 Km wide strip of the terrain across the flight path with a resolution of around 6 meters from an altitude of 8 Kms. The radar can function both during day as well as night. Also, it can map even areas under cloud cover.

The flights were conducted over Ahmedabad city and and Rann of Kutchch. The quality of the data is extremely satisfactory considering the fact that there was no on-board antenna stabilisation and motion compensation unit to correct the aircraft attitude and motion related errors. One can clearly identify roads and railway lines, runway and airport complex, built up areas, agricultural fields etc. Even individual fields with and without the crops could be identified.

Based on the engineering feedback derived from this data, the flight model will be developed and the ASAR will be made available to the users on operational basis. The flight model will have on-board motion compensation and antenna stabilisation unit and real time processor and quick look display unit.

The ASAR system is expected to be gainfully used for remote sensing applications related to Agriculture, water resources, mineral prospecting, coastal zone monitoring, oceanography etc.

(For details contact Group Director/MSDG/RSA-SAC)

FOREIGN

ERS-2 and GOME

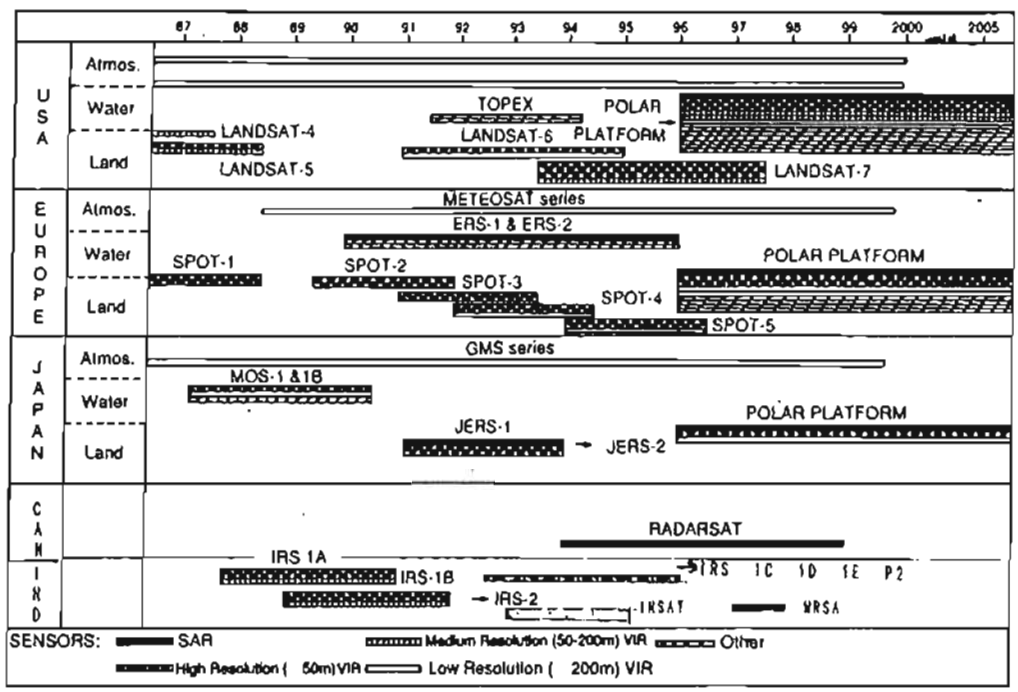
European Remote Sensing Satellite-2 (ERS-2) is the follow-on satellite system of ERS-1. Planned for 1994 launch, ERS-2 will provide data continuity to ERS-1 and address to the variety of environmental problems related to inputs for climate models, ocean circulation and energy transfer, mass balance of polar ice sheets, and monitoring of coastal processes pollution and land use changes. ERS-2 is likely to carry Along Track Scanning Radiometer (ATSR) enhanced with two visible channels, PRARE, AMI, and a new instrument called Global Ozone Monitoring Experiment (GOME) for measuring a range of trace constituents in the troposphere and stratosphere.

GOME is nadir - viewing spectrometer which in its normal viewing mode scans across track in three steps and can provide global coverage every three- days. GOME will measure the column depth of atmospheric constituents like ozone, nitrogenoxide, water vapour, oxygen, etc. plus aerosols and polar stratospheric clouds. Vertical profile of only ozone will be measured using both backscatter and differential absorption approach. This will be possible because of 0.2 nm resolution with 240-760 nm range of operating spectrum. GOME is likely to improve on the existing backscatter based methods of trace molecule monitoring because of its robust calibration system comprising sun and moon viewing plus viewing of an internal source. Moreover, differential absorption does not depend on absolute calibration but only on wavelength which is relatively easy. GOME will provide a mean for comparing the two methods of trace element measurements.

It will also give valuable lead to the proposed polar-platform based instrument SCIAMACHY (Scanning Imaging Spectrometer for Atmospheric Cartography).

(Source : ESA Earth Observation Quarterly)

Present & Future Remote Sensing Satellite Systems



(After P P Nageswara Rao et al 1991)

NEWSPIX

ASLV Launch

ASLV was launched successfully from SHAR on 20th may 1992. The event demonstrates the committment, dedication and determination of Indian scientists. ISRS-AC family compliments the efforts of ISRO scientists on this great achievement and congratulates all those who contributed for success of this mission.

INSAT-2A planned for launch on July 10,1992

As this issue was getting ready for release the first of the INSAT-2 series of spacecraft was undergoing pre-launch operations at CSG, Kourou, French Guyana. The electrical testing of the spacecraft at S1 position was completed by end May. It is scheduled for launch on Arian 44L flight V51 after completion of further operations like fueling. In addition to the payload for communications, this multipurpose spacecraft has Very High Resolution Radiometer (VHRR) operating in visible and thermal IR bands and Data Relay Transponder for meteorological applications.

STOP PRESS !!

INSAT-II has been launched on July 10, 1992 at 4:12 Hrs (IST). We hope to bring a report on this event in the next issue.

U.S. Embargo

U.S. state department announced two-year ban on all U.S. licensed exports to and imports from ISRO and the Russian trader Glavkosmos. The ban was levied to punish the two organisations for the transfer of Rocket technology controlled by the Missile Technology Control Regime.

(Source : Space Business News)

Hyperplane to replace SLV by 2000 AD

The flight version of India's futuristic hyperplane, which will replace the expensive rocket based launch vehicle , will be ready by 2000 AD. This was stated by Dr. A.P.J. Abdul Kalam in the 79th session of the Indian Science Congress.

(Source: Times of India, Jan 5,1992)

AIDS Research In Space

Astronauts orbitting in the U.S. shuttle Columbia, conducted research into one of the deadliest problems on earth - the AIDS virus. Payload specialist Larry De Lucas, his hands covered with gloves, inside a transparent, seled container, worked with an aids virus enzymethat is among a crop of protein crystals being cultivated on the record 13 day flight. Crystals grow larger and with fewer imperfections in the weightlessness of space, making them easier to analyse.

No private sector RS : US

US congressional budget office estimates that fully private RS systems are not feasible by end of current decade. EOSAT, the private firm operating Landsat system, is not expected to earn the revenue required to sustain the annual cost of approximately US$100 m for two Landsat type of satellites during 1990s and which are likely to cost US$1b. SPOT is likely to be better placed but still its choices are dim. So government money will continue to be invested for RS programs. CBO was however positive about the funding because sale of RS data/services are on rise. It concludes that full commercialisation is difficult but not impossible.

(Source : Space Exploration Technology)

Space Exploration Initiative (SEI)

NASA proposes SEI with a series of low cost, robotic missions to the Moon. These robotic precursor missions and lunar outposts form a part of the program called 'Mission from Planet Earth' with a long term goal of human exploration of Mars, and associated technology developments in the areas of space transportation and space life sciences. A strategy to carry out the mission has been defined and a National Launch System (NLS) is proposed to be developed for a range of payload requirements.

(Source:Space Exploration Technology)

REPORT ON CHAPTER ACTIVITIES

Since the last issue was delivered to you, much water has flown under the ISRS-AC bridge. We bring a report on few of the activities.

Laxminarayan Calla Memorial Lecture

The fifth lecture in the series was delivered by Dr. K Kasturirangan, Director ISAC, Bangalore on "Bio-Astronomy - A Test for Anthropomorphic Principle" at the Vikram Hall, Ahmedabad, on January 9, 1992.

Exhibition and workshop

The Exhibition and Workshop, co-sponsored by Space Applications Centre and Sardar Sarovar Narmada Nigam Ltd., Gandhinagar, were organized at Gujarat Agricultural University (GAU) during Feb 14- 15,92. Two day exhibition , organized at Anand Campus, was inaugurated by Dr. V M Jhala, Vice-Chancellor, Gujarat Agricultural University. The exhibition was open to public on both days. There were exhibits on science of remote sensing, various models of satellites, satellite images of different parts of the country and its applications in various disciplines. Video films on the subject were also screened. Large number of people, particularly students visited the exhibition. The Workshop, on application of Remote Sensing in Agricultural Research, Inventory and Management, was held at at the BA College of Agriculture, GAU, Anand on Feb 14, 1992 and was inaugurated by Shri T L. Patel, Director of Campus, GAU, Anand . There were about 100 registered participants from different institutions from all over Gujarat.

Science Quiz

This new activity involving two rounds (written and oral) was started this year for the under-graduate students of science stream. The Principal of each science college was requested to nominate five students for the quiz. Written test was conducted on January 27, 1992 out of which six top students were selected for the oral round. Oral round was conducted on February 23, 1992 at the Auditorium. Ahmedabad Doordarshan telecasted this on the National Science Day i.e. Feb 28, 1992.

National Science Day Celebration

The Chapter celebrated the day jointly with SAC, Ahmedabad, on February 28, 1992. Shri Pramod Kale, Director SAC, delivered a lecture on "Colours in Nature". Prof. P D Bhavsar, Former Director, SAC presided over the function and presented the prizes to the winners of 'Science Quiz'.

Visitor's response to ISRS Exhibition at Anand

From Students

Very informative. Has given us knowledge about RS and methodology employed in applications of RS technology - Arvind Kumar Rajpurohit, M.Sc. (Agri).

Was very pleased to see Anand's Photograph taken by IRS-1A Philip Abrahim and Shishir Rangan, B.Tech (Dairy Tech).

Liked the exhibition and the imagery of Gujarat in particular. The organizers explained things in detail - Neha Prajapati.

Liked the model of the satellite. Adequate explanation was given by the demonstrators - Shashi.

Should have been given wide publicity so that more people could have visited. - S S Ravi.

Provides detailed insight into the existing world of remote sensing and its applications in agriculture and other fields - Devang M Raval, B. Tech .

Excellent effort but feel that the technology is too expensive as compared to the returns- Kamlesh Bhatt, B. Sc.

Exhibition not exhaustive. Should have been given handouts and posters - Vaysi M, B. Sc.

Came to know so many new things. Effort should continue - Student, M S Patel High School, Std. VIII, IX

Well presented. Basic knowledge explained well. - Mikki Garg, M B Patel Science College

Good representation. Conduct such exhibitions in villages - Gopal Krishnan S.S., Dairy Science College, Anand.

Serves well to explain what are satellites and what is RS technology - Student M.R. Patel Science College.

A very imaginative, laborious and informative piece of work - Smita Pardhi, Student, Anandalaya

Excellent job, nice effort, marvelous - Smita Sinha, Student Anandalaya It was superb! - Dulari Amin, Anandalaya

Could not make out anything. People should stand by and explain the exhibits. More models should be included - Student Anandalaya

Very informative but if you want to improve upon then see our exhibition next year - Student Anandalaya.

Instead of charts, there should be more models - Student

Simply superb. Important achievement for the country - H K Bhatt

I hope that IRS becomes world famous system. Hope that IRS can help in dairy farming also - Student Dairy Science College.

We urge the government to provide all assistance to a department which does such excellent work - Ghadia Atul, B.Sc.

From Dignitaries and Citizens

Delighted to acquaint myself with the multifacet use of RS technology in various walks of human life for the benefit of the society. The more interesting aspect is to inculcate awareness among student community, the future decision makers of the country - Vice Chancellor, GAU.

An excellent job. Would provide much-needed exposure to the students. Avoiding the jargons - Assistant Conservator of Forests GEER, Gandhinagar.

The wide application of RS technology as exhibited in this exhibition will open new vistas for developing countries like India - Dr. G Sandhya, MSU, Baroda.

Gave us idea in the working of satellite and progress made by our scientists - RM Amin, Vallabh Vidyanagar, HOD Polytechnic. Very informative - Uday Trivedi, Lecturer Polytechnic, VV Nagar

Gives overall idea of RS and its application - Manoj Parmar, Lecturer Polytechnic, VV Nagar

Hold this exhibition in villages also - Jagadish Patel, Lecturer Polytechnic, VV Nagar

Exciting and very interesting exhibition. It looks as though India has yet to strive hard to reach the heights achieved by developed nations. This is one example where Government organization is doing such an excellent job. My congratulations to all - Pandya, Retd. Dy District Officer

The tremendous potential of RS technology has come out clearly through the excellent representations - NJ Shroff and others, ISTE Chapter, Civil Engg Department.

An excellent job, would be idealtaken to school - Staff members, Anandalaya, Anand.

Got a lot of information. This technique is of immense use for a fisherman like me - Abdul Miya, Umreth

An excellent educational display. I realized that space science is very useful in development. With you success - R K Patel, Scientist, NDDB

POPULAR LECTURES

Indian Earth Observation System

By Shri A S Kirankumar, Head SSD/EOSDG/RSA-SAC on Oct 11,1991

Earth observations from space platforms began with the launch of satellite for Earth Observation (SEO). Two satellites called Bhaskara I and Bhaskara II were launched in 1979 and 1981 respectively. These satellites carried two-channel (Red/Near IR) TV cameras and passive microwave radiometers (two and three- channels for respective satellites). Both the spin-stabilized satellites were

positioned in low (550 km) earth orbit at an inclination of 59 deg. to the equator. These features and the sensor characteristics were not ideal for remote sensing but the launch of satellites provided valuable experience in design of sensor and satellite systems and the related activities. INSAT VHRR is another satellite sensor designed for meteorological purposes. It is a two-channel (visible/thermal IR) sensor equipped with bi- directional scanning mirror covering, from geosynchronous altitude, area corresponding to +- 52 deg north/south and 32 to 50 deg. east. This historical scenario is completed with mention of another development called smart sensor on Rohini satellite which was actually a CCD-based two-channel sensor. Present Indian capability in earth observations is centred around two orbiting RS satellite - IRS-1A launched in 1988 and IRS-1B launched in 1991. The satellites carry identical 4-channel CCD-based sensors and provide a combined repetivity of 11 days. Design of earth observations system has three main considerations, viz. platforms (low earth, sun-synchronous, polar, geosynchronous, inclined, equatorial),type of observations (imaging or non- imaging type, active and passive sensors) and resolution (temporal, spectral, polarization and radiometric). While low earth orbits provide high resolution and facilitate active measurements, these orbits suffer from lacunae like large perturbations, instability and short life. Sun-synchronous orbits feature full earth coverage and fixed observation geometry and conditions required for quantitative studies. The geo- synchronous orbits facilitate continuous half-globe observation (±50 deg. N/S, ± 100 deg. E/W) but suffer from low resolution unless bulky sensors are used.

Future of Indian Earth Observation Programme centres around IRS- 1C/1D satellites to be launched in 1993. IRS-1C/1D will have three CCD based sensors, viz.

- PAN, single channel (0.5-0.75 um) panchromatic camera
- Multispectral sensors, three channel (vis-NIR- SWIR, 1.55- 1.75 um)

Wide Field Sensor (WiFS), 2-channel (Red/NIR) camera

PAN sensor will be a steerable (along tract) in the range of ± 26 deg. (or ± 390 km) giving stereo imaging with base-to-height ratio of 0.5-1.0. The IRS- 1C/1D orbit (817 km) achieves 5 day repeat coverage by WiFS and 24-days by LISS-III.

Meteorological sensor of future, INSAT-2 VHRR will feature improved resolution in visible/IR (2 and 8 km instead of 25 and 10 km). It will also carry splited IR channel for atmospheric correction and a water vapour channel. A two-band CCD camera with 1 km resolution and 6000 km swath is also envisaged.

Indian earth observation programme has a comparable sophistication to the existing systems in the world. Future systems are likely to further enhance the comparative capabilities. Certain system studies are also being considered in the modern context of EOS which is a means for monitoring all encompassing changes in earth's hydrogeological, geo-chemical and biological cycle in totality.

Environment and Man

By Dr. S K Nigam, Dy Director, National Institute of Occupational Health on World Environment day

Lecture organized by ISRS-AC on June 5,1992 at SAC, was attended by more than 100 participants. The function was chaired by Dr. George Joseph, Associate Director SAC. In his presidential address Dr. George Joseph underlined the urgency of environment protection owing to the rapid increase in the pollution rate so much so that the pollution during the last 30 years is much more than past 200 years. He pointed out that the current focus being on global environment, the local aspects like wasteland also need proper attention. This is an area where remote sensing has been very effective.

Main focus of Dr. Nigam's talk was on the causes and impact of environmental imbalances on human health. Imbalances are caused due to lack of coordination/coherence between man and environment which are direct result of increased population pressure due to alarming rate of population growth. Overpopulation has resulted in urbanization with about 27% of total population living in urban areas. Majority of these people live in most brutal inhuman conditions facing acute shortage of water and sanitation, severe health problems, high levels of air, water and noise pollution. Urban industrial challenges has lead man to careless (almost reckless) practices with regard to processing of raw materials like asbestos, silica dust, hazardous chemicals operations of thermal power stations. The most visible impact can be seen in form of streets/roads congested with automobiles. Alarmity of the situation can be gazed with the fact that number of automobiles which was 1891 during

A Memento of Remembrence to Dr Nigam, Presented by Dr George Joseph

All-in all, the lecture was very informative and a welcome departure from usual RS talks. It is hoped that the Remote Sensing community in Ahmedabad would have received many tips with regard to their professional dispensation as well as their social and personnel obligations towards keeping environment clean and worthy of human living.

Dr. Nigam, three times Hari Om Ashram Awardee, has published 75 papers in the field of toxicology and cancer. He has been awarded a gold medal in 1991 by PGI Alumni for his contributions in the field of medical research. His scientific activities at the moment are the role of immunology in the pathogenesis of many occupational diseases and on aluminium toxicity.

Letters to the editor

Your Newsletter could be a good platform for expressing your views on the developments in Remote Sensing and related fields. It is proposed to include this column in the newsletter on a regular basis. So, please send your views to the Editor via Secretary ISRS-AC.

FUTURE ACTIVITIES/EVENTS ENVISAGED

In its meeting on Apr. 29,92, the executive council Of ISRS-AC decided on an agenda of activities for the year 1992. A gist of the proposed/planned activities is as follows:

* Exhibition cum Workshops are envisaged for which, currently, there are two proposals. One from physics dept., Bhavnagar and another from Sardar Patel University, Vallabh Vidyanagar.
* Science Quiz is proposed by inviting the science students of higher secondary and college (B.Sc.) level.
* Panel Discussion, by inviting the experts fromvarious fields for discussion on the current problems in the context of Ahmedabad.
* Newsletter is expected to be released regularly and on a timely basis. Special annual issue is envisaged.
* Area/Village Development activity is proposed by adopting a model village.
* Recreation - educative/exertion tour cum get-together for the members.
* National Seminar - chapter will propose to host a National seminar during 1993.
* Office Space - attempt will be made for acquiring office space for the chapter.

ABOUT THE MEMBERS

Awards

ISRS-AC family feels elated and congratulates Dr. S.B. Sharma on being selected for Hari Om Ashram prerit Vikram Sarabhai award on space technology and Dr. P.C. Pandey on being conferred Shanti Swarup Bhatnagar award for earth atmospheric and planetary sciences.

Promotions

On behalf of ISRS-AC, we congratulate the following member colleagues who have achieved an important milestone in their career by gaining departmental promotion.

Shri I M Bahuguna as Sci 'SD', SAC
Mrs Anjali Bahuguna as Sci 'SD', SAC
Shri T T Medhavi as Sci 'SD', SAC
Dr. R Ghosh as Sci 'SE', SAC
Shri Mukund Rao as Sci 'SE', SAC
Shri D R M Samudraiah as Sci 'SF', SAC
Dr. P K Srivastav as Sci 'SF', SAC
Dr. Manab Chakraborty as Sci 'SF', SAC
Dr. K P Sharma as Sci 'SF', SAC
Shri Tapan Majumdar as Sci 'SF', SAC
Dr. S D Naik as Sci 'SF', SAC
Dr. R R Navalgund as Sci 'SG', SAC
Dr. P C Pandey as Sci 'SG', SAC

Review on Radar Remote Sensing for Land Resources

Dr. S Mohan, Shri N.S. Mehta and Ms Parul Patel of SAC has written a review report Radar Remote Sensing for Land Resources. The report starts with introductory topics like microwave remote sensing technique, radar-target interaction mechanism and radar image characteristics. It discusses radar's potential for various land applications , with suitable illustrations and review of the work done by various investigators. Eight applications discussed in the report are on soil moisture, flood mapping, crop identification snow studies, geological and geomorphological mapping, radar stereo mapping, forestry and urban land use. A summary of work done in India has also been discussed. A few SAR images covering various geographical regions of Indian land mass have been shown. Report also covers the recent trends in the field of radar remote sensing.

Transfers/Deputations

Dr. K.P. Sharma , Scientist, SAC, has been transferred to RRSSC Dehradun. We wish him a continued successful career.

Elected

Shri Pramod Kale as President, Indian Society Of Remote Sensing. Chapter feels elated on having contributed yet another President to the national body, and looks forward to Shri Kale for his support and guidance for this chapter.

Dr. Sailesh R. Nayak as joint secretary of the national body of Indian Society of Remote Sensing. Dr. Nayak ,as treasurer and secretary of the Ahemedabad chapter during its formative phase, had done a commendable job of giving shape to the chapter. We are confident that he will come out with flying colours in the case of national body as well.

Visits Abroad

Shri R K Dave visited Kourou, French Guyana as a member of the INSAT-2 Launch campaign team.

Dr. R.R. Navalgund visited Montreal, Canada for attending the 41st IAF congress and presented a paper on remote sensing in agriculture.

Grieved

We feel deep sense of loss and express our condolences on the sad demise of Shri A S Ramamoorthy and Dr.(Mrs.) K A Bhagawat, who had long association with the Remote Sensing activities in the country.

May God almighty give strength to the grief stricken family members of the deceased.

Welcome to ISRS-AC

Our strength has increased to 226. We introduce herewith the names of the new entrants to the ISRS-AC family.

Life Members

Shri Gopal Sharma, SAC (ISRO)
Shri K.L.N.Shastri, SAC (ISRO)
Shri J.G.Patel, SAC (ISRO)
Shri T.G.B.Shrikanth, SAC (ISRO)
Shri B S Lole, SAC (ISRO)
Shri G. Ram Mohan Rao, CGWB
Dr. S B Sharma, SAC (ISRO)
Shri K.M.Mathur, SAC (ISRO)
Shri B.K.Sharma, Ahmedabad
Shri G.S.Bhatia , SAC (ISRO)
Shri Rajeev Saxena, CGWB
Shri Arun Kumar, CGWB
Shri Anil Kumar Jain, CGWB
Shri Lalit Kumar Mathur, CGWB
Shri P.R.Gupte, CGWB
Shri V.S.R.Krishna, CGWB
Shri Sunil Kumar, CGWB
Shri J.N.Bhagat, CGWB
Shri A.Kannan, CGWB
Shri Ashok Kumar, CGWB
Shri Gaurang B. Parekh, Ahmedabad
Shri R.C.Jain, CGWB
Shri S.Pandey, CGWB
Shri D.R.M.Samudrariah, SAC (ISRO)
Shri R.P.Prajapati, SAC (ISRO)
Dr. P.K.Gupta, SAC (ISRO)
Dr. Ranendu Ghosh, SAC (ISRO)
Shri P.D.Yadav, SAC (ISRO)
Shri Kelan R.Kotak, SAC (ISRO)
Shri Hari Shanker, SAC (ISRO)
Shri Arijit Dey, CGWB
Shri Arumugam, CGWB
Shri Anoop Nayar, Ahmedabad
Shri P K Jain, CGWB
Shri Ajit Malavia, SAC (ISRO)
Shri A D Vyas, Gujarat Univ.
Shri Kannan V Iyer, SAC (ISRO)

Annual Members

Shri R.J.Bhanderi, SAC (ISRO)

This newsletter is by the members for the members. We plan to include, on a regular basis, the notes on the events in the life of our member colleagues. Notes could be on promotions, appointments, transfers, awards, visits abroad ,publications outside ISRS, personal memorabilia or on any other event highlighting the professional-cum-personal life of the members. The communications received from the members in this regard would greatly enhance the scope of this column. Please send your notes to the editor or secretary, ISRS- AC.

BOOK POST

If undelivered, return to :
Secretary
ISRS-Ahmedabad Chapter
C/O. Remote Sensing Area
Space Applications Centre
Ahmedabad 380 053

Shri J.K. Garg
MWRD / RSAG / RSA

Edited by
R.K.Goel, V.K.Dadhwal, Parul Patel, K.N.Padia, A.K.Mathur, R.K.Dave, B.S.Munjal, Space Applications Centre, Ahmedabad.
G.B.Pandya, M.G.Science College, Gujarat University, Ahmedabad.
Printed at : Library , Space Applications Centre, Ahmedabad.

Indian Society of Remote Sensing

Ahmedabad Chapter

NEWSLETTER

Volume 6 Number 4 *September 1, 1992*

Dear Members,

We are overwhelmed with your response, to our attempt at improving the quality of newsletter, in form of co-operation, encouragement, suggestions and constructive criticism. Please continue to be alert as this is the only way to make further improvements. We have tried to incorporate some of your suggestions in this issue itself. Others having long term implications would be adopted in due course.

We propose to release the Jan 1, 1993 issue as a special annual issue giving thematic coverage to the events and developments in the remote sensing world. Themes could be the different application areas, computer software and hardware, sensors, instrumentation and the related technologies like GIS. We are sure that you would be as generous as ever in your contributions to this effort. Wishing you a happy reading.

-Editor

Ahmedabad and its environment as depicted by IRS-1A-LISS-II

IN THIS ISSUE

RESEARCH NOTES

Locating Potential Mineral Bearing Areas..2
Grassland Mapping of Banni, Kachchh.....2
INSAT-VHRR Utilisation.....2
Havaman Upagrah.....3

ABOUT THE INSTITUTIONS

Central Ground Water Board (WCR).....4
Gujarat Jalsewa Training Institute.....4
Geology Dept, M G Science Instt.....4

A LOOK AROUND

Storm of Brains.....5
Panel Discussion on RIO.....6
Regional Information System.....7

TECHNOLOGY TRENDS.....7

NEWSPIX.....8

CHAPTER ACTIVITIES.....9

ABOUT THE MEMBERS.....10

and above all T T medhavy, S D Naik and B S Munjal at thier creative best.

Editor : R K Goel

RESEARCH NOTES

LOCATING POTENTIAL MINERAL BEARING AREAS

B P Pathole, Sr. Geologist, Remote Sensing Laboratory, DGM, Ahmedabad

Directorate of Geology and Mining (DGM), Government of Gujarat, took up a project , in collaboration with RRSSC - Bangalore, to locate potential mineral bearing areas in the Kachchh district using Remote Sensing , GIS and the wealth of Geo-information gathered over a century on this area.

IRS and Landsat data were used for preparing the geological, structural and geo-morphological maps at 1: 250,000 scale and the maps rasterised into the GIS system. Simultaneously, the attribute data related to the exploration of bauxite was documented in order to generate Prognastic maps and Geo-model for bauxite mineral by utilising INGIS, software developed by RRSSC, Bangalore. The exploratory data included the characteristics of the ore bodies comprising of the location ,elevation, thickness with chemical analyses, petrographic characteristics and the details of grade including classification in terms of industrial utility, etc. The exploratory data preparation for bauxite involved transferring of bauxite bearing areas, demarcated on 1:4,000 scale, during the detailed exploration conducted over two decades on to 1:50,000 scale SOI topo-sheets, initially, and then to 1:250,000 scale, sheets and also documenting all the attribute data, mentioned above, in a specified format for entries into the GIS. The integrated data base thus created in GIS have found wide ranging utility at various levels of planning.

While the geological map shows a close correspondence with the maps prepared by various earlier workers, the structural map reveals wealth of new lineament details which were hitherto unknown. The extension of lineaments from the outcrop areas into the area covered by younger tertiary sediments, identification of higher lineament concentration that is responsible in the formation of zig-zag coastal configuration of north-western parts of the Kachchh, trace of lineament along the eastern coast of Saurashtra and Kachchh into Rann and another one along the southern coast of Kachchh to the foot-hills of Mount-Abu are the significant revelations which have helped in further supporting the view held in respect of evolution of present day configuration of Kachchh.

The Geomorphological map reveals evolution of Landsystems as products of endogenic and exogenic processes operating in the Kachchh region. It has been possible to conform, from the geomorphological studies, various land-systems with the erosion cycles related with the regressive phases of sea levels observed during early-mid and late tertiary (Ranging from 65 MY to 37 MY) to early Quarternary periods (Ranging in age from 2 MY to 0.01 MY).

The Geo-physical data available with ONGC Vadodara is acquired recently and is under evaluation to identify relevant data for integration with other geo-information. Simultaneously, the data related with genetic aspects of bauxite are also being worked out as important elements of total GIS so as to integrate them with other data to create Geo-model and prognastic maps to guide mineral exploration of the department.

ISRS-AC EXECUTIVE COUNCIL 1992-94

Chairman: Shri R C Garg

Vice-chairman: Shri C K Joshi

Secretary : Dr M V Mulcy

Joint Scretary : Ms Anjana Vyas

Treasurer : Shri T T Medhavy

Members:

Dr J P Aggarwal Prof A B Vora Shri P S Thakkar

Shri A K Shukla Shri A S Rajawat Shri B P Pathole

Shri K M Saini Shri R N Shukla Shri Arun Kumar

GRASSLAND MAPPING/ MONITORING OF BANNI, KACHCHH

R N Jadhav, M M Kimothi & A K Kandya - SAC

In India, 12.15 million ha of land, i.e. 3.7% of the total geographical area has been recorded as permanent pasture and grazing land. In recent years, the factors responsible for gradual loss of grassland are: expanding agriculture, overstocking of domestic animals and improper pasture and grazing land management.

A pilot study was conducted in the Banni grassland area of the Kachchh district. Banni, at one time considered the largest grassland of its kind in Asia, has been degraded in the last decade. The main aim of this study was to standardise the methodology for mapping and monitoring of grassland through satellite data. Using multi-temporal satellite data belonging to the years 1980, 1985 and 1988, the status of grassland spread, invasion of prosopis juliflora and salinity ingress were critically observed.The major findings are

October-November data is most suitable for grassland mapping

TM band combination (542 or 431) and IRS LISS-II (PC 321 and 341) are better for grass/prosopis differentiation

MIR data (1.55-1.75 um) is useful for grassland and other vegetation discrimination

Prosopis has spread at a rate of 2673 ha/year during the period 1980-1988

Prosopis is invading areas suitable for palatable grass

Rainfall is no more a significant factor for Prosopis juliflora, since even during three consecutive drought years, Prosopis showed a steady rise.

Salinity ingress rate during 1980 to 1988 is 1611 ha/year

INSAT-VHRR DATA UTILISATION AT SAC FOR MONSOON MONITORING

P C Joshi, SAC

In order to disseminate weather information to district

authorities and Agriculturists the Department of Agriculture of Gujarat Government has set up a weather watch group (1991) consisting of personnels from IMD, SAC, Gujarat Agricultural University besides the personnels from department of Agriculture of Gujarat Government. These personnel meet frequently during the monsoon season and discuss the rainfall conditions in various districts and the likely weather situations in the coming week. The group also discusses the adequacy of rainfall for various crops in different districts.

INSAT VHRR data are received and recorded at AES/SAC. This data is processed at ISROVISION, by first density slicing of the image and then classified in different colours according to cloud top temperatures. The infrared data is useful in demarcating the cold and thick cloud. According to the classification, clouds having temperatures less than'233' K are likely to be rain bearing. The movements of the high convective zones are clearly discernible, in INSAT-VHRR IR data, when seen alongwith the surface and upper air charts provided by IMD.

FIRST INSAT-II VHRR IMAGERY - Courtesy Photolab- IPDPG/RSA/SAC

હવામાન ચિત્રણ

૧ જૂનથી ૧૬મી સપ્ટેમ્બરનો ગાળો હવામાન ઉપગ્રહ ૭૦૦ ટે.મા.નો ઇન્સ્ટ્રુમેન્ટમાં પ્રક્ષેપિત કરવામાં આવ્યો હતો.

TELEVISION AND INFRA RED OBSERVATION SATELLITE

ઉપરથી જોતું દૂરનું નામ TIROS રાખવામાં આવ્યું હતું, નામ પ્રમાણે, જેના ટેલિવીઝન કેમેરા ક્યારે દૃશ્યમાન અને પાર-રક્ત પ્રકાશમાં વાદળાની છબીઓ મળતી હતી. આ છબીઓની મદદથી પહેલી જ વખત પૃથ્વીના જુદા જુદા ત્રિજ્યારો પર હવાયેલા વાદળોના ચિત્રો હવામાન વિજ્ઞાનીઓને ઉપલબ્ધ થયા અને જેથી સમગ્ર વાવાવરણના પરિભ્રમણ વિષે પણ સચોટ ખ્યાલ મળ્યો. આ ઉપરાંત, બાદ કરીને ઉષ્ણ-કટિબંધના સમુદ્ર પર ઉદ્ભવતાં વિનાશકારી વાવાઝોડાં વિષે પણ ઘણી ઉપયોગી માહિતી મળી શકી. આ અર્થમાં દૃષ્ટિએ જોઇએ તો ટાઇરોસ પણ મેઘ પ્રકાશનો દૂર - સંવેદન ઉપગ્રહ જ હતો, પરંતુ જેનો ઉપયોગ ભૂમિ સ્પર્શિય માહિતી માટે નહીં, પરંતુ વાદળાની છબી મેળવવા પૂરતો જ સીમિત હતો. વળી, જેનું વિશ્લેષણ - માપ લેન્ડસેટ કે સાઇ. મા૨. મેટ. દૂર - સંવેદન ઉપગ્રહોના વિશ્લેષણ માપ જેટલું સારું નહોતું, પણ કિ.મા. ના ગાળામાં જ હતું, જે હવામાનની માહિતી માટે પર્યાપ્ત હતું.

વાદળા સૂર્ય - પ્રકાશનું ઘણું મોટા પ્રમાણમાં પરાવર્તન કરે છે, માટી, દિવસ દરમ્યાન ઉપગ્રહોના દૂર-સંવેદન સુપરત્નો દૃશ્યમાન પ્રકાશમાં વાદળાંની છબી લઇ શકે છે. પ્લાન્કના "ઉષ્મા ઉત્સર્જન"ના સિદ્ધાંત અનુસાર, ભૂપિ, સમુદ્ર, વાવાવરણ અને વાદળા બધા જ પોતાના પ્રમાણે પાર - રક્ત પ્રકાશનું ઉત્સર્જન કરે છે, આથી પાર-રક્ત પ્રકાશમાં દિવસ તેમજ રાત્રિ દરમ્યાન ઉપગ્રહોના ઉપકરણો વાદળાંની છબીઓ મેળવી શકે છે. આ ઉપરાંત, ઉષ્ણતામાન ઉત્સર્જનના પાર-રક્ત તેમજ સૂક્ષ્મ-તરંગ ગાળામાં કાર્ય કરતા અન્ય ઉપકરણો પણ કેટલાક હવામાન ઉપગ્રહોમાં રાખવામાં આવ્યા છે, જેની મદદથી હવામાનના અન્ય પરિબળો વિષે માહિતી મેળવી શકાય છે.

બધા હવામાન ઉપગ્રહોમાં વાદળાની છબી મેળવવાના ઉપકરણો હોય છે. ટેકનોલોજીની ઉત્ક્રાંતિની સાથે સાથે, આ ઉપકરણો વધારે સંવેદનશીલ અને વિશ્લેષણશીલ બન્યા છે. હવામાન ઉપગ્રહો સૂર્ય - સમકાલિક મથવા ભૂ-સમકાલિક કક્ષામાં ફરતા મોકલે છે, જેથી સમય સાથે તાલ મળે છે. જુલાઇ-૧૯૮૯માં ભૂ-સમકાલિક કક્ષામાં મૂકવામાં આવેલા આપણા "ઇનસેટ-૨બી" ઉપગ્રહમાં પણ "અધિક વિશ્લેષણશીલ વિકિરણમાપક" (VHRR) નામનું ઉપકરણ રાખેલું છે, જેની મદદથી દૃશ્યમાન અને પાર-રક્ત પ્રકાશમાં ભારતીય ઉપ-ખંડ તથા આસપાસના વિશાળ પ્રદેશ ઉપર છવાયેલા વાદળાની છબી મળે છે.

- ડૉ. પરવત પટેલ.

.....Continued on page 10 column 2.

ABOUT THE INSTITUTIONS

CENTRAL GROUND WATER BOARD (WCR)

The Central Ground Water Board is the apex organization at National Level entrusted with the responsibilities of hydrogeological surveys, ground water exploration, assessment, development, management and regulation of ground water resources of the country. It has two main wings i.e. hydrogeological drilling. The hydrogeological wing is responsible for carrying out hydrogeological surveys, ground water exploration, ground water resources assessment, monitoring of behavior of ground water systems and water quality, assistance to technology mission on drinking water and related water management, assistance to drought affected states for location of sites and design of tubewells and application of new technologies for planning the development of resource in various parts of the country, production of reports, maps, development plans, and coordination with State etc. The drilling wing provides the necessary support by drilling boreholes for ground water exploration and is also responsible for procurement, operation and maintenance of drilling equipment.

The Board operates through 12 Regional Directorates, 14 Engineering Divisions and 9 State Unit Offices. In addition, there are number of special study directorates for ground water pollution studies, conjunctive use of surface and ground water, map production and publication, remote sensing and mathematical modeling, data base management, basin wise study and development and artificial research studies.The Regional office at Ahmedabad has its jurisdiction over the state of Gujarat and the UT of Daman and Diu. As on March 1990 the entire state of Gujarat and the UT of Daman and Diu have been covered by the systematic hydrogeological surveys. Furthermore, 75,000 sq. km area has been covered by re-appraisal surveys and 526 bore holes have been drilled for assessment and evaluation of the hydrogeological parameters of different aquifers.

The annual action programme of the current year envisages regional reappraisal hydrogeological surveys in the drought prone Kutch district, ground water exploration in hard rock and alluvial areas in Valsad, Junagadh and Kheda districts and Piezometer construction programme in Ahmedabad and Mehsana districts. Special studies in LigNite bearing areas of Surat district and urban hydrogeology of Ahmedabad city and its environs with special reference to ground water development have also been taken up. In the Mahi right bank canal command, special project on conjunctive use of surface and ground water is currently under progress. About 900 permanent national hydrograph stations are being monitored four times a year for the study of ground water regime in the different hydrogeological formation in the state .

The regional office has a small remote sensing cell which provides remote sensing inputs for various field activities. Digital image processing and GIS applications are planned in the area being covered under conjunctive use project in the Mahi right bank canal. The other scientific facilities available in the regional office are a regional chemical laboratory and a geophysical unit equipped with resistivity survey and borehole logging equipments.

For further details contact Director, CGWB (WCR), Ahmedabad

REMOTE SENSING CELL, GUJARAT JALSEVA TRAINING INSTITUTE, GANDHINAGAR

As skilled and trained manpower in adequate numbers is an important pre-requisite for efficient operation and maintenance of water supply and sanitation, Government of Gujarat through Gujarat Water Supply and Sewerage Board has established a remote sensing cell in Gujarat Jalseva Training Institute at Gandhinagar. This centralised Remote sensing Cell is proposed to cater the training needs of geologist, hydrologist and engineers working in GWSSB, other departments of Government of Gujarat and other state officers, as well as to locate a probable site for ground water development and rain water harvesting structures for villages. Till 1987-88 GWSSB was completely dependent for remote sensing work on Space Application Centre, Ahmedabad. The efforts for creating the cell were started in the year 1986-87 and it started working in April 1989. The following activities are being done in the Remote Sensing Cell.

Preparation of districtwise and villagewise geomorphological maps and plans showing major lineaments and potential sites for ground water development. By the end of July 1992; 1002 numbers of villages of Gujarat state have been studied individually for delineation of ground water potential zones and 104 number of sites have been proposed for water harvesting structures.

Training officers of GWSSB and other states : Till now 18 training courses (including four national courses, two international courses) pertaining to geohydrological and remote sensing have been arranged successfully.

Research and Development : In the initial stage remote sensing cell had started research and development activities and at present it has undertaken a research project on demarcation of ground water potential zones and probable water harvesting structures in Dharampur taluka, Valsad district which has been sponsored by Technology Mission; Government of India.

Various facilities available with the remote sensing cell include Procom-II Enlarger with lenses, Mirror Stereoscopes, Geophysical instruments - ABEM-SAS-300 Terrameter for profiling and VES, ABEM Wadi with printer, Global Positioning System and Geographic Information System Toolkit (GIST) for data base management. The satellite data in form of FCC imagery and CCT for , IRS-1A LISS, Landsat 5 TM & SPOT and aerial photographs of some problematic areas of Gujarat state are also available.

For further details contact Shri R N Shukla, Remote Sensing Cell, Gujarat Jalseva Training Instt, Gandhinagar.

M G SCIENCE INSTITUTE, DEPARTMENT OF GEOLOGY

The Department of Geology was started first in the M.G.Science Institute, Ahmedabad, Gujarat, in the year 1948, under Bombay University. In the beginning geology subject was not known to the students, however, the depart-

ment started with three to four students. In the year 1952 the Institute started to impart education in geology as a principal subject at B.Sc. with 5 students every year. The department was recognised as a post- graduate centre for geology in the same year. With coming up of the Directorate of Geology and Mining and ONGC in Gujarat students could final some prospects for employments. This led to an increase in the strengthening of the students reach to 30 years every year.

The teaching at M.Sc. is managed by local teachers of the department, inviting outside teachers and experts of different branches of the earth sciences.

At present two teachers are working for their doctorate degree. The department has started teaching the subject of remote sensing and its application in the field of geology. Department invites scientists from Space Applications Centre for delivering lectures on remote sensing techniques and its applications in the field of natural resources.

For further details contact Shri G B Pandya, Head, Deptt Of Geology, M G Science Instt.

INDIAN INSTITUTE OF REMOTE SENSING

The Indian Institute of Remote Sensing (IIRS), a premier institution under the Department of Space for training of scientific and technical personnel in the application of remote sensing and photo-interpretation techniques, celebrated its silver jubilee in February 1992. The celebration was inaugurated by Prof. U R Rao, Chairman, Space Commission. Dr. Beek, Rector, International Institute for Aerospace Survey and Earth Sciences (ITC), Netherlands, was also present on the occasion.

IIRS, formerly known as Indian Photo-Interpretation Institute (IPI), was established in 1966, in technical collaboration with the Government of The Netherlands through ITC, under the aegis of Survey of India, Department of Science and Technology. The IPI was brought under National Remote Sensing Agency in July 1976 to meet the growing demands of trained manpower in the application of remote sensing. It was renamed as Indian Institute of Remote Sensing (IIRS) in June 1983.

A new training division 'Human Settlement Analysis Group' was formed in 1982 at IIRS, again with the active collaboration of the Government of The Netherlands through ITC. Courses on applications of aerial photographs and remote sensing techniques in Human Settlment Analysis and Planning were introduced in 1983, New courses on Water Resources and Coastal Processes and Marine Resources were added in 1985.

Source : SPACE india

A LOOK AROUND

STORM OF BRAINS

... On Marine Fisheries

A storm of brains is reported to have been occurred on June 23,1992 at Space Applications Centre, Ahmedabad. On further inquiries it was learnt that the storm was essentialy an aftereffect of achievements (or a precursor to further achievements) in the area of using satellite remote sensing for marine fisheries. A reliable source has revealed that this storm was further intensified by circulation of a report entitled Remote Sensing of Marine Fisheries : State-of-the-art cum Indian Experience by the project team of Marine Fisheries. About 44 representative brains, working in the field of marine resources, contributed to this storm. Representatives were from various organizations like CMFRI, FSI, state fishery departments, universities and NRSA, DOD and SAC.

The direction and intensity of this storm was guided and modulated by Shri Pramod Kale, Director, Space Applications Centre and Dr. George Joseph, Deputy Director, (RS). Ultimately the storm subsidised and ended leaving behind (recommending) considerable amount of work to be done as follows

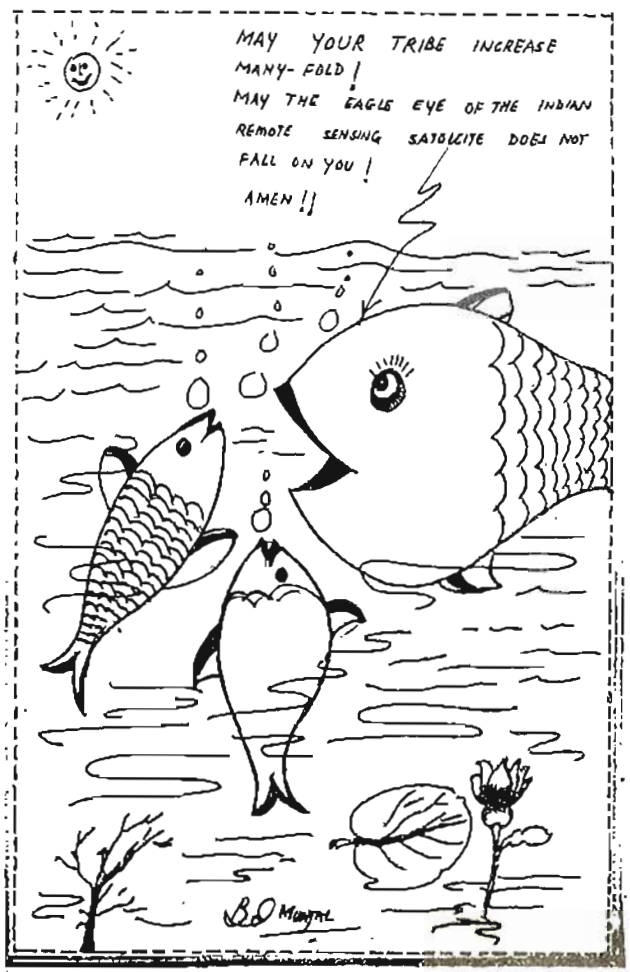
Fishery forecasts using SST should continue and efforts can be made to add more parameters as and when possible.

Validation for the forecast should be carried out.

FSI should take a lead role and join with SAC and NRSA in taking validation exercise.

Sagar Sampada cruise can be made use of for the validation. Information could be communicated to the areas close to Sagar Sampada.

CMFRI is trying to collect all parameters in good areas of



fishing. Data were collected in pre-monsoon, monsoon and post- monsoon season. After six months a similar exercise will be taken up. Requirement for this can be sent to CMFRI.

In order to validate the technique, the percentage area covered by the forecast and the fishermen should be considered. Also, percentage of fishermen who have gone to the suggested area and normal area should be taken into account. In addition to the catch with and without SST information should be analysed.

Exploited, underexploited and unexploited area should be identified. Which state can increase how much fishery potential should be worked out ?

Forecast outside 50 m depth range is also required.

Delay in communication of information should be minimized.

For factual details contact Dr A Narain, MWRD/RSAG/RSA/SAC

... On Cotton Yield Model Development

Another storm was building up while the experts were assessing the aftereffects of the storm on June 23,. It ultimately surfaced on June 28 at Space Applications Centre. This time the cause was to bring together the scientists working in the field of cotton yield modeling in the country and to have in-depth discussions on the important issues such as

the existing conventional cotton yield models

the yield affecting variables and the impact of environmental conditions

meteorological yield models

modeling for pest and disease and its impact on final yield

econometric yield models

relationship between remote sensing parameters and yield and finally

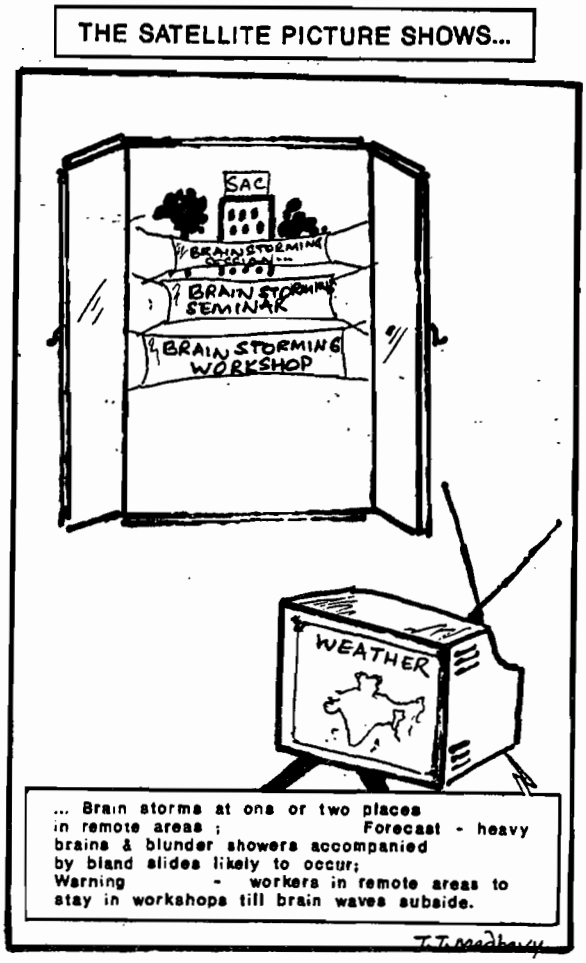
to integrate remote sensing variables with the crop grown variables and weather parameters to arrive at the hybrid model.

About 65 representative brains, working in the field of cotton, stormed in this workshop. Representatives were from central and state organizations, universities and ICAR etc. Lead presentations were made by Dr. A K Basu, Director, Central Institute for Cotton Research, Nagpur, Dr. S N Bhardwaj and Dr. Munshi Singh from IARI, Dr. R C Dubey, Director, Agromet, IMD, Dr. M S Kairon, HAU, Dr. Ajai, Project Manager CACA and Dr. M Chakraborty, Scientist SAC. The storm ended with many recommendations on future course of actions to develop cotton yield model.

For factual details contact Dr. Ajai, LRD/RSAG/RSA/SAC

PANEL DISCUSSION ON RIO EARTH SUMMIT

A Panel discussion was organized by the Ahmedabad chapter of Indian Meteorological Society at Physical Research Laboratory. Shri OPN Calla, Chairman of the Chapter, started discussions with opening remarks and gave reasons for holding the panel discussion. Shri Calla also read the comments sent by Prof. P R Pisharoty, who could not attend the discussion. Prof. Pisharoty stressed the need for action at local level with individuals to contribute towards preservation of planet by stopping wastage of water and by planting trees. Prof. S P Pandya, who presided over the function,



expressed that development of science is quite fast, however change in our society is not that much fast. On the other side, it is human desire and greed, which is resulting in environmental crisis. This greed has benefited the rich nations however the bad effects will be faced by all the nations. He emphasized that unless we change our social structure and make scientific developments towards that, this problem can't be solved. Prof. B H Subbaraya of PRL described various scientific issues those led to Rio summit. He said that change in climate is always there but recently this is so rapid that system can't adopt it. At current rate, it has been observed and modeled that atmosphere will be getting hotter and hotter. The high latitude regions are more likely to be effected but it is very difficult to pinpoint quantitative amount of warming at different regions.

Mr. Kartikeya Sarabhai, Director, CEE said that India could have achieved much more if government and nongovernment organizations had worked out a strategy to suit developing nations. He said that he was amazed to see around 600 Indians attending Government and Non Government summit. There were mainly three conventions. First was on Biodiversity, which was to take steps towards preserving plants and animal life. Second one on Climate Change

was to commit countries to agree on plans to reduce levels of green house gases. Third treaty was on protection of Forest. He told, it was a great achievement by India by letting down the Forest convention which was initiated by United States and was towards control of North over the forests of South. He said Agenda 21, an 800 pages document, describing do's and don'ts for each country to have environmental balance was accepted by all nations. The Agenda also describes that developed nations should give 0.7% of their GNP for developing nations. While many countries said they will try their best to follow it but none of them committed.

(Contributed by Shri Rajkumar, Secretary, India Meteorological Society, Ahmedabad Chapter.)

FORTHCOMING EVENTS

Workshop on coastal zone management in Bangladesh, 30 NOv - 4 Dec, 1992, sponsored by UNESCO & BNCU, organized by BNCU.

National symposium on the international Geosphere-Biosphere programme, at Madras, Dec 14 - 17, 1992, organised by the Indian National Committee for IGBP, Anna Univ and Central Leather Research Instt.

Seminar on Geology of Maharashtra : Environmental and Economical Aspects, at Solapur, first week of Jan, 1993, organised by Deptt of Geology, Shivaji Univ, Centre for P.G.Studies.

IMPACT OF MINING ACTIVITIES AND SUPER THERMAL POWER STATIONS ON ENVIRONMENT

A project report, summarising the work carried out in this project, has been brought out by Space Applications Centre. The report describes the analysis of the environmental impact on land, air and water using remotely sensed satellite data in Kudremukh, Dehradun-Mussoorrie mine belt, Korba and Talchar.

For further detailscontact Shri J K Garg, MWRD/RSAG/RSA/SAC

GIS BASED REGIONAL INFORMATION SYSTEM FOR BHARATPUR DISTRICT

As part of the demonstration of the Natural Resources Information System (NRIS) and the implementation of the Urban and Regional information System (URIS), a pilot-project has been completedby Space Applications Centre (SAC), Ahmedabad and Town and Country Planning Organisation (TCPO), New-Delhi. The major aim of this pilot-project has been to demonstrate and implement an information system for regional planning at district level around a GIS package - ARC/INFO.The broad framework of the project has been as follows:

design and organisation of a spatial information system for Bharatpur on 1: 50,000 scale around a GIS and to serve as a regional level database for district planning. This included the creation of a systematic spatial and non-spatial database.

demonstrate **integrated analysis** *of spatial/non-spatial data in the GIS environment for specific district planning problems. This has been oriented towards providing inputs to planning.*

The GIS database for the district consists of spatial data - multi-date landuse from Remote Sensing, soil associations, Groundwater potential, village boundaries from Census, Settlements, Road and rail network, slopes derived from contours etc. The non-spatial data consists of details on demography, occupational structure, facilities and services, landuse and irrigation details etc. for the 1451 villages in the district.

A variety of GIS analysis/modeling methods have been adopted. As part of the planning, the pilot-project has addressed the following aspects:

Land utilisation, where the major emphasis was to identify the changes in the landuse/cover and also to determine the capability of land.

Agriculture, where the stress has been to identify the relative levels of development of agriculture on a village-wise basis.

Services, where a settlement hierarchy has been determined based upon an assessment of education, medical, transport/communication and general facilities for each settlement

Intra-district disparities, where the settlement-wise assessment of various developmental indicators has been made. These indicators have also been assessed in an integrated manner to define a relative level of development for each village, thus bringing out the intra-district disparities.

An inter-agency review of the project was held at TCPO, New-Delhi on August 14, 1992. The review panel consisted of eminent planners from different central and state departments. Shri K Dharmarajan, Additional Secretary, Ministry of Urban, Government of India and Chairman, TCPO; Shri P P Kale, Director, SAC; Dr George Joseph, Associate Director, SAC and Shri D Meshram, Chief Planner, TCPO also participated in the review meeting.

A set of presentations were made by the SAC-TCPO project-team. The detailed report on the project - *A GIS BASED REGIONAL INFORMATION SYSTEM - A CASE STUDY FOR BHARATPUR DISTRICT* was also circulated.

(Contributed by shri Mukund Rao, SPUCC/RSA/SAC)

TECHNOLOGY TRENDS

JAPANESE ERS-1 SATELLITE

The Japanese earth resources satellite JERS-1 was launched into a sunsynchronous orbit at an altitude of 568 km and an inclination of 98' on February 11, 1992 from

JERS SENSOR DETAILS

Spectral bands (Micro Meters)

VNIR	1. 0.52-0.60	
	2. 0.63-0.69	
	3. 0.76-0.86	
	4. 0.76-0.86 (Stereo)	
SWIR	5. 1.60-1.71	
	6. 2.01-2.12	
	7. 2.13-2.25	
	8. 2.27-2.40	
Stereo angle		15.33 deg.
Ground Resolution		18.30 m (cross track)
		24.20 m (along track)
Swath width		75 Km

NASDA's Tanegashima Space Centre by the H-1 launch vehicle. The satellite has a revisit period of 44 days. JERS-1 is the largest satellite developed by Japan. In the deployed condition, it has a dimension of 11.9 m in the direction of the flight and 11.4 m in the transverse direction. The payloads on the satellite are the Synthetic Aperture Radar (SAR) and the Optical Sensors (OPS). Since SAR is a side looking instrument, both SAR and OPS do not observe the same area at the same time.

The JERS-1 SAR is a high resolution, all weather imaging radar which can map the topography and geological characteristics of the earth's surface penetrating cloud cover, small amounts of vegetation and dry soil. The resolution of 18 m is the second highest available from spaceborne SAR for remote sensing, compared to 15 m from ALMAZ and 30 m from ERS-1. The L band SAR has a look angle of 35' (compared to 23' for ERS-1 and 20.5' for SEASAT) to the right of the flight direction. Through reduced quantisation levels (3 bits each for I and Q channels compared to 5/6 bits per channel for onboard/ground range compression for ERS-1, the data rate is kept down to 60 Bbps, enabling the use of onboard tape recorders for collecting data out of sight of ground stations.

JERS-1 OPS consists of two high resolution sensors in the visible and near infrared band (VNIR) and the short wavelength infrared band (SWIR). The VNIR telescope can look 15.3' forward in the flight direction in addition to the nadir look, enabling the generation of stereoscopic images. Both VNIR and SWIR systems use 4096 element CCD (charge coupled device) sensors. The SWIR PtSi IRCCDs (infrared CCD) are maintained at 77-82' K by a Stirling cycle cryo cooler which has a design life time of 2000 hours.

Source : International Remote Sensing News

REMOTE SENSING OF CROPS

Satellite derived false colour imageries have been used for the assessment of cotton crop condition. Areas of moderate (50 per cent crop loss) and severe (80 per cent crop loss) damage by the white-fly have bees easily identified. The damaged crop area estimated from the satellite data was found to be close to that of the area reported by the Directorate of Agriculture to within 12 per cent. The report suggests that the remote sensing techniques could be used to monitor & manage the outbreak by monitoring cotton growing, to demarcate areas requiring crop rotation and to estimate the acreage under alternate hosts (tomato, chilli, tobacco, etc.).

Source: SPACE india

NEWSPIX

Bhaskara-II

One of the the early Indian experimental remote sensing satellites, Bhaskara-II, launched on November 20, 1981, re-entered earth's atmosphere on November 30, 1991. The 440 kg satellite, launched by the USSR on board an Intercosmos rocket, carried a two-band TV camera system and a three-frequency passive mocrowave radiometer system. The satellite was successfully used for more than two years for conducting remote sensing experiments related to ocean, forestry, hydrology, water and land masses.

Bhaskara-II experiment was important in that it paved the way for developing the operational Indian Remote Sensing Satellites, IRS- 1A and IRS-1B, which are in service today. Bhaskara-II was last tracked by the ISTRAC at 0715 hours UT on November 30, 1991.

Source: SPACE india

Aryabhatta

The first Indian satellite, Aryabhata, launched on April 19, 1975, re-entered atmosphere on February 10, 1992 after being in orbit for almost 17 years. The signals during Aryabhata's 92,875th orbit, the last around the earth, were received by the Sriharikota ground station of ISRO Telemetry, tracking and Command Network (ISTRAC), at 1827 hours Universal Time (UT) for a duration of about 30 seconds before the satellite became silent.

Aryabhata was launched on board the Soviet Intercosmos rocket from the USSR into an initial 619 x 562 km orbit with an inclination of 50.64 deg. The primary objectives of the Aryabhata mission were (a) to indigenously design and fabricate a space-worthy satellite system and evaluate its performance in orbit; (b) to evolve the methodology of conducting a series of operations on the satellite in its orbital phase; (c) to set up ground-based telemetry, tracking and telecommand systems; (d) to establish infrastructure for the fabrication of spacecraft systems. All these objectives were more than met by Aryabhata before the end of its designed operating life of six years. The satellite also carried three scientific experiments in X-ray astronomy, solar physics and aeronomy. Aryabhata was being tracked from sriharikota ground station regularly even after its six-year operating life.

Source: SPACE india

CHAPTER ACTIVITIES

Regional Planning through Remote Sensing

A lecture by Shri D G Pandya, Chief Town Planner, Govt of Gujarat.

ISRS-AC organised this popular lecture at Space Applications Centre on July 9, 1992. Dr Pandya stressed the need for proper end use of the planning exercise. Integration of the data from a variety of sources is a must while carrying out the planning exercise for development of an area. In this context, he underlined the need for integrated look at the physical, industrial and demographic aspects for effective planning at regional level. The data on forest, landuse and groundwater etc. plays a vital role in such an exercise specifically for perspective planning. These data elements are of dynamic in nature and hence remote sensing technology has a very important place. He presented the work done on planning for south Gujarat region, wherein he suggested alternatives for alignment of coastal highway and railway line considering the likely environmental and socio-economic impacts. He urged the researchers and experts working on different aspects of remote sensing to contribute to the development planning exercise for south Gujarat region.

Dr D G Pandya is M. Tech (Regional Planning). During 1961 to 1967 he worked for Bokaro city and new city near Ranchi and Govt of Orissa. He was at UK in one of the Boroughs during 1967 to 1969. Thereafter he is with Govt of Gujarat. In the intervening period during 1980 he was employed by UN at Bangladesh for 6 1/2 months. He participated in seminars at Paris and Bangkok during 1981 and 1992. Currently he is Chairing the Ahmedabad Regional chapter of the Institute of Town Planning India for period 1991- 1993

Van Mahotsav

Chapter organised a Van Mahotsav during 3rd and 4th week of July 1992. A total of 350 saplings were distributed to about 100 members. Species included Asopalav, Peltaforam, Gulmohar, Gauva (fruit), Cassia and Kasid. The organisers thank the Forest Department, Gujarat for providing the saplings. The special efforts made by Shri J P Aggarwal, Conservator of Forests, Gandhinagar circle are gratefully acknowledged.

It was decided by the ISRS-AC Executive Council that the growth of the plantations will be inspected by a committee after an year and a prize will be given to the members whose plants are healthy, and well grown.

A memento of remembrance to Shri Pandya - presented by Shri R C Garg

A DISCUSSION ON THE NEWSLETTER

R R Navalgund, SAC

While appreciating the excellent work done by the Editorial Staff of the Newsletter for introducing a new format and for introducing innovative sections on technology trends, about the members. I have a few suggestions/remarks to make to further improve its readability. The print-letter size should be bigger. The section on reserarch notes read more like status report. It should highlight new ideas/innovative work done. The members outside SAC may be encouraged to contribute. Could you also confirm whether the emblem of ISRS that is being printed on the Newsletter does show the 'islands'? The cartoons are excellent. Wishing you all the best and extending my cooperation.

Mukund Rao, SAC

I congratulate the Editorial Board on the *new-look* newsletter. The contents are also informative and make a good reading. I felt the character size to be too small and maybe a larger character size would make a comfortable reading. The section on the activities of the members is welcome and a good forum for knowing more about the members. While, the present issue seems to be SAC heavy on members's achievements, I am sure this will be expanded to include other members also in the future issues. The cartoons also are excellent and the one on Bush is *TOPS*. I also suggest that a separate section on GIS be initiated - where information and the activities of GIS - within and outside DOS can be reported.

P C Joshi,SAC

In the newsletter (section on) *Promotions* many (names) are missing. Sufficient care has not been taken.

Editor

As suggested by you, the letter size has been increased and the emblam has the islands. As regards the lack of coverage from outside SAC in the section 'about the members', I am sure you would find a positive change in this issue itself. We run this section largely based on your inputs. You would have also noticed the presence of articles on GIS in the current and previous issue. Inclusion of a separate section on GIS would require further reformatting with thematic coverage to all the other aspects . This is not found feasible at present for all the issues. However, we plan to release a special annual issue giving thematic coverage to different aspects of remote sensing and related technologies.

SPECIAL ANNUAL ISSUE - APPEAL FOR CONTRIBUTIONS

We propose to release the Jan 1, 1993 issue as a special annual issue giving thematic coverage to the events and developments in the remote sensing world. Themes could be the different application areas, computer software and hardware, sensors, instrumentation and the related technologies like GIS. We are sure that you would be as generous as ever in sending your contributions to this effort.

....*Continued from page 3 column 1*

INSAT-II VHRR UTILISATION

The monsoon was active during the last week of July around the country in general and Gujarat in particular. The rainfall during this week surpassed the total seasonal rainfall for Kutch region. The other regions of the state also received very good rainfall. The active monsoon period could be seen in the first weather picture of INSAT-IIA at 12 IST on 28th July. There are two main activity centres - one over the east Madhya Pradesh and another over Rajasthan. The former is a depression which formed over Bay of Bengal around 26th July and moved west-northwest. As is evident these depressions are very important rain producing systems during monsoon seasons. More rainfall occurs in the southwest sector of these depressions. The prediction of the formation of these depressions well in advance is one of the challenging problems of the monsoon meteorology. The Gujarat region came under the influence of this depression on 29-30 July. However Gujarat has lot more rain a few days prior to the arrival of the depression in the vicinity of Gujarat. This is because of a low pressure system (the cloud blob over Rajasthan in the picture) formed over the monsoon through. This formed as a low pressure in surface and was there for three days either as a surface low or as a upper air circulation. This was very unusual. This happens very rarely. The understanding of such formation is much more difficult than the formation of the monsoon depressions.

ABOUT THE MEMBERS

WELCOME TO ISRS-AC

Our strength has increased to 232. We introduce herewith the names of the new entrants to the ISRS-AC family.

Life Members

Shri Lalit Bhalotia, Ahmedabad

Shri A S Arya, SAC, Ahmedabad

Dr. Satyendra Bhandari, SAC, Ahmedabad

Dr. Shabbar F. Barodawala, Ahmedabad

Annual Members

Shri Ananth Rao, SAC, Ahmedabad

Shri Sujay Dutta, SAC, Ahmedabad

Shri Pradip Kumar Parchure, CGWB (WCR)

Shri B M Rao, SAC, Ahmedabad

Shri I C Matieda SAC, Ahmedabad

HONOURED

Dr P C Pandey, Scientist, Space Applications Centre, as fellow of the National Academy of Sciences, Allahabad.

VISITS ABROAD

Shri Pramod P Kale, Director, SAC visited Boulder, Colorado, USA and participated as a panel expert in an international conference Satellite Remote Sensing for Resource Management, Environmental Assessment, and Global Change Studies : Needs and Applications of developing Countries, organized by the United Nations in cooperation with the Government of the United States during Aug 17-20, 1992.

A TALK BY SHRI R C GARG AT DEAL, DEHRADUN

Shri R C Garg from SAC delivered a talk *Microwave remote sensing in India, its past present and future* under the aegis of Institute of Electronics and Telecommunications Engineers at Defence Electronics Applications Laboratory (DEAL), Dehradun. He briefly told about the advantages of Microwave remote sensors over optical remote sensors in having day and night and all weather capability, capable of measuring soil moisture and depicting well, surface and subsurface features. He discussed optimum parameters for microwave remote sensing namely frequency band, polarization, look angle, resolution both spatial and radiometric for elevan applications finalized by inter-departmental committee set up for the purpose in the country.

In past, work began in mid-seventies at the Space Applications Centre with the development of 3 channel (19, 22 and 31 GHz) SAMIR (Satellite Microwave Radiometer) onboard Bhaskara-I and later on Bhaskara-II gave useful data for application in estimation of sea-surface temperature, water vapour and liquid water. Scatterometer (1982-89) was completed for soil moisture estimation experiment at Navgaon in Gujarat. Technical consultancy agreement with Rajasthan Communications Ltd was signed to develop such equipment, for measuring backscatter co-efficient for different type of applications in agriculture and its possible applications for defence.

Technical details of Real aperture Radar at X-band developed at SAC during 1980-88 was given. To demonstrate its application as an imaging radar an imagery of a Meteorite crater at Lonar near Aurangabad was shown.

C-band Airborne Synthetic Aperture Radar being developed at Space Applications Centre was discussed giving its comparision with SPOT. It was also indicated that the future scenario is to use spaceborne platform to make use of full capability of microwave sensors at reduced operational cost. To begin with, there is likelihood of putting C-band scatterometer for oceanographic application onboard PSLV sometime in 95-96 timeframe and if resources crunch are not faced, a Microwave Remote Sensing Satellite (MRS-1), may be put in orbit by 97-98. On application front with other satellite there is a plan to utilise SIR-C data which are multi-frequency and multi- polarisation data for many applications in the field of agriculture, geology and forestry.

PROMOTIONS

On behalf of ISRS-AC, we congratulate the following member colleagues who have achieved an important milestone in their career by gaining departmental promotion.

Shri B P Pathole as Sr. Geologist DGM

Shri J V Bhatt as Sr. Geologist, DGM

Shri S D Kapse as Asstt. Geologist, DGM

Shri R C Jain as Sr. Hydrogeologist, CGWB

Shri Arunkumar as Sr. Hydrogeologist, CGWB

Dr. P C Joshi as Scientist/Engineer SF, SAC

Shri H I Andharia as Scientist/Engineer SE, SAC

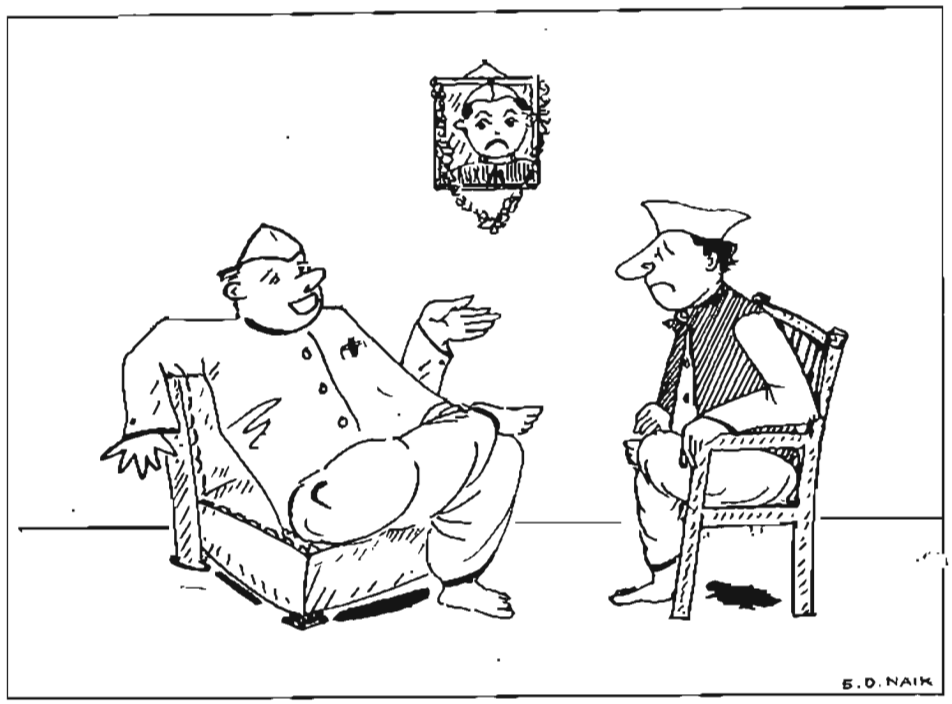
ELECTED

Dr P C Pandey, Scientist, Space Applications Centre, has been elected as President, national executive council, Indian Meteorological Society for years 1991-93 and as member, national executive, Indian Geophy. Union, Hyderabad for years 1991-92.

Dr P C Joshi, Scientist, Space Applications Centre, has been elected as member, national executive council, Indian Meteorological Society for years 1991-93.

CONTRIBUTIONS TO THE SECTION ABOUT MEMBERS

This section is about the members of ISRS-AC. This can be maintained only with members active support. Please continue to send notes about yourself or about your member colleagues on promotions, appointments, transfers, awards, visits abroad ,publications outside ISRS, personal memorabilia or on any other event highlighting the professional-cum-personal life. Please send your notes to the editor or secretary, ISRS- AC.



You should approach ISRO for 'Image Enhancement' as your 'public image' is severely eroded in the recent past

BOOK POST

If undelivered, return to :
Secretary
ISRS-Ahmedabad Chapter
C/O. Remote Sensing Area
Space Applications Centre
Ahmedabad 380 053

Edited by
R.K.Goel, V.K.Dadhwal, Parul Patel, K.N.Padia, A.K.Mathur, R.K.Dave, B.S.Munjal, Space Applications Centre, Ahmedabad.
G.B.Pandya, M.G.Science College, Gujarat University, Ahmedabad.
Printed at : Library, Space Applications Centre, Ahmedabad.

Indian Society of Remote Sensing

Ahmedabad Chapter

NEWSLETTER

Volume 6 Number 5 *November 1, 1992*

WE HOPE ALL OUR MEMBER COLLEAGUES HAD A HAPPY DIPAWALI AND WISH YOU ALL A PROSPEROUS NEW YEAR

ISRS-AC GETS A ROOM FOR OFFICE

ISRS-AC Executive Council is pleased to inform the members that a room has been arranged for the maintenance of society office . This room (Number 23) is part of a building (Number 34) situated within the premises of Space Applications Centre (SAC) . Director, SAC was very considerate to this requirement of the society , represented by the executive council .

On behalf of the Chapter, the chairman and secretary express thier appreciation and gratitude to Director and Controller, SAC for their generosity.

IN THIS ISSUE

RESEARCH NOTES

Soil Conservation Priorities.....2
Spatial Decision Support System.....2
Pakshi Nireekshan.....3

ABOUT THE INSTITUTIONS

School of Planning, Ahmedabad.....4
Remote Sensing Applications Facility at SAC.....4

A LOOK AROUND

Passive Microwave Remote Sensing of Soil Moisture.....5
Coastal Environment.....5

TECHNOLOGY TRENDS

Micro Satellites.....6
Vector Engine.....6
Future Sensors for IRS.....7

CHAPTER ACTIVITIES.....7

ABOUT THE MEMBERS.....9

... *T T Medhavy, S D Naik and B S Munjal providing lighter moments.*

Editor : R K Goel

RESEARCH NOTES

TECHNO-ENVIRONMENTAL-CUM-SOCIO-ECONOMIC PRIORITIES FOR SOIL CONSERVATION IN SANTRAMPUR TALUKA, PANCHMAHALS

B S Lole, J G Patel, K L N Sastry, R K Goel and R R Navalgund, Space Applications Centre

Detailed analysis on 1:50,000 scale has been carried out to derive Composite Land Development Sites (CLDS) and soil conservation priorities. This forms an important input to sustainable development planning for the area. The work was carried out as a part of a pilot project on Natural Resources Information System (NRIS) for District Level Planning undertaken at Space Applications Centre. To start with, it involved creation and organisation of an integrated (spatial and non-spatial) database using a GIS (refer note on SDSS). GIS Overlay analysis was done for derivation of CLDS using inputs from remote sensing (landuse and Hydrogeomorphology) and conventional sources (slope derived from elevation and soil). Derived CLDS were further analysed along with drainage using the empirical model of sediment yield index and techno-environmental index for soil conservation worked out on sub- watershed basis. Village-wise socio-economic index was generated using the census data and the two indexes composited spatialy as well quantitatively. A combined techno-environmental-cum-socio- economic index was thus generated on sub-watershed basis and priorities for soil conservation worked out. The analysis was further concluded with broad estimates of extent, cost and man-power required for carrying out the soil conservation programme in very high and high priority sub-watersheds.

SPATIAL DECISION SUPPORT SYSTEM (SDSS) FOR AREA DEVELOPMENT PLANNING USING GIS

R K Goel, J G Patel, K L N Sastry and R R Navalgund, Space Applications Centre

Realisation of computerised and easy to use Spatial Decision Support tools facilitating the simulation of **what-**If scenarios would be the near-ultimate contribution from informatics to area planning for sustainable development. Recent advances in the technologies related to spatial data gathering and spatial data management (viz Remote Sensing and GIS) makes it look feasible. An attempt has been made in this direction at Space Applications Centre, Ahmedabad as a part of a pilot project on implementing the Natural Resources Information System (NRIS) for District Level Planning. Panchmahals district of Gujarat state was the study area. The system thus realised, using state of the art GIS, consists of three major components viz database, spatial query shell and spatial decision support shell.

Database has integrated spatial/ non-spatial data elements comprising of the thematic map inputs from remote sensing (landuse/landcover, hydrogeomorphology, groundwater prospect) and conventional sources (soils, elevation, slope, aspect, drainage, transport network, village/taluka boundaries, settlement locations) and village-wise non-spatial data on socio-economic and infrastructure aspects like demography, occupation and basic amenities. The database is designed and organised in a manner it minimises the data redundancy and maximises the multiplicity of usage of each data element. The majority of the spatial elements in the database are created and being used by the resource analysts (refer note by B S Lole).

Spatial Query Shell provides an easy to use, menu based access mechanism in point and shoot mode for making integrated query on all aspects (i.e. natural resources, socio-economic and infrastructure) in a single environment. It offers appropriate menus, graphic screens and icons to a user for specifying query in various modes like what lies here, where lies this, theme surface , criterion surface, reference, spatial window and planning sector. The shell also presents different user (spatial and functional) views of the database in user terminology, provides an illusion of seamlessness on the horizontal spread of the data base contents and keeps a user free from botheration about where and what of the data base elements in the computer storage. An example query could be *for predominantly tribal pockets* (criterion surface) *in santrampur taluk* (spatial window) *show the groundwater prospects* (surface theme) *and the villages which does not have drinking water source* (where lies this).

Spatial Decision Support Shell (SDSS) provides **what** If analysis for planning the optimum location of village amenities at District/ Taluka level under Minimum Needs Programme (*MNP*). The shell is useful for addressing two major issues in the context of decisions on the location of additional amenities. In the long run it can be used to prepare a perspective plan depicting the settlements where the additional amenities needs to be located. In the short term , given the resources for a specified number of units of an amenity, the system can be used to decide upon the settlements where these units should be located. It facilitates evaluation of various options and thereby helps in converging to an optimum set of settlement(s) for locating the additional amenities in an interactive, visual, iterative and spatial environment. At every iteration, the shell facilitates

* addition and/ or deletion of new locations
* quantitative evaluation/examination of the impact of these options with respect to predefined objective function (weighted average distance) and Planning

ISRS-AC EXECUTIVE COUNCIL 1992-94

Chairman: Shri R C Garg

Vice-chairman: Shri C K Joshi

Secretary : Dr M V Muley

Joint Scretary : Ms Anjana Vyas

Treasurer : Shri T T Medhavy

Members:

Dr J P Aggarwal Prof A B Vora Shri P S Thakkar

Shri A K Shukla Shri A S Rajawat Shri B P Pathole

Shri K M Saini Shri R N Shukla Shri Arun Kumar

Commission norms (viz distance and population served)

* spatial evaluation/ examination in terms of centrewise consumer settlements (within and outside distance norms etc.).
* spatial verification of the options against the backdrop of various natural resources, socio-economic and infrastructure conditions in the planning area. These conditions can be queried and overlaid in a variety of forms like where lies this, what lies here and surface theme, etc.

The system has been used, by the designers, to carry out case studies for selected amenities (fertilizer store, highschool, dispensary, godown and branch postoffice) in Santrampur Taluka. .This was an attempt to realise decision support system facilitating (simulating) the what if scenarios for a particular Context i.e. optimum location of amenities. The most important aspect was the characterisation or modelling of the impact and customization of the GIS tools to realise such a system. The experience gained would go a long way in reallsing such decision support systems in the context of natural resources (i.e. landuse , forestry etc.) and other infrastructure like transport network.

BYE BYE SPACESHIP, HAVE YOU ANY FUEL
YES SIR I YES SIR, THREE TANKS FULL
ONE FOR MY BOOSTER, ONE FOR THE FLAME
AND ONE FOR THE PAYLOAD
THAT'S PART OF THE GAME ....T T Medhavy

SPECIAL ANNUAL ISSUE - APPEAL FOR CONTRIBUTIONS

We propose to release the Jan 1, 1993 issue as a special annual issue giving thematic coverage to the events and latest developments in the remote sensing world on following themes :

* Land and Water Resources Applications * Hydrology * Image Processing * Spatial Information Systems
* Meteorology and Oceanography * Sensors * Computer S/W and H/W * Instrumentation * Any other theme

We are sure that you would be as generous as ever in sending your contributions to this effort. Please send your notes (max 3 pages) latest by Dec 20, 1992.

દૂર સંવેદન અને પક્ષી નિરીક્ષણ

ઉત્તરના ઠંડા પ્રદેશોમાંથી શિયાળામાં પક્ષીનો ખળાંતર કરી મોટી સંખ્યામાં સૌરાષ્ટ્ર ઉપખંડમાં આવે છે. આ કચ્છ-પ્રવાસી પક્ષીઓ ઉત્તરના પ્રદેશોમાંથી, ખૂબ દેશોમાંથી લાખો માઈલ કાપીને અહીં આવે છે. સૌરાષ્ટ્ર ઉપખંડમાં મુસાફરીનું સ્થાન પણ ખૂબજ મહત્વનું છે. ઉત્તર અને દક્ષિણમાંથી સૌરાષ્ટ્ર ઉપખંડમાં આવતાં લોકો ઉત્તરમાંથી મરઘા ચાને બાજરો વગેરે ખોરાક અને પાણીના ધોધાદાર ખાડાં પર મુસાફરી કરવેલું છે. દેશમુકુટ-માંથી ટ્રેકિંગ વગેરે ખોરાક વધવા પક્ષીઓ મુસાફર પરથી પસાર થાય છે. આમ મુસાફરમાં પક્ષી નિરીક્ષણ માટે શિયાળો ખૂબજ ઉત્તેજનાપૂર્ણ બની રહે છે.

મધ્ય શિયાળામાં મોટા ભાગે પક્ષીઓ ખળાંતર કરવાં નથી પણ સ્થાયી થાય છે. શિયાળામાં વિવિધ જળાશયો પર સ્થાનિક પક્ષીઓની ગણતરીનો મેટ કાર્યક્રમ સૌરાષ્ટ્રમાં ઘણે થાને છે. સાપણા દેશમાં પણ પક્ષી ગણતરીનો આ કાર્યક્રમ ૧૯૮૭ થી ચાલે છે. અમદાવાદના પ્રમોદરૂ ચિનાઈ કેન્દ્રની મદદથી ઉત્તર ગુજરાતમાં પક્ષી ગણતરીનું કાર્ય ૧૯૯૦માં શરૂ થયું.

૧૯૮૮માં નમદાવાદ કચ્છમાં આ કાર્ય શરૂ કર્યું ત્યારે નળસરોવર, થોળ, કાંકરિયા, પુનમ વળાવ : ધોળકા:, ગંગાસર વળાવ : ચોરમગામ જેવા ગેટલાક જાણીતા જળાશયોની મુલાકાત લીધી. આ ઉપરાંત મહેસાણા કચ્છના કેટલાક તાલુકાના બોળના સિંચાઈ વળાવની પણ મુલાકાત લીધી. સને ૧૯૯૦થી ત્યારા વખાનવર પ્રકાશિત નકશાઓનો ઉપયોગ કરી ઉત્તર ગુજરાતના જળાશયોની યાદી તૈયાર કરી. ગેલ્લા ૨૬ - ૨૭ વર્ષમાં તૈયાર થયેલ વળાવો, જળાશયો કે બંધ જેને કોઈ માહિતી આ નકશાઓમાં દર્શાવવામાં આવી ન હતી.

આજના યુગમાં દૂર-સંવેદન પદ્ધતિઓથી મુખ્ય જિલ્લાની ઉપરી માહિતી મેળવી કરાઈ રહી છે. ઉપગ્રહ ત્યારા મારતી વચ્ચેરી પરથી વિવિધ જળાશયોના પાણીના વિસ્તારના નકશા તૈયાર કર્યા વધા અન્ય નકશાઓ મી મદદથી આવા સ્થળોએ સહેલાઈથી કેવી રીતે પહોંચી કરાય તે નકશો કર્યું આ ઉપરાંત આ જળાશયોનું આકારપટ પણાનો અને ખેતીવાડી વ્યવસ્થા બન્ને જિલ્લે જિલ્લે જાણકારી મેળવી, તે સ્થળોની મુલાકાત લીધી. દૂર સંવેદન પદ્ધતિના ઉપયોગથી જળાશયોમાં પાણી છે કે નહીં અને જો પાણી હોય તો તે કેટલા વિસ્તારમાં પ્રસરાયેલું છે તે જિલ્લે સહેલાઈથી માહિતી મળી રહે છે. વળી નકશા, ઉપગ્રહ, કે દુષ્કાળના વર્ષોમાં કે જળાશયોમાં પાણી ન હોય તે વિસ્તારની મુલાકાત લેવાનું મુલતવી રાખવા જિલ્લાનો સમય, બળતણ અને બચેલું ઘણું બધું શક્ય બને છે.

ઉપગ્રહ ત્યારા પ્રાપ્ત થયેલાં ઉપયોગથી ઉત્તર ગુજરાતના વિસ્તૃત જેટલા જળાશયોમાં પક્ષી ગણતરીનું કામ ચાલે છે. વળી છેલ્લા પાંચ વર્ષના અનુભવ પરથી એક હકીકત ધ્યાનમાં પણ આવ્યા મળી છે કે ખૂબ ઓળખમાં ઉત્તર ગુજરાતમાં મધ્ય જિલ્લામાં જોવા મળતા વધા અમદાવાદની આજુબાજુ આવેલ ગણતરી પક્ષીઓ ઉત્તર વધા પશ્ચિમ ગુજરાતમાં ઘણાં ઓછે સેંકડો જિલ્લામાં જોવા મળતા છે. ગાજણ - ગ્રેલેજ ગુઝ અને રાજણ - બાર હેડેડ ગૂસના આ પક્ષીઓમાં મોખરે છે. આનું કારણ છેલ્લા દસ વર્ષમાં ગુજરાતમાં વધેલો સિંચાઈ હોઈ શકે. ૧૯૪૪-૪૫માં ડૉ. સલીમ અલીએ ગુજરાતના સર્વેક્ષણ દરમ્યાન આ પક્ષીઓનો ઉલ્લેખ કર્યો નથી.

દૂર સંવેદન પદ્ધતિનો ઉપયોગ પક્ષીવિજ્ઞાન ક્ષેત્રે, ઉપગ્રહ ત્યારા કે દસ્ત, તૈયાર જળાશયોની યાદી તૈયાર કરવા, પક્ષીઓના પાકૃતિક નિવાસ સ્થાનના મૂલ્યાંકનમાં, નાશ પામવા નિવાસ સ્થાનોનું મૂલ્યાંકન કરવા, નાશ પામવા જળાશયોની જાણે તૈયાર કરવા, વિ. ઉપરાંત જળાશયોમાં પાણી છે કે નહીં તે સમે માહિતી મેળવવા, પક્ષીઓના શિયાળો ગાળવાના સ્થળોનું સર્વેક્ષણ વધા પ્રજનન સ્થળોની માહિતી મેળવવા, પક્ષીઓના વધા તે પક્ષીઓના જળાશયો પર નિયમિત દેખરેખ રાખવા વધા લેન્ડ યુઝ કરવા ડાંગરના ખેતરોમાં જોવામાં પાણી સંબંધી માહિતી મેળવવા તેમજ પક્ષી ગણતરીના કાર્યક્રમોમાં દૃષ્ટિબંધુઓ કરી શકાય.

પી. મેર ૧૯૯૨.

ABOUT THE INSTITUTIONS

REMOTE SENSING LAB , SCHOOL OF PLANNING, AHMEDABAD

School of Planning, Ahmedabad is an autonomous institute for Post-Graduate Studies in the field of urban and regional planning, environmental planning and housing. The school was established in 1972. At present the institute has facilities like the computer centre with mini computers, micro computors with all necessary peripherals and a good collection of applications software. Faculty members of the school undertake several research studies in various subjects concerning development and policy making. The institute has established a photo interpretation cell during 1988. The basic objective in establishing this cell was to train the planners in the advanced technology of remote sensing, photo interpretation, geographical information systems and digital image processing. The need of such technology for planners is well recognised.Currently the cell has the following facilities:

* Remote Sensing Optical Equipments including High Magnification Enlarger, Procom-2, Optical Reflecting Projector, Large Format Optical Enlarger, Diazo Printer, Simple Light Tables, Illuminating Magnifier, Mirror Stereoscopes, Pocket Stereoscopes, Prism Stereoscope, Parallax Bars and Electronic Planimeter.
* Computers including PC/ATs (286, 386), A-3 Digitizer, A/3 Plotter, alongwith software like ARC/INFO GIS, Usemap GIS and CARP GIS Software.
* Information (Data) including Aerial Photographs, Satellite imageries, Transparencies and Paper Prints.

During the very first year of the remote sensing cell's inception, a full time elective course on remote sensing was introduced into the curriculum as a three credit course in second semester of post graduate programme with the cooperation of scientists from Space Applications Centre (ISRO), Ahmedabad. It is very encouraging to know that during the first year of its inception, most of the students opted for this elective.

All the students of the School of Planning were trained at Indian Institute of Remote Sensing, Dehradun, for a short course on the use of remote sensing techniques in human settlement analysis and urban and regional planning. This was continued for two years initially.

The growing interest among students, in this field is seen from the fact that quite a few students were working for their planning dissertation on areas related to remote sensing studies application and geographical information system.

The Remote Sensing Cell is also involved in research and consultancy projects sponsored by government and non government organisations. It has completed a project on Environmental zonation of a District, sponsored by Ministry of Environment and Forests. Recently it was given a grant worth of Rs. 26.00 lakhs from Ministry of Human Resource Development to modernise the Cell at the Campus and to carry out a research project in the field of geographical information system. In addition to these various activities the cell is currently engaged in wasteland mapping project assigned by National Remote Sensing Agency. As a part of the Schoolthe cell offers a great potential for development as a unique and nodal facility with a strong application bias. In addition to, being a Centre for academic courses for prospective planners as well as practising professionals, it is hoped that the lab would become an active centre for information exchange on applications of remote sensing in planning and development of human settlements.

Prof. William Ritchie from University of Aberdeen, UK, visited the School during 1989. He has appreciated the developments in remote sensing activities at the school.

(For further details Contact Ms Anjana Vyas , Coordinator, Remote Sensing Lab, School of Planning, Ahmedabad)

REMOTE SENSING APPLICATIONS FACILITY AT SAC

The facility, which is a division under Remote Sensing Applications Group (RSAG) at SAC, is equiped with the following:

Visual Interpretation Equipments

* Large Format Optical Enlarger (LFOE) used for 4X enlargement of satellite imageries in 24 cm format
* Modified LFOE for 2X enlargement for LISS II images at 1:500,000 scale
* Variable magnification LFOE for 3X to 5X enlargement in 24 cm format
* High Magnification Enlarger (HME) - 3.5X to 45X enlargement of 50mm X 50 mm window of 24 cm format imagery.
* Optical Reflection Projector - 0.22X to 4.5X enlargement/reduction from 24 cm map / print / imagery

Spectral Signature and Ground Truth Equipments

* Multiband Ground Truth Radiometer (GTR) for in-situ measurement of spectral signature of various objects in 8 bands (4 IRS and 4 Landsat compatible)
* Barn's Radiometer having 8 channels (4 IR & 4 visible)
* Exotech Radiometer having 4 channels compatible to Landsat
* Infrared Thermometers - Non contact type thermometer for measuring temperature in range -30C to +100C Accuracy +/- 0.5C, Resolution +/- 0.1C.

SAC CELEBRATES ITS 20 YEARS

On having completed its 20 years of service to the nation, Space Apllications Centre is organising the following events:

* Open House and Exhibition , Dec 6-11,1992.
* Seminar on Space Applications - Future Scenario during Dec 14-16,1992.
* Popular Lectures by Eminent Scientists during Sep-Dec,1992.
* Various other events like Quiz, Debate, Essay writing, Model making etc.

For further details contact Shri O P N Calla, Chairman, Organising Committe.

* Solar Integrator Measurement of solar radiation and its integration over a period of time
* 35 mm cameras for Field photography

Other equipments

* Leaf Area Meter to measure leaf area on plant or of detached leaves of width up to 127 mm & length 1 meter. Accuracy +/- 2%, resolution 1 mm^2
* Digital Planimeter for measurement of area on map etc. with facility for scaling, accumulation and digital readout
* Digital curvimeter for measurement of length of curve, line on map with digital readout
* Ground based scatterometer which is a mobile truck mounted equipment for measurement of back scattering coefficient of a target from height of 12 - 20 meters.It has range 1- 18 GHz, look angle 10-80 off nadir polarisation HH HV VH VV.

Photographic facility

* Colour and B/W photography and printing for reports / presentation / interpretation etc.
* Colour and B/W slide making
* Reduction and enlargement of interpreted maps.
* Hasselblad 70 mm cameras for aerial photography

Satellite Data Library

* This facility has satellite data in photographic and digital form like diapositive, browse, prints, FCCs and CCTs, of different satellites such as IRS-1A, 1B, Landsat 1 thru 5, SPOT, NOAA, INSAT, Bhaskara 1 & 2 and SIR-C.

Air Photo & Maps Library

* This library has topographical maps on scale 1:50,000 and 1:250,000 covering entire INDIA, interpreted maps on themes like wetland, landuse, urban sprawl, hydrogeomorphology, forestry etc., Atlases on forest, irrigation, agriculture, etc.

Other facilities

* A0 size xerox machine for same size print on paper, tracing paper or film of up to A0 size.
* Laminating machine for documents of width up to 70 cm.
* Binding machines - for comb binding and thermoplastic binding of A4 size documents.

(For further details contact : Shri R M Pandya and C R Vaidya, RAF/RSAG/RSA/SAC)

A LOOK AROUND

PASSIVE MICROWAVE REMOTE SENSING OF SOIL MOISTURE CONTENT

A study on microwave remote sensing of soil moisture content over bare and vegetated fields was initiated by Physics Department, Gujarat University, Ahmedabad (Dr. A D Vyas and Dr. A J Trivedi) in collaboration with Botany Department of Gujarat University (Prof. A B Vora) and Space Applications Centre, Ahmedabad (Shri O P N Calla, Shri S S Rana and Dr. S B Sharma) in 1984 and is still in progress.

Microwave radiometric measurement of soil moisture content over bare field (of different texture) and vegetated fields (crops, Bajra, Gawar, Maize and Wheat) was made using dual polarized microwave radiometers operating at L and K band microwave frequencies.

Several ground based experiments were conducted in this programme and the results obtained were quite interesting. It is found that the brightness temperature observed by the radiometer is sensitive to moisture in the soil and decreases with the increase of moisture content in the soil. In comparison to K- band, L-band is more sensitive to change in moisture content in the soil. The texture effect can be minimised by expressing moisture content as the available moisture content in the soil. The estimated soil moisture sampling depth at L-band is 2-5 cm while for K-band it is less than 2 cm. The vegetation cover affects the sensitivity of radiometer to soil moisture content. The effect is more pronounced,the denser the vegetation and the higher the frequency of operation. The measured polarisation factor over vegetated field at L-band was found to be appreciably reduced compared to that over bare field. The difference between normalised brightness at L-band and K-band is sensitive to vegetation type.

(For further details contact Dr. A D Vyas, Physics Department, Gujarat University,Ahmedabad)

COASTAL ENVIRONMENT MAPPING

The Department of Space had undertaken a project to map coastal wetlands/landforms and erosional/depositional areas on 1:250,000 scale for the entire country's coastline. This project was funded by the Ministry of Environment and Forests, Government of India. 80 coastal wetland/landform and 60 shoreline-change maps have been prepared. These maps are being used by various agencies such as Fisheries Department, Public Works Department, Town and Country Planning Department, Pollution Control Board etc. The classification ac-

curacy of wetland maps is 85-89% and planimetric error of shoreline-change maps varies between 0.4-1.0 mm. Wetland/landform maps depict mudflats, beach, spit, coral reef, rocky coast, mangrove, marsh, plaeomudflats, coastal dunes, high tide and waterlines etc. The area under all these category have been computed. It was observed that majority mangrove and coral reef areas are degraded. Many places non-vegetated wetlands have been converted into other uses such as agriculture, salt pans and aquaculture. The Chilka and Pulicat lakes are being silted up. It is suggested these maps are to be used for preservation, conservation, utilisation and development of zones.

(For further details contact Dr S R Nayak, MWRD/RSAG/RSA/SAC)

TECHNOLOGY TRENDS

MICROSATELLITES

A low-cost British micro-satellite (UoSAT-5) was launched along side ERS-1 on July 17, 1991. UoSAT-5, is one of the micro-satellites of UoSAT series having the earth imaging system (EIS), developed at University of Surrey with the support from UK-SERC and SSTL. UoSAT-5 is demonstration of the potential of low-cost microsatellite technology in support of well focussed remote sensing applications.

The EIS was designed to provide meteorological scale images (1550 x 1150 km) of the earth from the 765 km low earth orbit, yielding a nadir ground surface resolution of 1.7 km using a orange filter (610 nm) to enhance land-sea/arid-vegetation boundaries. The EIS on UoSAT-5 is not intended to provide an operational service and therefore acts as a capability demonstration and catalyst for future dedicated micro-satellite remote sensing missions.

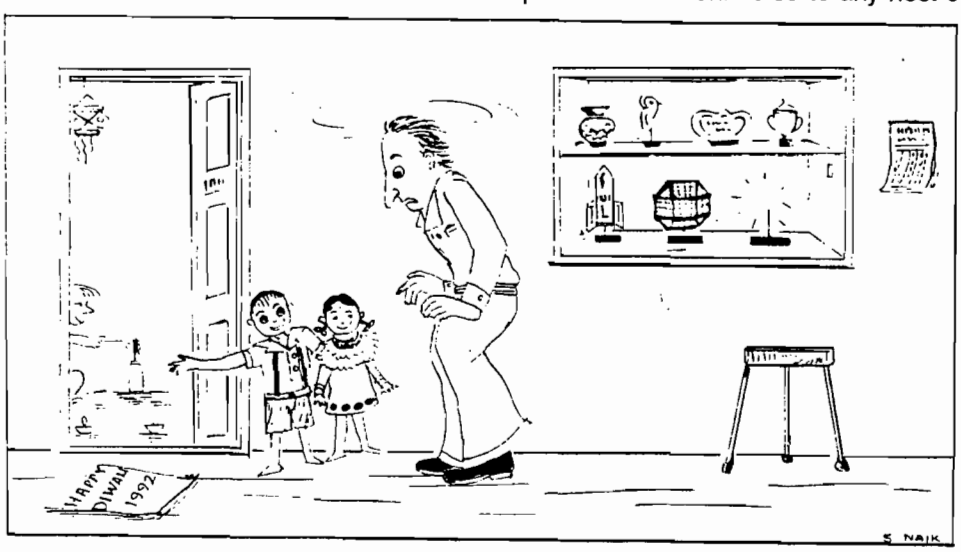
Neverthless, UoSAT-5 is the first satellite capable of taking detailed images routinely of the earth's surface and weather systems. It has demonstrated cost-effective means of monitoring the weather, pollution and climatological changes.UoSAT-5 has shown its potentiality by providing valuable images repeatedly (few days interval) of the areas of Gulf region to monitor changing levels of pollution due to oil fires over Kuwait. November 1991 images showed that the smoke rapidly decreasing as the last oil-well fires were successfully extinguished. It had imaged the ice-berg and monitored when a large 100 by 60 km ice-berg was reported to have broken away from the Antarctic-ice-shelf and to be drifting slowly towards South America and to Cape Horn shipping lanes. The images showed not only the drift of the ice-berg but also its rotation and gradual shrinking in size as it melted. It is found that micro-satellites can fulfill a very useful and complimentary role.

Future UoSAT 's include enhanced EIS with two CCD cameras with resolution - 2 km and 300-400 meters during 1992 and resolution better than 100 m during1993.

(Source : Article by Dr. Martin Sweeting from Surrey University in Space Technology International, 1992)

VECTOR ENGINE

The design and development of *Vector Engine* was taken up as an R&D activity at Space Applications Centre in order to meet the growing computational requirements of remote sensing applications. A scaled down prototype model of the machine with 8 MFLOPS computational rating, 64 Kwords of data memory and 16 Kbytes of program memory was demonstrated on 16th July, 1992. Vector Engine (V.E.) is basically a back end processor connected to an IBM PC/AT host. However, it can be connected to any host computer by redesigning the interface card.



We too have launched 'IRS' with our rocket.
We got it from our showcase Daddy!

V.E. has architectural features by which it is distinct from processors of the same class. The data memory unit is multi- buffered so that when V.E. is engaged in computation with few of the buffers, the host can transfer data to the other buffers, thereby allowing computation and data transfer to proceed simultaneously.

Computational power of V.E. is derived from three parallely executing floating point processors. Data memory is 8-way interleaved.

To decouple address generation integral calculations from basic floating point computations, the data memory units are provided with independent address generator units. A microcoded structure has been adopted for realising

the control structure. This approach provides flexibility to tune the machine for dedicated applications (e.g. compressing SAR raw data).

Users of Vector Engine are provided with a library VELIB of vector routines written in C. users can develop their own applications in Xenix environment on V.E. by linking their C programs with the library. Few applications programs (e.g. principal component analysis of multiband data) was shown to perform better than programs developed on other machines of the same class.

(Source : K S Dasgupta, Head SIPFS/IPDPG/RSA/SAC)

FUTURE SENSORS FOR INDIAN REMOTE SENSING SATELLITE (IRS)

SENSOR	BANDS (µm)	RESOLUTION	SWATH	REPEATIVITY
IRS - IE LISS - I (LAUNCH - MID 1993)	1. .45 - .52 2. .52 - .59 3. .62 - .69 4. .77 - .86	66 Meters	120 Kms.	24 Days
IRS - IC/ID LISS- III (LAUNCH - END 1994)	2. .52 - .59 3. .62 - .69 4. .77 - .86 5. 1.55 - 1.70	23.5 Meters 70.5 Meters	140 Kms 140 Kms	
IRS - IC/ID PANCHROMATIC (Stereo +/- 26 Deg)	.50 - .75	<= 10 Meters		
IRS - IC/ID WiFS	2. .52 - .59 3. .62 - .69 4. .77 - .86	188 Meters	770 Kms	5 Days

(Source : Dr Ram Ratan, EOSDG/RSA, SAC)

CHAPTER ACTIVITIES

REMOTE SENSING - A BROAD PERSPECTIVE

A Lecture by Dr R R Navalgund, Head, Land Resources Division, RSAG/RSA, Space Applications Centre

ISRS-AC organised this popular lecture at M G Science Institute, Ahmedabad on september 18, 1992. The lecture , co-sponsored by M G science Instt, was attended by about 150 parcipants including students, teachers and the members.

The lecture explained the physical basis of remote sensing in terms of reflectance/emittance properties of earth surface objects measure from airborne space borne sensors. Concept of spectral signatures discriminability of vegetation soil, water bodies, snow and clouds etc. on the basis of signatures was elucidated. Basic principles of operation of electro-optical and microwave sensors used in the present day earth observation systems were described. Broad specifications and features of Indian Remote Sensing Satellites relevant to RS applications was brought out. Use of remotely sensed data in different fields such as agriculture, forestry, water resources, marine fisheries, coastal envrionment were described through illustrative case studies. Integrated studies initiated in the district of Punchmahals, Gujarat for facilitating sustainable development was also dealt with. The lecture ended giving a scenario of future earth observation systems.

Dr R R Navalgund obtained his [illegible] from IIT-Bombay and Ph.D. from TIFR-Bombay. He Joined Space Applications Centre (ISRO) in 1977 and since then has been working in the area of remote sensing applications. His main interest are in a) spectral signature studies of crops growth under diverse conditions and other earth surface objects, b) crop production forecasting using RS data, c) District level planning and d) integrated studies for sustainable development using space technology. He has been involved in conceptualisation, formulation and execution of major remote sensing application programmes of the Department of Space. Dr Navalgund is a recipient of INRSA award 1992 instituted by ISRS.

EXCURSION TOUR TO NALSAROVAR

In order to promote closer interaction amongst the members and thier families, the ISRS-AC executive council proposes to organise a tour to Nalsarovar. Tentative timeframe for this tour is during the last week of January, 1993.

For details Cantact Secretary, ISRS-AC.

MEMBERS ARE REQUESTED TO CONVEY THEIR PARTICIPATION FOR NALSAROVAR EXCURSION TO SECRETARY ISRS- AC BY DECEMBER 10,1992.
CONTRIBUTION : MEMBERS WITH FAMILY Rs. 50/-
ONLY MEMBERS - NIL

Future Remote Sensing Scientist presents a bouqet to Dr Navalgund

A Section of Audience

MEMBER'S VIEWS ON NEWSLETTER

Pranav S Desai ,SAC

The latest copy of N/L is interesting in both content and style. The cartoon on fisheries, however was both repetitive (such has appeared earlier) and misleading (it is not IRS, but NOAA which is used). Anyhow, as a poetic liberty, it may be acceptable. In forthcoming symposia, ISRS Lucknow Nov 17- 19, missing! The idea of giving list of honors is fine. Visits abroad may be not essential-but if at all it is given, then completeness is desirable . Promotion list likewise, may not be necessary.

Mukund Rao,SAC

The September issue of the NEWSLETTER has come out well. I am sure in the times to come it will have a professional look. However, I have some small comments that you may note. Word storms has been used too many (11) times. A publication needs to develop some basic publishing rules of its own. Either the presentation should be based on column breaks or on article breaks. Further, the WIDOWS and ORPHANS (misplaced text) must also be standardised.

ABOUT THE MEMBERS

WELCOME TO ISRS-AC

Our strength has increased to 241. We introduce herewith the names of the new entrants to the ISRS-AC family.

Life Members

Ms Ketki Kharod, SAC

Shri A K Sharma, SAC

Dr K L Majumder, SAC

Shri S Avarani, Ahmedabad

Shri Bharat Dave, Ahmedabad

Annual Members

Shri T P Srinivasan, SAC

Ms Mini Raman, SAC

Shri Nikunj P Darji, SAC

Dr Arvind Sinha, Ahmedabad

Shri S S Ray, SAC

Shri Kashiram, Ahmedabad

Shri Shekhar Sarabhai, Ahmedabad

HONOURED

Dr R R Navalgund , Scientist, Space Applications Centre has been selected for the conferment of the Indian National Remote sensing award for 1992 on the basis of the recommendations of the National award committee of the ISRS. The award consists of a cash prize of Rs 5000, a medal and a certificate.

Paper on Relation of Wheat Yield with parameters derived from spectral growth profile published in ISRS journal volume 19 No. 1 1991 by Shri R P Dubey, Ms N D Ajwani and Dr R R Navalgund from Space Applications Centre has been selected for the award of best paper published by the journal in 1991.

PROMOTIONS

On behalf of ISRS-AC, we congratulate following member colleagues who have achieved an important milestone in thier carreer by gaining departmental promotion.

Ms Ketki Kharod as Scientist/Engineer SB, SAC

Shri B GopalKrishna as Scientist/Engineer SE, SAC

VISITS ABROAD

Dr George Joseph , Associate Director, SAC participated in the IAF congress held at Washington DC during August 30 - September 5, 1992.

RETIREMENT

Shri N K Sharma, Librarian, Space Applications Centre has concluded his professional service carreer and has gained hard earned retirement. Shri Sharma has been representing the SAC library as sustaining member of our chapter. His enthusiastic support to the chapter activities, including the publication of this newsletter, would be fondly remembered and greatly missed. Chapter wishes him a cheerful retirement.

ERRATA

In the ISRS newsletter Volume 6.4, Dr P C Pandey had been reported to be elected as President of the Indian Meteorological Society for years 1991-93. There is an error in this report and Dr Pandey is, in fact, elected as the Vice- President of this society. We regret the error.

A LECTURE BY SHRI A R DASGUPTA AT INSTITUTE OF TOWN PLANNING, NEW DELHI

Shri A R Dasgupta from SAC delivered an invited lecture '*Geographical Information Systems - The State of the art*' on September 17, 1992 at the training programme on GIS applications in urban and regional planning organised by the Town and Country Planning Organisation, Ministry of Urban Development. The lecture, illustrated with a large number of visuals from GIS application studies, covered a variety of issues. These included a brief description of GIS, when to use and when not to use GIS, a retrospect and prospect, current state of the art and future towards. Copy of lecture notes was also made and circulated. Those interested can contact Shri Dasgupta for a copy.

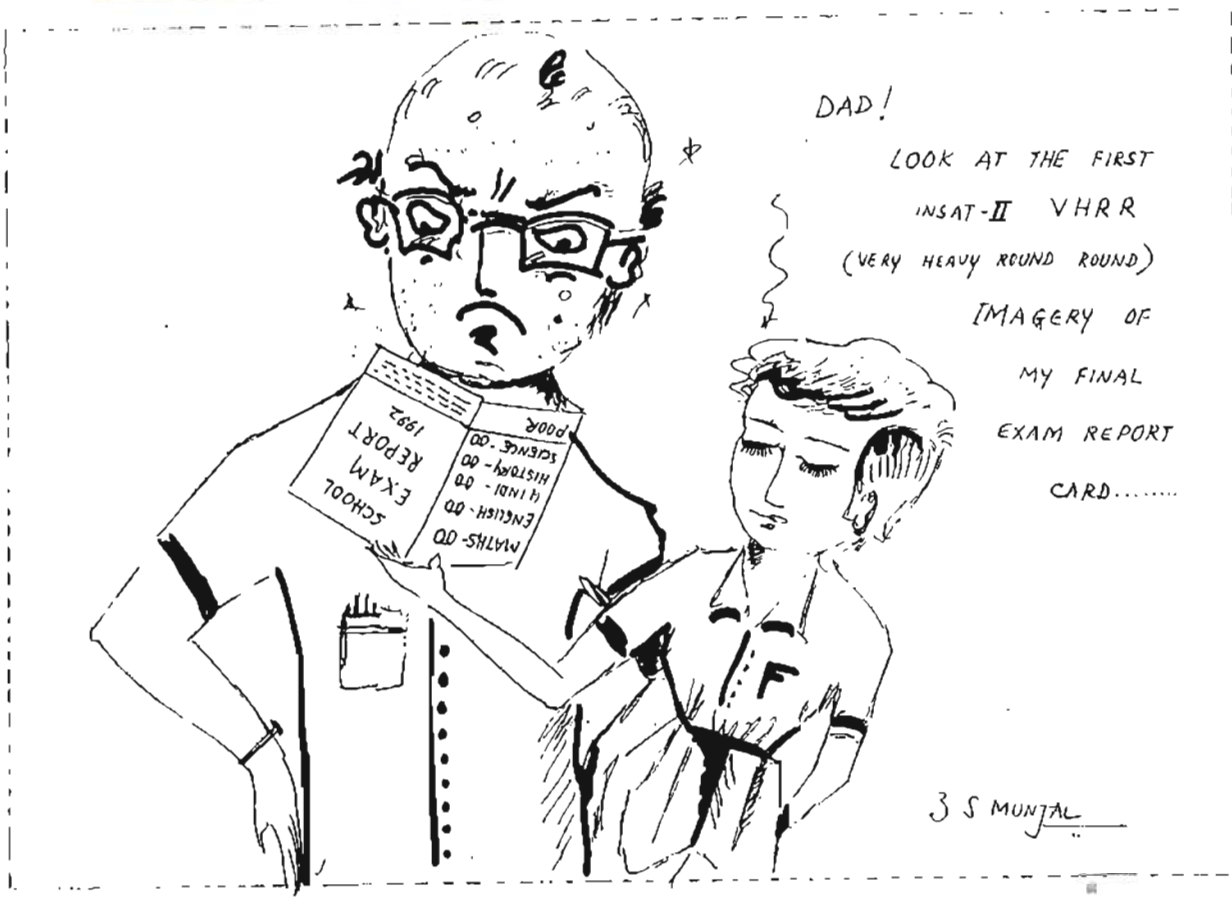
A TALK BY DR R R NAVALGUND AT ENGINEERING STAFF COLLEGE, GANDHINAGAR

Dr R R Navalgund from SAC delivered an invited lecture *Remote Sensing in Water Resources Planning and Development* on october 19, 1992. The lecture was organised by the Gujarat State Centre of Indian Society of Engineering Geology and the Baroda chapter of the Indian Geotechnical Society. The talk dealt with the physical basis of remote sensing, concept of spectral signatures, in particular the spectral reflectance properties of water under different conditions and in its different phases. It further explained how such RS data is collected through spaceborne systems, and analysis of data using visual and digital techniques is made. Salient features of IRS system were also described.

How RS data has been used in various aspects of water resource, was the other part of this talk. Use of RS data in mapping and monitoring of surface water bodies, reservoir sedimentation, snow mapping, glacier inventory, flood mapping and damage assessment, watershed characterisation, command area management, identification of water-logged areas, ground water exploration, sites of rain water harvesting structures etc. through cases studies were eluciated. How RS data is being used in integrated land and water resources studies for sustainable development was outlined.

CONTRIBUTIONS TO THE SECTION ABOUT MEMBERS

This section is about the members of ISRS-AC. This can be maintained only with members active support. Please continue to send notes about yourself or about your member colleagues on promotions, appointments, transfers, awards, visits abroad ,publications outside ISRS, personal memorabilia or on any other event highlighting the professional-cum-personal life. Please send your notes to the editor or secretary, ISRS- AC.



BOOK POST

Shri T.K. Garg
MWRD/RSAG/RSA,
Space Applications Centre
Ahmedabad-380053

If undelivered, return to :
Secretary
ISRS-Ahmedabad Chapter
C/O. Remote Sensing Area
Space Applications Centre
Ahmedabad 380 053

Edited by
R.K.Goel, V.K.Dadhwal, Parul Patel, K.N.Padia, A.K.Mathur, R.K.Dave, B.S.Munjal, Space Applications Centre, Ahmedabad.

G.B.Pandya, M.G.Science College, Gujarat University, Ahmedabad.

Printed at : Library , Space Applications Centre, Ahmedabad.

Indian Society of Remote Sensing

Ahmedabad Chapter

NEWSLETTER

Volume 7 Number 1 *January 1, 1993*

Indian Society Of Remote Sensing
4, Kalidas Road, Dehra Dun - 240 001

MESSAGE

I am glad to know that Indian Society of Remote Sensing Ahmedabad Chapter is bringing out a special issue of News Letter. On the 17th March, 1988 the Indian Remote Sensing Satellite (IRS-1A) was launched successfully and it has been continuously operating since then. This is a major achievement. Benefits derived from the utilisation of the data, received from the IRS-1A , have indicated that use of Remote Sensing is currently playing a major role in providing a vital and necessary information regarding our natural resources. I am certain that in future, it will play a major part in our management of natural resources.

I am sure that a large number of contributions on Remote Sensing activities by various experts in the respective fields, would lead to advancement of knowledge and useful exchange of information. I wish this may go a long way for the overall development of Remote Sensing related activities.

I convey my best wishes for the success and growth of Ahmedabad Chapter activities.

1 - 3 - 1993

(Pramod Kale)
President

IN THIS ISSUE		.... On Page
Geological Applications of SAR data	R K Sood et. al.	2
Engineering Geologic Investigations	N D Patel et. al.	3
Regional Geological & Structural Studies	B P Pathole et. al.	5
Petroleum Exploration	T J Majumdar	6
Crop Condition Assessment : Past Present & Future	Ajai & H P Bhatt	7
River Channel Pattern Changes	S D Naik	9
Oceanographic Applications	S M Bhandari	11
Soil Information System	B S Lole & R K Goel	12
Brackish Water Aquaculture Site Selection	M C Gupta	13
Photographic Data Products Generation	A K Shukla	14
Quality Evaluation of Optical Sensor Data	S S Palsule et. al.	14
Calibration Analysis of Optical Sensor Data	H S Bhatt et. al	16
INSAT - 2 Very High Resolution Radiometer		17
Operationalisation of PROBAR	A K Shukla et.al.	18
CHAPTER ACTIVITIES		20
LIST OF ISRS-AC MEMBERS		21
Editor : R K Goel		

SPECIAL ANNUAL ISSUE

GEOLOGY

GEOLOGICAL APPLICATIONS OF SYNTHETIC APERTURE RADAR (SAR) DATA- SOME OBSERVATIONS & PROSPECTS

R K Sood, N S Mehta, S Mohan, A S Rajawat and I M Bahuguna, Space Applications Centre

Synthetic Aperture Radar (SAR) data collected by the Shuttle Imaging Radar (SIR) - A & B, airborne INTERA-SAR, and data collected by the recently launched first European Remote Sensing Satellite (ERS-1) over parts of the Indian landmass have been evaluated for geological applications.

The above mentioned four data sets covering different areas have been studied. SIR-A data (L-band) covers about 1700 km long and 50 km wide SE-NW linear strip starting from Chilka lake in Orissa to the Thar desert near Jaisalmer in Rajasthan. SIR-B data (L-band) covers 1000 km long and 50 km wide NNE-SSW linear strip over the Indo-Pak border in Punjab and Rajasthan. Airborne INTERA SAR data (X-band) covers around 2000 sq. km area over parts of Anantpur district in Andhra Pradesh. SIR-B and INTERA SAR data were also collected over some other parts of the Indian region. One frame of ERS-1 SAR data (C-band) covering 10,000 sq. km area over parts of Dhenkanal district of Orissa has also been studied. Comparative analysis of these data with optical sensor data like Landsat MSS and RBV, Salyut-7 space photographs, IRS-1A and panchromatic aerial photographs was also carried out.

The unique imaging geometry of SAR provides excellent delineation of structural features. It is observed that signature of lineaments with positive or negative topographic expression is far better on radar images. Bright linears correspond to structural ridges, dykes, quartz reefs etc. or features showing positive relief. Most of the darker linears correspond to fracture controlled valleys, fractures or features of negative relief. Comparison of rose diagrams prepared using different data sets show that the number of lineaments mapped using SAR data is more in all directions except the look direction of SAR. It has been observed that mapping of outcrop pattern is easier on SAR images and this facilitates the delineation of structures like folds and faults in the area around Kota and Jhalawar in Rajasthan and Dhenkanal in Orissa . Identification of small lineaments (macro linears i.e. 2-10 km) is observed better in SAR data.

It has been observed that SAR is sensitive to topographic relief and surface roughness variations which get manifested as different tonal and textural patterns. These tonal and textural patterns facilitate mapping of different geomorphic features. On SAR image, delineation of landforms with positive relief seems to be quite easy e.g., structural ridges, structural hills, denudational hills, residual hills etc. It is observed that low lying areas such as flood plains, river valleys, pediment, pediplain, aeolian plain, alluvial plain etc. are seen as comparatively darker areas on SAR data. Few drainage traces could be mapped using SAR data. The details within flood plains of even major rivers like the Ravi, the Sutlej, the Narmada and the Mahanadi are not distinct. However, on SIR-B images acquired over desert region, it has been obsereved that delineation of inter-dunal depressions and flats is easy as they are seen as dark tonal patches of different dimensions. The contrast with surrounding sand dunes has been observed to be more on SAR data as compared to Landsat MSS data.

Radar images do not reflect any unique signature for specific lithology. However, rock types which reflect definite geomorphic expression in terms of relief or specific dissection pattern of the relief can be easily delineated. SIR-A image over central India e.g., south of Saugor, Madhya Pradesh shows zig-zag scarp lines appeared as conspicuous white lines with alternate dark areas corresponding with horizontal Deccan Trap flows. The contrast is so high that it is possible to delineate flow boundaries as close as 1 km. In Anantapur area, Andhra Pradesh intrusive quartz reefs, dolerite/gabbro dykes etc. could be easily mapped due to target characteristics such as positive relief, linear shape and association with the country rock. In addition some of the litho contacts have been observed as lineaments.

Most of the land cover features that acted as rough surfaces at the imaging frequency could be mapped. It has been observed that SIR-A and SIR-B images provide relatively more information on cultural features like built up lands, roads, railways, bridges etc. SAR images show limitations for delineating smooth land cover surfaces and features.

The above studies suggest that geological potential of SAR data is quite substantial and it is emerging as an important complementary information source which can be used in addition to optical sensor data for planning regional exploration strategies and targeting localized areas for detailed field mapping and geophysical exploratory activities. It is envisaged that efforts for digital integration of SAR data with optical sensor images, thematic information, and geophysical data may result in better qualitative and quantitative analysis. The sensitivity of

ISRS-AC EXECUTIVE COUNCIL 1992-94

Chairman: Shri R C Garg
Vice-chairman: Shri C K Joshi
Secretary : Dr M V Mufey
Joint Scretary : Ms Anjana Vyas
Treasurer : Shri T T Medhavy
Members:
Dr J P Aggarwal, Prof A B Vora, Shri P S Thakkar, Shri A K Shukla, Shri A S Rajawat, Shri B P Pathole, Shri K M Saini, Shri R N Shukla, Shri Arun Kumar

SAR data to soil moisture may be effectively utilized to identify anomalous soil moisture pockets in unirrigated agricultural areas and non outcrop areas like aeolian plain, buried pediplain, alluvial plain etc. Such anomalous soil moisture pockets may be explored to target shallow aquifers.

PRELIMINARY ENGINEERING GEOLOGIC INVESTIGATIONS AROUND NANI-BARSAN WATER RESOURCES PROJECT SITE

N D Patel, V B Patel, P H Vaidya and D M Pancholi, Narmada and Water Resources Department, Govt. of Gujarat

INTRODUCTION

The application of Remote Sensing has great potential in the engineering geological investigations for any dam site during the reconnaissance stage. This technology provides quick information on the various geological, geomorphological and structural features around the proposed project site. This helps apprise the design engineers and planners the implications of engineering geological problems, viz. seepage, sliding and settlement in the foundation of dam structure etc.

An attempt has been made for delineating quickly the terrain characteristics such as geology, landform, drainage pattern and structural set up for the proposed 34 m high Nani-Barsan dam located about 70 km ESE from Bharuch city. The study has revealed the presence of 2 sets of lineaments, i.e. dyke lineaments (set I) and fault lineaments (set II). The Karjan river on which the dam is proposed to be constructed flows along the fault lineament. This may pose the problem of foundation seepage and settlement. The dyke lineaments, which are almost perpendicular to the fault lineament may act as underground barriers to seepage through the foundation. The presence of buried pediments (shallow) in and around the proposed dam site is indicative of the cut off grade rock at a shallow depth.

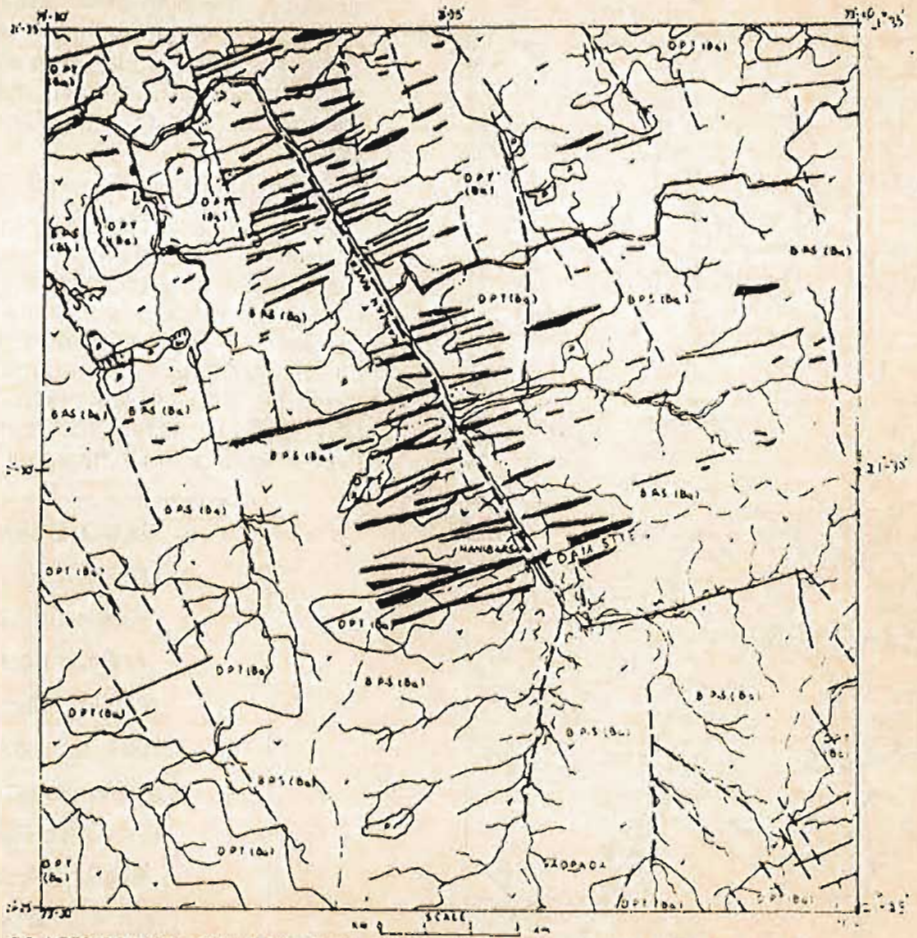
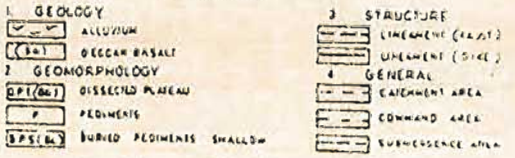


FIG. 1 GEOLOGY, GEOMORPHOLOGY & STRUCTURAL SETUP AROUND NANI BARSAN W. R. P.

LEGEND



METHODOLOGY

Topographical maps (1:50,000 scale) have been studied to have an idea of relief of the terrain, drainage pattern/system of Karjan river and its tributaries etc. The base map has been prepared using this map. Fifty numbers of black and white vertical aerial photographs were assembled and a loose uncontrolled mosaic was prepared to obtain the broad picture of geology, geomorphology, structural set-up and other terrain characteristics. These photographs were also studied under mirror stereoscope for more detailed work. IRS-1A/LISS-II geocoded satellite data were also used to supplement the information. A map showing the geology, geomorphology and structural set up around project site has been prepared (figure 1) and interpreted for evaluating engineering geological problems.

GEOLOGY

The Deccan trap basalt flows, intruded by basic dykes of Cretaceo- Eocene age, have been mapped around the proposed project site.

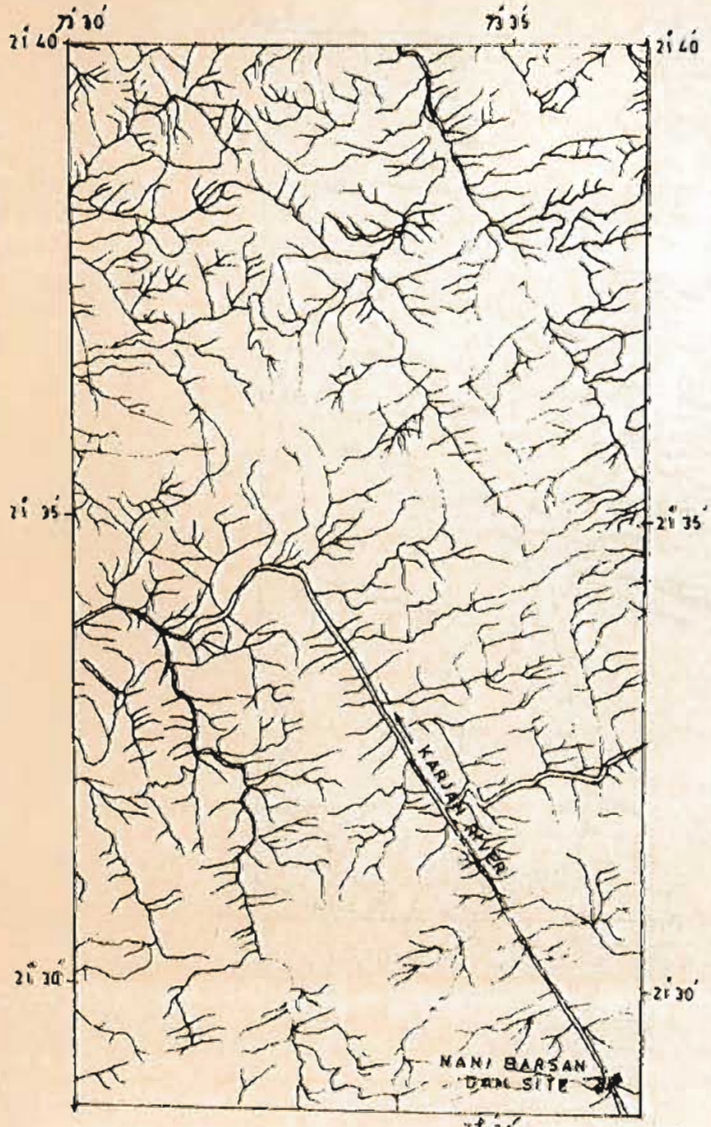


FIG. 2. DRAINAGE PATTERN OF STUDY AREA

GEOMORPHOLOGY

Geomorphologically, the area represents the landforms developed mainly due to the erosional processes. The various landforms, namely dissected plateaux of basalt in the southern portion and in North-East and North-West portion of the proposed dam site have been mapped. The intervening area is covered with thin veneer of soil and alluvial cover over the pediment of basalt (buried pediments-shallow). At a few places patches of pediments of basalt have also been noticed (figure 1). The drainage system in the study area (figure 2) is rectangular type representing its structural control. This also indirectly indicates the thin veneer of alluvium.

STRUCTURAL FRAMEWORK

The study of landform, drainage pattern as well as tone and texture in the aerial photographs, has revealed two sets of lineament patterns in the area. First set of lineaments is represented by basic dykes running in ENE-WSW direction having width of a few meters to as much as 30 m. They are closely spaced. The second set of lineaments is developed in the NW-SE to NNW-SSE direction. The high order streams are flowing along this set of lineaments including the Karjan river in a straight length of 13 km. The study has indicated the displacement of the basic dykes along this set of lineaments. Thus it is a set of lineaments controlled by faults.

ENGINEERING GEOLOGY

The terrain is occupied by the Deccan trap basalt flows at and around the proposed dam site indicating the availability of competent foundation rocks. The lineaments running across the Karjan river and sub-parallel to the dam alignment (ENE-WSW) would act as natural barriers to seepage underneath the dam structure. The lineaments running in NW-SE and NNW-SSE are the fault lineaments along which Karjan river is flowing. This lineament set is running almost

REMOTE SENSING
IN LIGHTER WAVELENGTH
Down to the Earth
At Grass Root Level
With High Resolution
True followers of Gandhi
Roaming villages and fields
In search of Real Truth
But, Alas! Apartheid
Discriminating by colours,
Never True, but False
Masking or Enhancing
That is Remote Sensing
.....P N Pathak, SAC

perpendicular to the proposed dam alignment. This lineament (fault lineament) may pose the problem of seepage through the foundation of dam and occurrence of weak zone requiring foundation treatment against settlement. Moreover, this set of lineaments is important from seismic design consideration.

CONCLUSIONS

The remote sensing technology has proved its immense potential in evaluation of engineering geological problems at the reconnaissance stage itself for the Nani-Barsan Water Resources Project area and has brought out major geological features having tremendous impact in the design, planning and construction of the proposed structure.

UTILITY OF SMALL SCALE SATELLITE IMAGERY FOR REGIONAL GEOLOGICAL AND STRUCTURAL STUDIES - A CASE STUDY OF SAURASHTRA PENINSULA, GUJARAT

B P Pathole, A K Muley & B S Dave, Department of Geology & Mining, Government of Gujarat, Ahmedabad

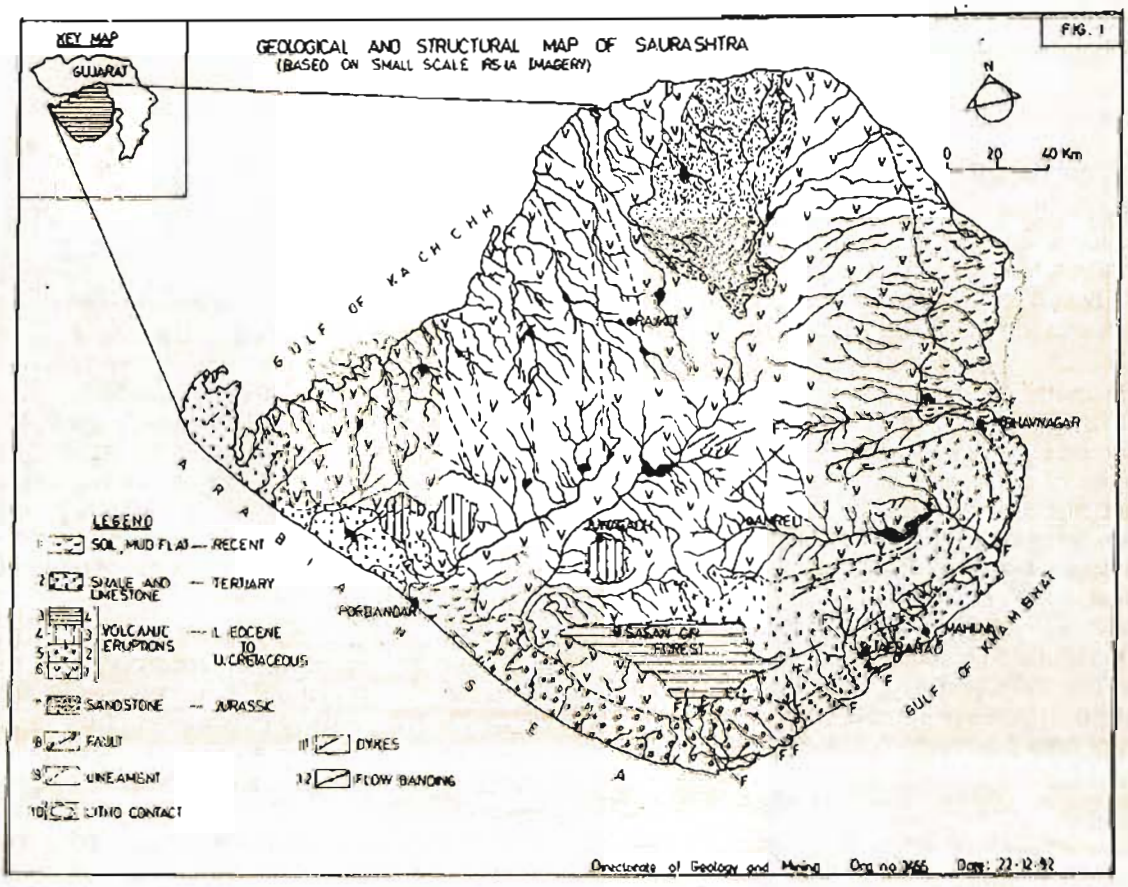
In view of the occurrence of huge lignite deposits in parts of Saurashtra and availability of wealth of lithological and petrological details for various rock types in the area, it was thought to take up this area for geological and structural studies by utilizing small scale (1:1.5 million scale) FCC imagery of IRS-1A to find out the possibilities of extension of lignite bearing horizons vis-a-vis regional geology and structure.

On the FCC mosaic, sandstone of Jurassic period (155 MY) stands out, apparently, in view of its light yellow tone and medium texture. The basaltic rock of U. Cretaceous (100 MY) to Eocene period (65 MY) occupying the entire area, except southern and south eastern coastal tract, is distinct in view of its typical joint controlled drainage pattern and greenish gray tone (pink tone wherever thick vegetation growth is observed) and medium texture. The sedimentary rocks comprising shale and limestone of Tertiary (65 MY) and quaternary period (1.5 MY) confining to southern and western coast can be deciphered based on pink tone, smooth texture and medium to poor drainage density.

Based on the photo characteristics, as stated above, four geomorphic landforms in the Deccan basaltic domain (trap), conforming to distinct episodes of eruption, could be distinguished (figure 1). The chronological order of episodes of eruption is as follows:

Episode - 1

Basaltic rock occurring as low to undulating terrain and occupying vast areas in parts of northern and central Saurashtra.



Episode -2

The alternating sequence of basic and acidic volcanic rocks forming two long trending semi-oval shaped hill ranges noticed from Sihor - Bhavnagar - Talaja - Rajula and Amreli.

Episode -3

The magmatically differentiated igneous complex comprising rocks of both acidic and basic variants having heterogeneous genetic history forming the semi-circular hills of Barda and Alech, (near Porbandar) Girnar (near Junagadh) and Chamardi hills (near Bhavnagar).

Episode -4

Pre-dominantly basic but subordinately acide volcanic rocks forming the semi oval shaped compact hill ranges noticed in Gir Forest range.

Whereas basaltic rock conforming to the fourth episode of eruption appears to be a part of regional volcanic eruption, noticed typically in parts of Maharashtra, MP, Gujarat and North Karnataka, the later episodes, being intrusives into the basaltic rock, are local in nature. The degree of weathering and erosion that these litho units belonging to different episodes of eruption have undergone, are distinctly reflected in the nature of their occurrence, i.e. the oldest have been eroded the most, while the younger ones standout as topographic highs. The confinement of younger intrusive episodes (No. 2, 3 and 4) to the southern coast indicate the prevalence and also concentration of larger number of fissures, both linear and curvilinear, in basalt of this area than in other parts. The occurrence of dyke swarms in this area, probably belonging to second episode of eruption, further corroborates this fact. The intrusion of basic magma of the first episode has disturbed the parallelism noticed in the flow pattern which is apparently seen south of Amreli.

Although the fact that the present configuration of Saurashtra is on account of a system of its bounding faults formed due to northernly movement of Indian plate during Eocene to Quaternary periods is well known, the occurrence of many long trending lineaments traversing the Peninsula, were unknown. The availability of small scale IRS-1A Imagery have made it possible to delineate them (figure). The lineament pattern further reveals that in the area north- south trending lineaments are more pronounced and predominant in comparison to directions of other lineaments.

The analysis of the satellite imagery further reveals that the zig-zag alignment of coastal lines of north, south and east of peninsula are on account of the lineaments. The lineaments, being planes of weakness, have acted as loci for greater water movement and yielded to wave action than other portions, thus, causing zig-zag configuration. Since the tertiary sediments are observed to continue all along the coast, from south east to north west, systematic geological mapping, using large scale imagery and aerial photographs, is undertaken to delineate potential basins of lignite deposits.

REMOTE SENSING FOR PETROLEUM EXPLORATION

T J Majumdar, LRD, RSAG, Space Applications Centre

ON-SHORE EXPLORATION

The study has to deal with the location of hydrocarbon-bearing structures and is concerned with mostly subsurficial properties. Main focus is on establishing a proper correlation between the surficial expressions above oil bearing zones and the parameters measured by remote sensing.

Geophysical methods are widely used in petroleum exploration. In addition, recently remotely sensed images are also analyzed by visual interpretation techniques for targeting zones of petroleum occurrences qualitatively only. A synergistic and quantitative approach has successfully been attempted here to correlate geophysical data with remotely sensed information. A mathematical model has been developed based on multiple correlation and regression analysis to predict the probability of oil occurrence in different areas. The test areas chosen for this purpose are the Cambay basin (Gujarat) and the Brahmaputra Basin (Assam) in India. In the Cambay basin different sets of data (Landsat MSS, aerial MSS including thermal IR, and Magsat) have been used whereas in the Brahmaputra basin only Landsat MSS data have been used. The different types of remotely sensed data, e.g. Landsat MSS (Viz + IR), aerial MSS (Viz + IR + TIR) and different types of geophysical data, e.g. gravity, magnetic, seismic, were integrated. In addition, topographic data have been used to differentiate the different neotectonic zones. The linear as well as multiple correlationships of different types of data sets are tested and found to be quite satisfactory. The final prediction of the zone of oil occurrences is matching satisfactorily with the actual occurrences of the hydrocarbon-bearing structures in the Cambay basin, Gujarat as well as in Brahmaputra basin, Assam. A set of new probable zones of oil-bearing structures has been delineated in the upper ranges of the Brahmaputra basin which is considered non-oil bearing, in general. The correlation technique has been attempted with three different algorithms, namely linear, inverse and exponential. The linear relationship has yielded the best result. Similarly, in multiple correlation technique, correlations of MSS band 5, 7 and their ratio have been attempted with geophysical parameters. The band 5 yielded the best correlation and ratio of bands 5 to 7, the least.

A possible application of pattern recognition technique has been attempted for hydrocarbon exploration. The surface expression has relation with the sub-surface structure. The spectral information of these patterns is recorded along scene traces. On a two-dimensional graph, the mean reflectance value and the relationship of reflectance with distance for each scan trace has been plotted. It is observed that the dots, corresponding to each scan trace of an area with significant structure, form a well- defined cluster.

In the next phase of study, thermal IR data have been utilized mainly for two purposes, namely, construction of

subsurface structural isotherms and thermal inertia mapping. The calibrated thermal IR imagery of a part of the Cambay basin is utilized to determine the surface temperatures and to detect the heat-flow. Applying the conductive heat-flow continuation technique, the three-dimensional configuration of the hydrocarbon-bearing reservoir has been defined. The zone delineated by the present study coincides with the oil-bearing structures inferred by seismic survey. The results indicate the possibility of utilizing this technique as an effective tool for hydrocarbon exploration.

Generation of thermal inertia image and its possible geological application has been attempted over a part of the Cambay basin. Using the concepts of energy balance computation and also using the procedures involved in albedo computation and the digital registration of day time and predawn imagery, a thermal inertia map of a typical area of interest has been generated. An attempt has been made to correlate the thermal inertia anomalies with sub-surface structures. The analysis done here for a small area of interest shows the possibility of delineation of subsurface structures by thermal inertia mapping. In addition, Magsat vertical component (Z-component data over the Cambay basin have been used to generate the residual magnetic anomaly map. As it is well known that the major magnetic anomaly as obtained by satellite data have their origin lying in the lithospheric region and above, an attempt has been made to correlate them for prediction of basement depth in the area of interest. A strong correlation has been observed in the region of changing slope of the basin.

Some of the image processing techniques have been attempted for enhancing the typical geological features of interest, e.g. linear and anomalous patterns seen in the imagery. These include:

* Application of Haar transform for delineation of linear and anomalous patterns over a part of the Cambay basin.
* Extraction of shoreline and drainage patterns using edge detection and template matching techniques from aerial MSS thermal IR data over the Cambay basin with an attempt to automatize the threshold selection.
* Development of a digital filtering technique for extraction of directional components of linears in the Brahmaputra valley, Assam.
* The surface temperature modeling using INSAT-VHRR and MOS-1 VTIR data as well as generation of regional thermal inertia map over a hydrocarbon - bearing structure.
* Simulation of thermal inertia imagery using a model with day time HCMM data.

A mathematical model has been developed to determine the sedimentary thickness in a prograding deltaic system (West Bengal Delta). By applying the model, sediments accumulated during various geologic periods have been estimated. Since, petroleum occurring basins rarely show any signature on the surface, it is difficult to generate a set of optimal spectral bands with respect to petroleum exploration. However, an attempt has been made to generate a set of optimal bands using multispectral data over a known oil- bearing structure.

OFF-SHORE EXPLORATION

The basic concept behind off-shore hydrocarbon-bearing structure exploration relies on the fact that the shape of the sea surface reflects the distribution of the mass below and satellite altimeter can be used to infer this sea surface. However, corrections of the data required for the atmospheric effects as well as dynamic sea surface parameters, e.g. waves, tides etc.

Geosat/Seasat altimeter data have been preprocessed and suitably corrected to estimate the prospective geoid over western off-shore regions. The intensive test sites include Bombay-Ratnagiri and Kerala-Konkan basins. The prospective geoid information is being correlated with the existing sedimentary thickness over the area of interest. The other activities currently going on in this direction include gravity modeling using spherical harmonic expansion, high frequency and band-pass filtering of information related to crustal anomalies, regional profile plotting over Western off- shore using Geosat data, geophysical image generation, automatic stacking and cross-over corrections etc. Also, ERS-1 altimeter data analysis is being planned over the same region. The total effort is a part of a joint collaborative programme between ISRO and ONGC.

AGRICULTURE

CROP CONDITION ASSESSMENT : PAST, PRESENT AND FUTURE

Ajai & H P Bhatt,Space Applications Centre

Assessment of crop condition during its growth cycle is an important input in the production forecasting system. Crop production forecasts require accurate estimation of acreage for harvest, its geographic distribution and the associated crop yields as determined by local growing conditions. Both crop acreage and yield can vary from year to year and within year and therefore require periodic monitoring. An ideal forecast system is the one that can accurately assess current crop condition and can detect and rapidly respond to changes in the relevant conditions.

The term **crop condition** implies an evaluation of the degree of stress. The word **stress**, although difficult to define from physiological point of view, is commonly used to signify any effect on plant growth that is detrimental. The task of **crop condition assessment** requires *detection of stress, differentiation of stressed crop from the normal crop at a given time, quantification of extent and severity of stress and assessment of production loss.*

In order to develop a **crop condition assessment system** (CCAS) it was necessary to study the feasibility of using remote sensing technique for achieving each of the tasks mentioned above. Thus a large number of controlled field experiments were conducted during the last

decade to understand the spectral signatures and to address the basic questions related to spectral manifestations of crop stress, growth and conditions. Some of the important questions to be addressed were:

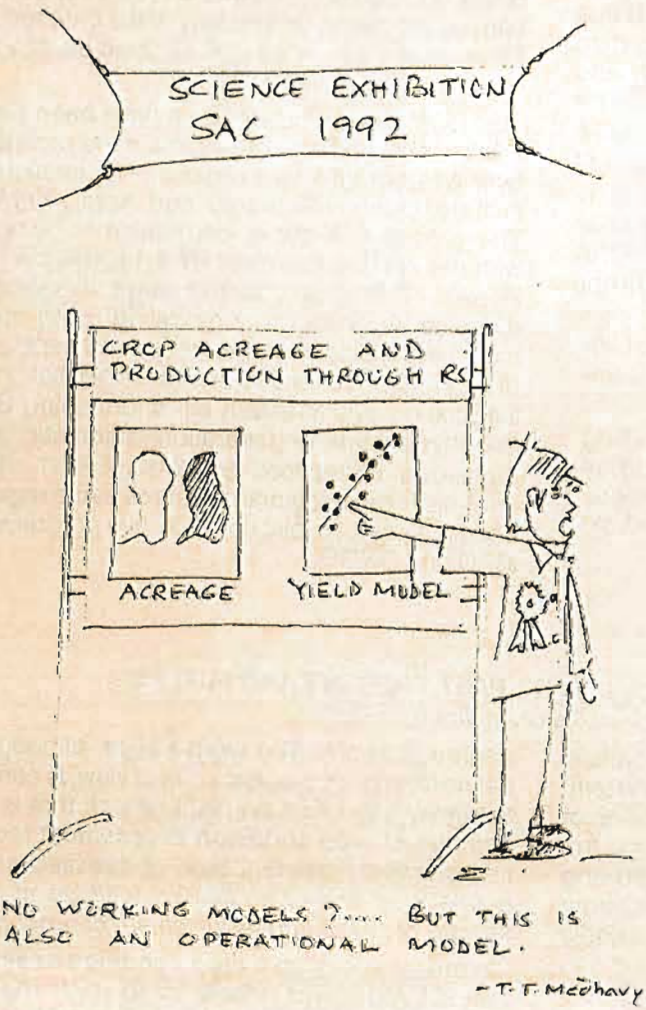
* Is there a significant change in the spectral reflectance/emittance characteristics of the plants undergoing different kinds of stress?
* Is it possible to quantify the degree of stress vis-a-vis spectral reflectance/emittance characteristics?
* what kind of relationship exists between the spectral response and growth variables?
* what are the spectral manifestations of the plants undergoing different kinds of stress

Concepts developed and inferences drawn from these experiments had led to the development of methodology for large area crop condition assessment using satellite data. The procedure developed was based on the condition assessment on grid cell basis. In this approach the area of interest is divided into geographically referenced grid cells of appropriate size and each grid is monitored individually. The index representing per cent of healthy pixels in the cell, called Green Index Number (GIN), is computed for each cell using the transformed multiband satellite data. Multidate data is used to generate GIN profiles for the cells. GIN data base is generated for 5-7 years. Current season's profile is compared with the **average normal profile** drawn from the data base for condition assessment. The procedure was tested for wheat crop in parts of Indore district of Madhya Pradesh. The procedure developed was further refined to give crop condition for a particular crop at district/tehsil level. This is being currently used for assessment of crop condition for cotton crop.

The Crop Condition Assessment System (**CCAS**) uses transformed IRS data to give cotton crop condition during its growth cycle. Here, the output from cotton acreage estimation is used in generating a **cotton mask** and is fed into CCAS as an input. The procedure consists of registration and radiance normalization of multidate data, generation of vegetation index (VI), vegetation index number (VIN) and its time profiles for each cell. The VINs computed for each cell are aggregated over district ar finally district VIN profile is generate and stored in the data base. This data base along with the weather data is used in crop condition assessment.

Use of canopy temperature based satellite derived indices in estimating evapotranspiration, crop stress detection and condition monitoring has been attempted in limited cases. Canopy temperature based indices are very sensitive to crop, water status and responds well to fast changing weather variables. These indices are thus useful in providing the crop conditions on a day to day basis whereas the spectral VI responds to integrated effects over a period of time. A lot of research is still needed in this direction.

The use of data from active microwave sensors in crop condition moni toring specially in kharif season s requires a lot of R&D and therefore becomes a potential area for further research. Measurement of laser induced fluorescence from plants is another recent area of research in the field of crop condition assessment. Chlorophyll fluorescence, which is a signal related to the performance of plant photosynthetic apparatus, seems to be the most promising approach for detection of different kind of plant stresses including that of soil and air pollution.



HYDROLOGY

CHANNEL PATTERN CHANGES OF THE SUBANSIRI RIVER IN ASSAM DECIPHERED FROM THE SATELLITE DATA OF 1985-88

S D Naik, Space Applications Centre

The Subansiri river, one of the major tributaries of the Brahmaputra river in the north bank, rises in the snowy part of the Central Himalayas having an average height of 5182 m. After traversing through the Miri hills, the river enters into the plains near Dolongmukh to below 152 m in the foothill zone. It flows through the plains for about 72 km southwards and takes south-westerly course till it meets the Brahmaputra river. While flowing through the alluvial plains of Assam, the Subansiri river undergoes frequent shift in its meandering course . The changes in

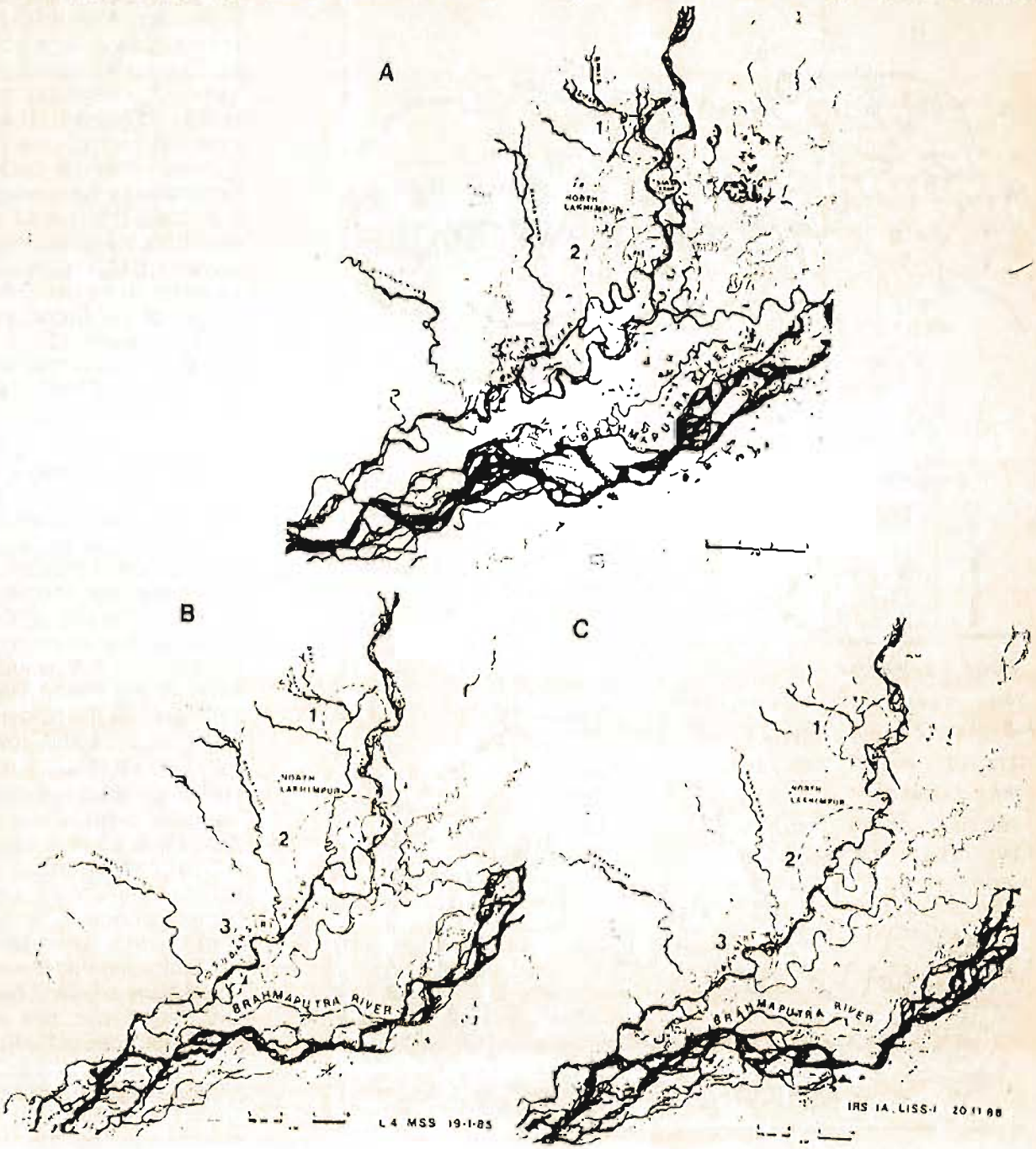
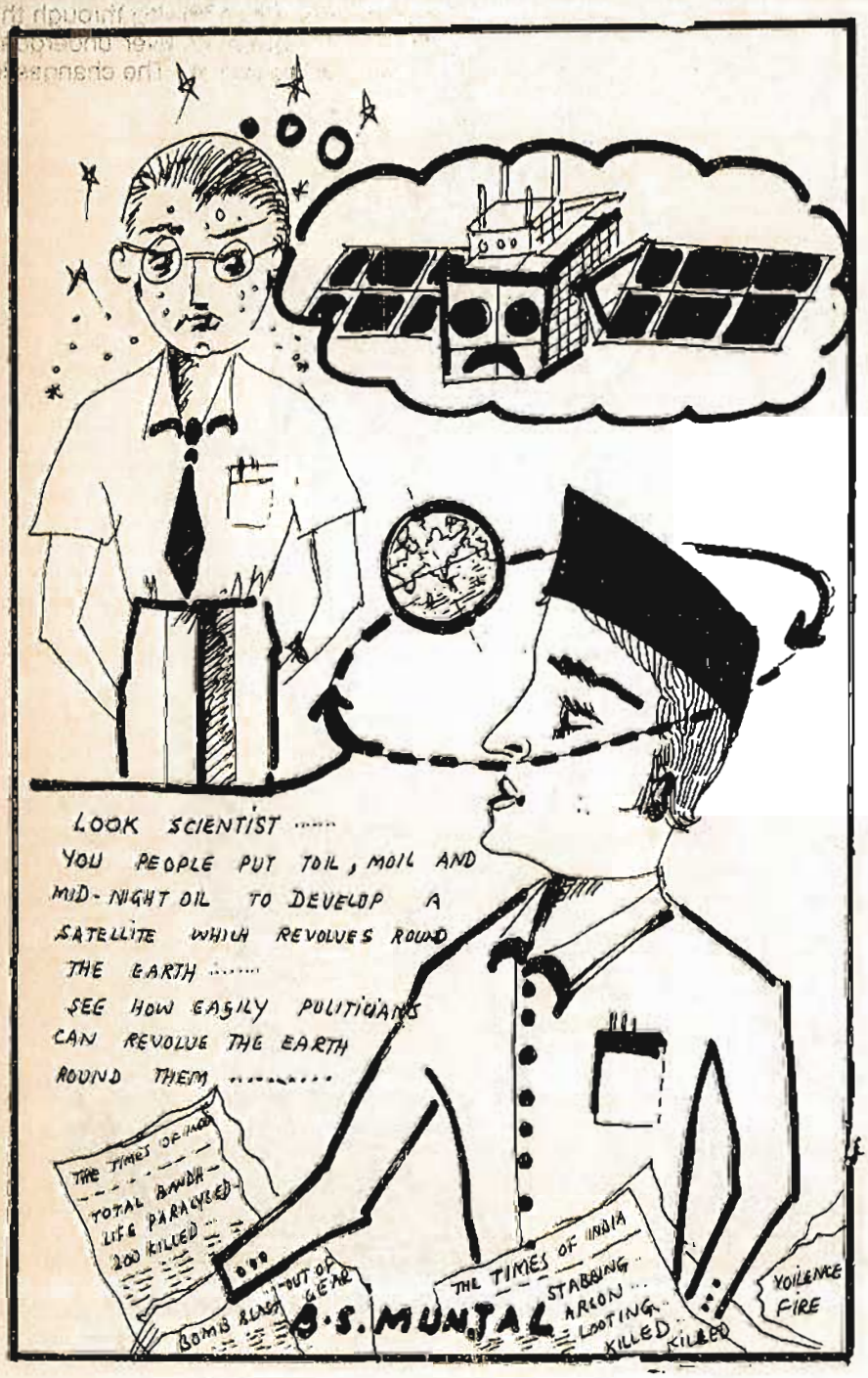


Figure 1 : Channel pattern of the Subansiri river as seen on the topographical map (A) and deciphered from the Landsat imagery of 19-1-1985 and IRS-1A imagery of 20-11-1988 (C).

its channel pattern observed from the satellite imagery of the period 1985-88 are briefly outlined in this note.

The channel pattern of the Subansiri river flowing through the alluvial plain of Assam upto its confluence with the Brahmaputra river as presented by the Landsat MSS scene of 19.1.1985 and IRS-1A LISS-1 scene of 20.11.1988 is shown in figure. The data was interpreted at the scale of 1:250,000. Stream course of the Subansiri river as shown on the Survey of India topographical map is presented in figure A. The course of the Subansiri river deciphered from the Landsat MSS of 19.1.1985 and IRS-1A LISS-I of 20.11.1988 has been shown in figure B and C respectively. Comparison of the channel pattern as seen on the topographical map and as deciphered from the satellite images indicates that the river course has undergone considerable shifts in its course within the period under consideration.



After debauching into the plains, the Subansiri river flows towards south in the meandering pattern. A notable change in its course is seen near the confluence of its tributaries namely the Bagi and the Dirgha rivers (inset 1). The bifurcated stream course of the Subansiri shown in the topographical map has undergone significant changes as is evident from the satellite images covering this part of the Subansiri basin. Stream course of the Subansiri river has taken a sharp bend causing severe bank erosion during 1988 affecting the landmass measuring for about 2 sq. km in extent.

While flowing towards south the Subansiri river, during the period 1985-88, has adopted a shorter channel by flowing in the direction of southwest as shown in inset 2. This segment of the river has undergone major changes in its course during such a short period. The study of the IRS-1A imagery indicates that the tendency of this river is to shift towards west in this particular area.

In its southwesterly course near the confluence of the Ranga river with the Subansiri river, a gently meandering pattern has developed a sharp bend in its course as is evident from the IRS- 1A imagery of 1988, bringing additional area under bank erosion (inset 3). The Ranga river, one of the major tributaries of the Subansiri river, has indicated shift in the course of its lower reaches. This is in particular clear from its rectangular bend which has become nearly straight by shifting about 2 kms westwards.

OCEANOGRAPHY

OCEANOGRAPHIC APPLICATIONS OF VISIBLE BAND IMAGES FROM INDIAN OPERATIONAL REMOTE SENSING SATELLITES

Satyendra M Bhandari, Space Applications Centre

Ever since the birth of Satellite Oceanography, more than two decades ago, satellites have become a vital part of the oceanographers kit - much like the CTD or the Echosounder. Satellite based remote sensing has helped in extending the oceanographer's view to include basin and global scales. As a result, a variety of new oceanic processes and phenomena have been explored and understood.

Most of the satellite based ocean observations have come from sensors onboard satellites launched by the U.S. - for example the AVHRR onboard NOAA, CZCS & SMMR onboard NIMBUS etc. A number of satellites specifically designed to cater to the need of the oceanographers have also been launched by U.S. over the last two decades. These are GEOS-3, SEASAT, GEOSAT and TOPEX. Imaging radar sensors were also flown on SIR-A and SIR-B missions. Recently the European Space Agency (ESA) and Japan have launched satellites specially configured for ocean remote sensing (ERS-1 and JERS-1). India is also contemplating to launch its own dedicated met/ocean satellite sometime during the 90s.

While oceanographic community in India has shown interest in the analysis of data from different satellites whenever available, there is no systematic effort to investigate oceanic regions around India. This is so because there is no Indian satellite for oceanography with assured and continuous data availability.

For several years , however, India has successfully operated IRS and INSAT series of operational remote sensing satellites for natural resources and weather monitoring, respectively. The sensors onboard these satellites are not optimized for oceanographic applications. Nevertheless, the long term database of high resolution high quality state-of-the-art images generated by these satellites provide tremendous opportunity to systematically explore and study a variety of oceanographic phenomena over the oceanic regions surrounding India. The LISS-I and II, onboard IRS, provides multispectral images in the visible (0.4-0.7 μ) and VHRR onboard INSAT operates in the visible (0.55-0.75 μ) and the thermal IR (10.5-12.5 μ) window regions of the atmosphere. IRS and INSAT images therefore contain significant amount of *Oceanographic* signal to be extracted and utilized for oceanographic applications.

The INSAT-VHRR thermal IR band images have been used in a few applications to locate some ocean surface thermographic features e.g. eddies and fronts. The strong thermal gradients in VHRR images over the shelf-slope region have been used in fisheries application. On the other hand, the visible band images have largely been ignored as far as oceanographic applications are concerned.

Here we intend to highlight the potential utility of high resolution IRS and INSAT visible band images for oceanographic studies.

LISS-I & II onboard IRS produce high resolution (~70 and 35 m) wide swath (140 and 70 km) images in four spectral bands in the visible region once every 22 days. With the simultaneous availability of IRS-1A and 1B in suitably staggered orbit, the frequency of imaging a given place reduces to once every 11 days. With these imaging characteristics IRS images permit exploration of mesoscale and submesoscale oceanographic phenomena. Of course, ocean imaging in the visible band would be restricted to cloud free regions.

Using IRS images we have successfully studied the characteristics of large internal waves occurring in the Andaman sea region. In spite of the fact that Andaman sea region is frequently cloud infested, a careful search through the large LISS-I browse database has revealed a number of cases of clear surface signatures of subsurface internal wave activity. Finer resolution LISS-II images under suitable conditions show presence of swell propagating over the ocean surface. Study of evolution of wavelength and direction of these large gravity waves can be used to infer the ocean bottom topography. A number of IRS images also reveal a variety of surface features which help in visualization of surface flow field. Also present are signatures of naturally occurring oil slicks which are good indicators of surface current patterns in the region.

VHRR onboard INSAT series of satellites, on the other hand, provide frequent (say 3 hourly) simultaneous visible and thermal IR band images covering the entire oceanic region of interest. Cloud free IR images provide valuable source of information to study the surface thermographic features and their time evolution. These find applications in studies of boundary currents, fronts and eddies etc. Again the vast amount of visible band images have not found favor with the oceanographic community.

We have explored the phenomenon of **Sunglint** which regularly occurs in all daylight visible band VHRR images. Sunglint is the specular reflection of sun imaged by the sensor. The detailed characteristics of the observed sunglint signatures are a function of the sea-state (i.e. state of roughness of the sea surface) and the observation geometry. We have analyzed the sunglint signatures in INSAT visible band images to estimate surface wind speed over the glinted area. Sunglint signatures provide a valuable and complementary source of wind information over the oceanic regions.

These and many other oceanographic phenomena and processes can be explored with the storehouse of already available IRS and INSAT images. Both IRS and INSAT are operational satellites with assured availability in the years to come. At present, data collection from IRS is primarily dictated by requirements of land resources studies.

Therefore the ocean coverage of IRS extends only upto the continental shelf regions of the country. For meaningful oceanographic studies it would be worth extending the IRS coverage to open ocean areas over the Arabian sea and Bay of Bengal. It would also be desirable to operate LISS cameras with high gain settings over low radiance ocean scenes. Whenever appropriate and necessary, these data can be supplemented with other concurrently available high resolution images from LANDSAT,SPOT, NOAA, ERS-1 etc. to gain a deeper understanding.

In future, India is planning to upgrade the IRS system with sensors providing improved resolution, wider swath , spectral coverage extending to middle and thermal bands as well as sensor tilt capability allowing more frequent revisits of a given area. These developments would increase the ocean information content of IRS images further.

The importance of satellite images in oceanographic studies lies in the opportunity it offers to visualize surface flow fields and their modifications by subsurface processes on scales impossible to obtain with in-situ localized ship based measurements. Sometimes it is difficult to quantify such a contribution, but often the insight gained by examining these images may give rise to new discoveries. It is with this hope the attention of scientists interested in oceanographic studies is drawn to the long multiyear data base of high quality images over the oceanic regions surrounding India produced by indigenous operational IRS and INSAT series of satellites.

SPATIAL INFORMATION SYSTEMS

SOME THOUGHTS ON REALIZATION OF A SOIL INFORMATION SYSTEM (SIS)

B S Lole and R K Goel, Space Applications Centre

SYSTEM REQUIREMENTS

A Soil Information System (SIS) can be visualized as a computerized mechanism which manages spatial and non-spatial data in support of soil survey and which can facilitate generation of interpretative maps and tabular outputs showing potentials and problems of soils for various development planning tasks such as

* watershed management (soil and water conservation and integrated watershed development)
* wasteland development
* forest and pasture development
* agriculture development and
* urban development etc.

Soil Information System (SIS) should be able to

* accept and manage a variety of input data sets available in tabular as well as map form at different scales
* validate and update the data base contents
* inter-relate various data sets in spatial as well as tabular context
* manipulate the spatial as well as tabular data and provide interface to other systems
* provide a user friendly interface in order to retrieve the information in desired form
* provide appropriate tools to assemble the data sets for publication.

Primary input data on soils is collected in the form of hand written notes, formatted data with text and abbreviations, in a particular form with codes, user related forms, hand held data sheets, grid maps, final maps and analytical data related to typical pedon. The data could be collected in various stages on different aspects like

* meteorology (climate from IMD)
* crop data on regional and/or area basis from agriculture departments, statistical offices or universities
* landuse from village records, Directorate of Economics or Remote Sensing
* Geology from GSI or Department of Geology and Mining
* Analytical data based on laboratory analysis
* soil morphology from field
* soil maps from field or remote sensing

GIS - CORE OF THE SYSTEM

Such an SIS would require to handle a large amount of input data sets in various forms. A Geographical Information System (GIS) which provides a mechanism for managing georeferenced data sets in an integrated manner, would have to be the core of SIS. Furthermore, the input data sets will have to be integrated and analyzed in order to generate the interpretative maps as mentioned above. A GIS providing tools for manipulation and analysis of geo-referenced data sets would be very essential for realization of SIS. Capability of a GIS to be able to treat the geographic coordinates and attributes of spatial features separately and at the same time in a related manner would be very much essential. Various other GIS tools would be required for integration of different spatial data sets on topography, landuse and water resources via. overlay analysis, proximity analysis for interpretation of relationships amongst the soil areas and for non-spatial data modeling of soil units and spatial depiction of the results.

DATA BASE DESIGN AND CREATION

Design and creation of an integrated data base is of utmost importance for realizing an effective SIS. The first task would be the identification of complete set of input data elements considering the needs of generating outputs, non-redundancy and multiple usage of single data element. Spatial inputs in map form could be on map sheet basis at different scales. Non-spatial inputs may be based on a variety of units. On the other hand the outputs may have to be generated on the basis of hydrologic units, forest units or administrative units for different functions. It is therefore desirable to organise the data base in a manner it facilitates three different views.

User's view (functional schema) which provides an illusion of functionality to the organization of data base as

per the end uses like watershed management etc. At the same time another user view could be the logical schema which facilitates retrieval of spatial information on different types of spatial units like watershed, forest range, taluk etc. Internal storage (physical schema) will have to be decided based on the spatial units of input data availability. Such an organization will have to be supported with data base dictionaries providing means of across view translations.

The data entry into the system would be via map digitisation and direct entry through alpha-numeric terminal. Prior to the input of individual maps into the system, a spatio-tabular framework has to be laid down.

USE OF GIS FOR BRACKISH WATER AQUACULTURE SITE SELECTION IN WEST BENGAL

M C Gupta, Space Applications Centre

Fisheries in India is an established sector so far as marine fisheries of coastal waters is concerned. However, much remains to be done in offshore waters. There is ample scope for development of brackish and inland fisheries. Government of India (GOI) and Food and Agriculture Organization (FAO) have identified a Brackish Water and Inland fisheries project covering the development of brackish water shrimp culture and culture-based fisheries. This project has selected 14 sites from three states viz West Bengal, Orissa and Andhra Pradesh.

This note presents the work done for brackish water aquaculture site selection viz data collection, data base creation and development of a menu based user friendly software using Simple Macro Language (SML) around Geographic Information System (GIS) for two selected sites of West Bengal namely Digha and Dadanpatra. Figure shows an integrated map of Digha and Dadanpatra sites of West Bengal. It includes landuse, road network, habitation, population and village codes.

Aquaculture is one of the source of export earning to India. It also creates employment opportunities to the skilled and unskilled rural poor. However, production levels are low due to scarcity of seed during the year and the lack of compound shrimp feeds. Thus there is a need to exploit aquaculture resources and to use newer methods to enhance the production as well as the export earning.

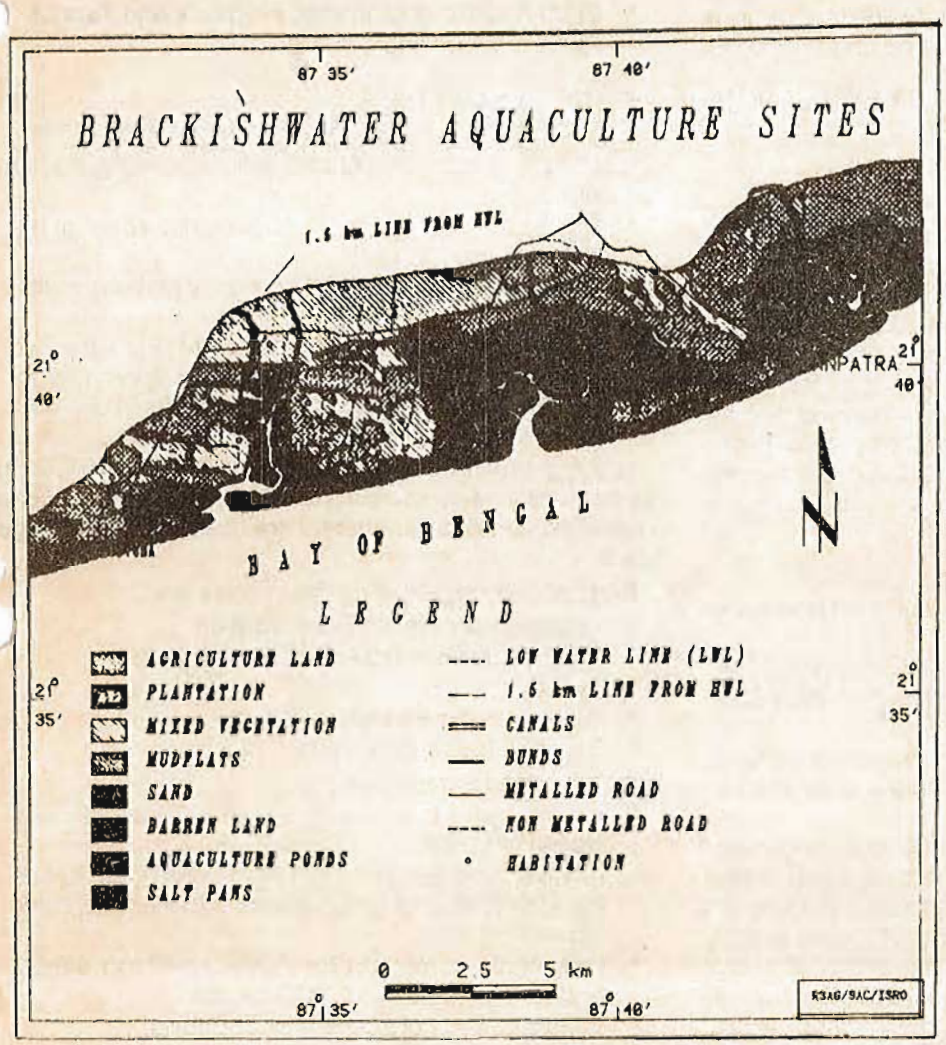


Figure 1 : Integrated Map of Digha and Dadanpatra sites in West Bengal.

An attempt has been made to develop a model for prioritisation of sites by integrating various parameters such as engineering, ecological, infrastructure, demographic and meteorology using weightage factors to help planners/decision makers in selecting aquaculture sites. In the model, the weightages are assigned to the parameters in two steps.

The percentage weightages are assigned among the parameters depending upon their importance in selecting aquaculture sites. Parameters like water salinity, soil texture, seeds availability, feeds availability and population around site are given higher weightages. Certain other parameters like air temperature, water temperature and training are given lower weightages. In the second step, weightages are assigned to the parameters individually depending upon their suitability for aquaculture.

Thus a cumulative weight is calculated for various sites by taking into accounts all the parameters for ranking the sites for their suitability for aquaculture development

IMAGE PROCESSING AND DATA PRODUCTS GENERATION

PHOTOGRAPHIC DATA PRODUCT GENERATION ACTIVITY AT SAC

A K Shukla, Space Applications Centre

Generation of photographic data product has been a very important activity in the overall data product generation system and was started at SAC since Bhaskara-I time frame. Bhaskara-I and II data product generation gave us valuable experiences to design and establish operational procedures for photo product generation in the country. During initial stages of IRS-1A project, well defined procedures were laid down after extensive experimentation conducted jointly by SAC and NRSA. A new set of photographic data product specifications were evolved for IRS-1A. Strict quality control criteria were established to supply better quality data products to user community. At SAC, a large number of IRS-1A precision and special data products were generated for dissemination to users. The R&D activities for the testing of IRS-1B and ERS-1 data product generation software and to operationalise at NRSA needed several checks at photo product level at SAC. Today, with the existing capability, the laboratory is involved in the generation of R&D Stereo and PAN product for IRS-1C, INSAT VIS/IR data product, ASAR data product and apart from other remote sensing user requests, special data products such as Gujarat Mosaic and India Mosaic FCC. Following facilities are currently available at the centre:

* Colour FIRE 240 film recorder
* Joyce Loebl photowrite system
* Kreonite E-6 and C-41 Colour film processors
* Colenta R-3 and One shot colour paper processor
* Luth B/W film processor
* Logeline B/W paper processor
* Durst 1840 and 2000 Colour enlarger
* Klimsch contact printer
* ESECO process monitoring system
* Klimsch linear measuring instrument
* Joyce Loebl Micro densitometer
* SICO Spectro photometer, PH motor and Titrator
* Klimsch microfiche camera

QUALITY EVALUATION OF OPTICAL SENSOR DATA

S S Palsule, H S Bhatt, Mritunjay, Bankim Shah, Pushpa Shah, H K Garg and C V S Prakash, Space Applications Centre

INTRODUCTION

The underlying concept of data quality evaluation in remote sensing satellite mission is the analysis of satellite imagery given a landscape of the object imaged. The comparative analysis could be performed visually in qualitative manner on photographic product (media) and measurement can quantify radiometric and geometric aspect of data with reference to specification of the product. The other comparative analysis is performed digitally in quantitative manner on Computer Compatible Tapes (CCTs) and this media allows data handling more dynamically and efficiently. The harmonic analysis quantifies frequency content of the image.

OBJECTIVES

The basic objective of data quality evaluation is to evaluate

* functional performance of sensors (payload) on ground and on board using calibration data and scene data.
* stability analysis of platform by comparing ground control points on image scene data and reference map data.

The evaluation could be quantified by analyzing radiometric and geometric aspect of scene data. Each aspect is translated into radiometric and geometric parameters and derived from user defined products which are already generated by applying radiometric correction (detector normalization) and geometric correction (platform related) on photographic and digital media at various levels.

PARAMETERS OF EVALUATION

The parameters of data quality evaluation are broadly classified for nadir viewing and oblique viewing and are as follows..

* Radiometric parameters which signify spectral behavior of image data.
* Geometric parameters which signify platform stability
* Modulation Transfer Function (MTF), Effective Resolution Element (ERE) and Point Spread Function (PSF) signifying the spatial behavior in conjunction with spectral fidelity.

The radiometric parameters are basically engineering performance parameters from calibration data and scene based radiometric parameters are observed from image data.

Engineering performance parameters are

* validation of detector normalization
* radiometric error (standard and temporal)
* dynamic range
* detector behavior with time
* Signal to Noise (S/N) ratio

Scene based parameters are

* relative band behavior of target radiance at satellite/aircraft level.
* relative band behavior for target reflectance at satellite/ aircraft and ground level (after atmospheric correction)
* look angle correction for mirror scanning sensor and for oblique view of CCD sensor
* dynamic range of scene and landmass
* saturation radiance
* effect of sun angle on normal and oblique viewed images

The geometric parameters are based on viewing ge-

ometry of payload from satellite platforms and they can be classified as:

* The parameters which affect dynamically the image scene due to attitude rate, velocity , height variation of the platform and modelling error.
* Geometric parameters which do not change rapidly but changes its viewing geometry with reference to ground measured references. The change may occur due to displacements induced by vibration generated during launch or misalignment due to thermal conditions. These parameters are basic viewing angle of satellite axis which has to be computed after launch and could be verified seasonally at six months interval. The dynamically affected parameters are:
* scale and scale variation
* location accuracy
* internal distortion

These parameters are functions of attitude values, height and velocity variation. They are also analyzed from ancillary computer compatible tapes (ACCT).

All parameters mentioned for satellite sensor are valid for airborne sensors. In the absence of Inertial Navigation System (I N S) data for aircraft platform, polynomial fitting method is used for comparing image and map data.

The other parameters which are static in nature can be called as bias matrix and classified as:

* Sensor alignment with spacecraft axis
* Inter sensor alignment angle
* Band to band registration
* Sidelap and overlap of sensor frames

Evaluation of all geometric parameters is based on Ground Control Points (GCPs) and Relative Control PointS (RCPs).

Parameters like MTF, ERE and PSF are evaluated both from natural test sites and on artificial test sites. Anisomorphism is yet another parameter which is a measure of variation in spatial resolution due to integration time variation and jitter in platform. It is computed from GCP's which are distributed over a circular shape on ground and normally seen as ellipse on image data. Sidelap and overlap of scene data quantifies orbital drift during mission.

At present following packages are operational at NRSA, Hyderabad.

* CALANL- Engineering performance of sensor from calibration data
* SCNEVAL- Scene based radiometric parameters
* GEOEVAL- Geometric parameters
* ACCT- Platform behavior from ACCT (Ancillary computer compatible tapes)
* MTF and ERE- from contrast of natural target

Accuracies obtained for IRS-1A/1B

Parameters	Accuracies	
	IRS-1A	IRS-1B
List of abnormal detectors(from onboard calibration data and scene data)	23 - detectors (1088:1120) of LISS-1	58 detectors (153:185, 1531:1555) of LISS-2B
Standard Error (from onboard calibration data)	2 to 3%	1%
Dark current	1 count	0 count
Dynamic Range	0-127	0-127
S/N Ratio	255	255
Inter sensor calibration	10%	3%
Detector Normalisation	±1 count	±.5 count
Location Accuracy	±2.5 km (RMS)	±1.2 km (RMS)
Scale	.5%	.5%
Internal Distribution	±5 pixels	±5 pixel
BBR	± .8 pixel	±.3 pixel
Side lap of two cameras	32 pixel	74 pixels
Overlap of two frames of LISS-1	352 scan lines	347 scan lines

S/N ratio is defined as ratio of mean to standard deviation and standard deviation is half count.

CALIBRATION ANALYSIS OF OPTICAL SENSORS

H S Bhatt, R N Acharya, S S Palsule and CVS Prakash, Space Application Centre

The CALIBRATION is the determination of the quantitative relation of detectors response to uniform input value it is intended to measure. The calibration under consideration is the amplitude calibration of LISS camera. Amplitude calibration involves measurement of the proportionality factor between a change in radiant (radiance) input and the corresponding change in output units of the system as digital numbers. This factor is called gain. Also the relation must be known between some fixed lowest reference point on the input scale and a corresponding point on the output scale, a relation called offset.

LISS camera of IRS 1A/1B records radiance reflected from earth surface in four bands. Each band contains a 2048 element linear array of charge coupled devices. The scanned earth's surface energy in push broom mode is converted into electrical signal and this signal is converted to digital number in the range 0 to 127. The photo response of each detector from the detector array is different for uniform input intensity due to responsitivity of each detector. Establishing a relation between input and output of each detector of an array is a GROUND CALIBRATION exercise during prelaunch period. The ground calibration set up consists of an integrating sphere of 10" aperture as the light source which uniformly illuminates the payload. The different intensity (radiance) level is obtained by changing lamp current combination. This intensity (radiance) is measured by hand held indigenously developed ground truth radiometer. The camera is interfaced to satellite interface simulator and a VAX 11/750 computer. The output of camera is recorded on magnetic tape (CCT). Each file of CCT corresponds to 128 lines (records) of 2048 detectors array (Record length) for one intensity level and six such files are recorded for six intensity levels. The calibration data is recorded for all cameras (3), all bands (4) and all gain settings (4) of each camera, , 3 temperature values (15°C, 20°C, 25°C) and two power supply options as normal and standby.

The processing and analysis of recorded data involves

* Generation of curve for mean count vs detector number which provides the spread of response to input intensity over the whole array
* Line fitting between six input intensities (radiance) and corresponding counts (digital number) as outputs using least square fit.
* Generation of detector normalized curve as count vs detector number
* Statistical table for first, second and third minimum /maximum count, standard deviation and radiance with respect to detector number
* List of abnormal detectors or detectors deviating from normal behavior.

The straight line curve of each detector is called a **light transfer characteristic** curve which gives gain and offset coefficient for (2048 X 288) detectors. If this curve could not be fitted within a count for more than two intensity level and if normalized curve for any intensity is not within a count, the ground calibration exercise is repeated for those specific conditions. The saturation radiance of detector corresponds to maximum count of127 and minimum saturation radiance of an array is used for normalizing the curve to avoid striping near high counts. The detailed analysis is carried out to quantify dependent/independent parameters like combination of gain number, temperature range and power supply. The normalized look up tables (LUTs) are generated for each detector, band and camera. This LUT is the basic input for applying radiometric corrections (detector normalization) for scenes acquired from satellite. LUTGEN software package is an operational package for generating LUT of any camera.

The gain and offset factor of each detector changes (degrades) with time and this is monitored using onboard calibration data. The onboard calibration system is based on light emitting diode (LED), the illumination of the two LEDS's are powered on ground command. The two LEDs generate 12 intensity levels by changing current values and exposure duration. This data is obtained as reference data during thermovac testing of payload for various engineering conditions. On board calibration data is acquired once in every cycle. CALANL software package at data reception station computes (near real time) a list of abnormal detectors. Detail analysis of each detector is performed using CALDQE software package at Balanagar, Hyderabad, in an hours time.

Operational software package GNDCAL and LUTCAL has been developed to analyze onboard calibration data during thermovac test and ground calibration data for detector characterization during prelaunch period respectively. Both the packages give detailed analysis of each detector in a few hours after data being recorded. This analysis gives input to payload engineers for i) accuracy of calibration set up ii) detector performance for various camera set up conditions.

To summarize results of on board calibration data for IRS 1A in 3 years time, it is found that standard error is within 2% and dark current value increase by 1 count for some bands, while for IRS 1B we find in one year standard error is within 0.5% and dark current is at zero range. Ground calibration data exercise of IRS 1B for all camera provides normalization within 1 count. IRS 1E LISS-E camera provided normalization within 2 count for band 1 and band 2 and the other bands it is within 1.5 count for the three input intensity levels provided to us. The same package has been used to analyze ground calibration data recorded for MEOSS payload at DLR Germany and with three intensity values. normalized curve is within one count.

SENSORS

Minimum Saturation Radiance and Count to Radiance conversion factors for various bands of IRS - IB LISS

	Minimum Saturation Radiance (mw/ Cm -Sr -u)			Conversion Factor K : (mw/ Cm - Sr - u) * 100		
	LISS - I	LISS- IIA	LISS- IIB	LISS - I	LISS- IIA	LISS- IIB
Band 1	16.69	15.74	15.18	13.30	12.39	11.95
Band 2	17.84	24.60	24.49	14.05	19.02	19.28
Band 3	16.85	15.85	15.22	13.27	12.48	11.98
Band 4	17.06	15.83	15.12	13.43	12.46	11.91

Source : A S Kiran Kumar and K Mathew, in NNRMS Bulletin - 16 (Nov, 1992)

INSAT-2 VERY HIGH RESOLUTION RADIOMETER

VERY HIGH RESOLUTION RADIOMETER (VHRR) is one of the major payloads onboard INSAT-2 series of spacecrafts to carry out Meteorological observations in the visible (0.55-0.75 microns) and thermal infrared (10.5-12.5 microns) bands. The ground resolution at the subsatellite point is nominally 2km x 2km in the visible and 8 km x 8 km in the IR band. The incoming radiation is reflected onto an 8-inch aperture R-C telescope by a Beryllium scan mirror mounted at 45 deg. to the optical axis. The optical system includes a gold film dichroic beamsplitter which transmits visible light energy and reflects IR energy so that the radiation from earth is channeled to the visible and IR focal planes simultaneously. The detector configuration consists of two staggered arrays of four silicon photodiodes each sensing in the visible band and two Mercury-cadmium Telluride detectors operating nominally at 105 deg. K sensing in the Thermal - IR Region. The Scan mirror is mounted on a two-axis gimballed scan mechanism system to generate a two dimensional image by sweeping the detector instantaneous field of view across the earth's surface in East to West (fast scan) and North to South (slow scan) directions. Four contiguous visible lines alongwith a registered IR line are generated during the fast scan at the end of which the scan mechanism steps in N-S direction by one IR IFOV. Scan direction in fast scan is reversed at the end of every line to improve scan efficiency. Three modes of operation are provided.

* Full frame mode scans 20 deg x20 deg minimum in about 33 minutes covering the entire earth disc and some space around.
* Normal mode covering 14deg N-S x 20 deg. min E-W in about 23 min.
* Sector mode in which the sector can be positioned anywhere in steps of 0.5 deg. in N-S direction to cover 4.5 deg N-S X 20 deg minimum E-W is particularly suited for rapid, repetitive coverage during severe weather conditions like cyclone.

The 20 deg coverage in E-W direction ensures cold space view at both the ends of the scan line. This is used for DC restoration and as a calibration point for IR and visible channels. In orbit IR channel calibration is realised by viewing an internal black body at the end of full frame and normal frame modes as well as when commanded in sector scan mode. The temperature of the blackbody is accurately monitored at five locations and transmitted in VHRR data stream.

The visible and IR detector outputs are individually amplified, band limited and digitized by ten bit A/D converters. The digitized data of all the channels, house keeping information, calibration data etc. are formatted, randomized and transmitted serially in the extended C band.

The INSAT-2 VHRR differs from INSAT-1 VHRR in several significant ways in the design approach as well as in system realization to provide functional improvements and operational flexibilities. The salient features include:

* Better resolution : 2 km in visible and 8 km in IR band.
* The optics design employs R.C. telescope with a novel concept of a Dichroic with a wedge angle and curvature.
* No auxiliary optics requirement for Visible channel.
* Patch control possible at 8 different control points in the range of 105 - 115 deg. K.
* Full redundancy for Path control and monitoring
* Visible detector staggering for better SNR, lower cross talk and contiguous scan line generation.

A very important aspect of INSAT-2 VHRR development is the high level of indigenisation achieved. Apart from overall design, design analysis, integration and evaluation at the payload level several critical components and processes have been developed and qualified for flight

use inspite of the tight time schedule and stringent demands put forward by the state-of-the art performance requirements of the VHRR payload. Various ISRO centers as well as Indian industry have been involved in the development of VHRR.

The first flight model of VHRR was integrated with INSAT-2A spacecraft and launched on 11 July 1992 from KOUROU by ARIANE rocket. It was operationalised on August 6,1992 after detailed on-orbit performance evaluation. The India Meteorology Department is operationally using INSAT-2A VHRR data since then. The second flight model currently under Test and Evaluation at SAC will be integrated with INSAT-2B spacecraft for launch by ARIANE later this year.

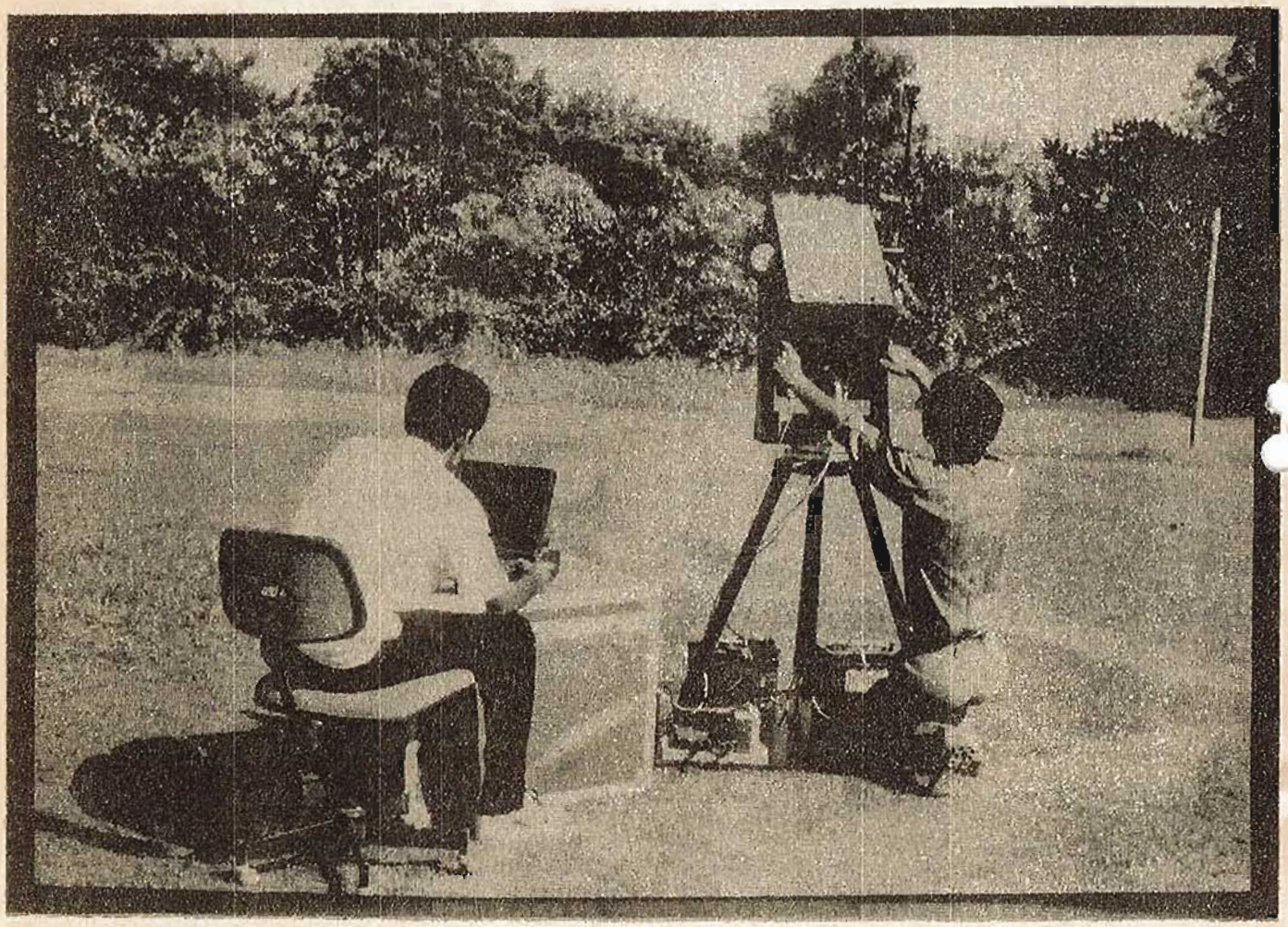
Source : Electro-Optical Sensors Group, Space Applications Centre

OPERATIONALIZATION OF PROBAR - A NEW TOOL FOR AEROSOL MONITORING AND SPECTRAL SIGNATURE STUDY

A.K. Shukla, Y P Desai, A Garg and K S Pandya, Space Applications Centre

PROBAR is a **programmable band radiometer** meant for the recording of simultaneous spectral radiance and irradiance in the visible and NIR region. The equipment was obtained from M/s. Moniteq, Canada and was received in damaged condition without any further technical support from the company which has been closed now. Recently, the equipment was brought to working condition with in-house efforts and satisfactory performance was obtained.

PROBAR has the concept of a spectrometer and the spectrum falls on 128 element CCD array and the Pbs detector. The 400 μm to 1100 μm spectral range are detected by CCD whereas 1.5 um to 1.75 μm and 2.08 μm to 2.35 μm are detected by Pbs detector. The spectral bands have been programmed in PROBAR for IRS, Landsat-TM, SPOT and thirteen 5 nm narrow bands. However, it is possible to program any spectral band of interest. A

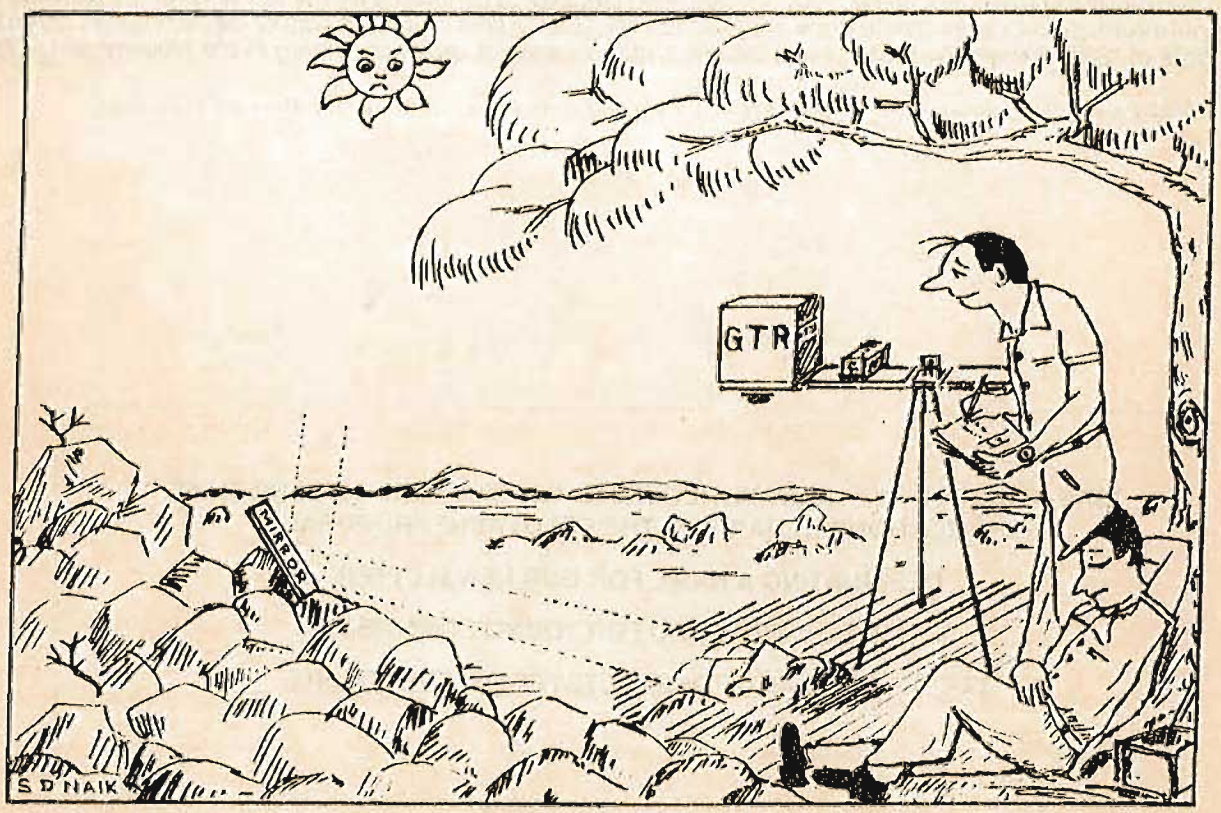


PROBAR in operation

maximum of three bandsets of sixteen each can be programmed in PROBAR.

The wavelength calibration of 128 element CCD array has been performed using mercury source upto the accuracy of 2 pixels. The spectral calibration of PROBAR has been done using 1000W calibrated tungsten light source for 1° FOV and 15° FOV. The radiometric correction software has been developed to process raw data obtained on Lap top PC using calibration coefficients. The pointing accuracy of PROBAR has been achieved better than +/- 0.50 degree. Repeated measurements has confirmed the equipment measurement repeatability of +/- 0.5%.

PROBAR has been used operationally at KANIJ test site selected for data product calibration. Using 15° FOV, PROBAR was used to measure reflectance of sand in satellite bands while 1° FOV was used to record direct solar irradiance in thirteen narrow spectral bands. The experiments were conducted synchronous with IRS and Landsat passes. The radiometrically corrected PROBAR data was used to construct Langley plot for the determination of total optical depth of atmosphere and aerosol optical depth. The realistic particle size distribution derived from the inversion of spectral optical depth measurements taken by PROBAR has been used to compute path radiance. Based on the total optical depth and path radiance, IRS data over KANIJ test site has been corrected for atmospheric effects. It is planned to use this technique for the absolute calibration of IRS data after conducting few more synchronous data collection. Another important application of PROBAR planned is on the study of spectral signature of various features using high resolution capability of PROBAR varying from 1.5 nm at 400 nm to 15 nm at 1100 nm.



In situ data collection . . . .

CHAPTER ACTIVITIES

We provide herewith a report on activities of ISRS Ahmedabad chapter during April to December 1992.

MEMBERSHIP DRIVE

As a result of untiring effort by the current executive council and enthusiastic support of the remote sensing community, the membership of our chapter has increased from **185 to 241**.

LECTURES

Following lectures were organised.

* Popular lecture, **Environment and Man**, by Dr. S K Nigam on **World Environment Day** ,June 5, 1992 at SAC.
* Popular lecture, **Regional Planning through Remote Sensing** , by Shri D G Pandya, on July 9, 1992 at SAC.
* Lecture, **Remote Sensing : A broad perspective**, by Dr. R R Navalgund for students and lecturers on Sept 18, 1992 at M G Science Institute.

PUBLICATIONS

Frequency of the Newsletter has been increased to once in two months. Three issues were released as follows:

Vol. 5, No. 4 and Vol. 6 No. 1, 2 and 3, July 1, 1992

Vol. 6 No. 4, Sept 1, 1992

Vol. 6 No. 5, Nov. 1, 1992

OTHER ACTIVITIES

* Van Mahotsav was organised during July 1992 wherein 350 saplings of different varieties were distributed to the members.
* Excursion tour is planned for January 1993 in order to provide an informal forum for interaction amongst the members/families

MEMBER'S VIEWS ON THE NEWSLETTER

The Newsletter of ISRS Ahmedabad Chapter is perfecting itself with the passage of time. However, perfection has the sky as its limit. The contents of the Newsletter are of varied interests and provide information and educative reading. I appeal all the members of the ISRS, Ahmedabad Chapter to contribute for the up- keep of the Newsletter, the personal information or work that is done in the space application field. The abstracts of the lecture/talk given by the members of ISRS Ahmedabad Chapter were apt and the cartoons quite interesting in the November 1, 1992 issue.

D M Pancholi, Superintending Engineer (Geo), Central Designs Organization, Gandhinagar (Gujarat)

ISRS-AC EXECUTIVE COUNCIL REQUESTS THE MEMBERS TO SEND THIER SUGGESTIONS REGARDING THE FOLLOWING PROPOSALS:

DESIGNATING A NAME FOR OUR NEWSLETTER

SETTING UP OF AWARD FOR YOUNG SCIENTISTS

TAKING UP OF ANY OTHER ACTIVITIES IN THE FUTURE

LIST OF ISRS-AC MEMBERS

PATRON MEMBERS

Director of Research, Gujarat Agricultural University, Ahmedabad
Managing Director, G. R. O. F. E. D., Ahmedabad

SUSTAINING MEMBERS

Director, School of Planning, Ahmedabad
Office In-charge, A. I. S. & L. U. S., Ahmedabad
Director, D. G. M., Ahmedabad
Librarian, Space Applications Centre, Ahmedabad
Executive Director, N. D. D. B., Anand
Supt. Engineer, C. D. O., Gandhinagar
Supt. Engineer, Narmada Project, Gandhinagar
Member Secretary, Gujarat Council on Science & Technology, Gandhinagar

LIFE MEMBERS

L-0013	Shri R N Jadhav
L-0014	Shri S C Sharma
L-0015	Shri Pradeep R Shukla
L-0027	Dr. A Narain
L-0038	Dr. Baldev Sahai
L-0046	Prof. P D Bhavsar
L-0105	Shri P S Thakkar
L-0120	Dr. Sushma Panigrahy
L-0121	Dr. M V Muley
L-0122	Shri M H Kalubarme
L-0123	Shri A V Kulkarni
L-0124	Shri A R Dasgupta
L-0125	Dr. R R Navalgund
L-0126	Shri Tejpal Singh
L-0127	Shri N K Patel
L-0128	Shri V Tamilarasan
L-0129	Dr. J S Parihar
L-0130	Dr. Shailesh Nayak
L-0131	Dr. Mrudula Nandan Baradhan
L-0132	Shri Mukund Rao
L-0133	Shri G C Bhatnagar
L-0137	Dr. S D Naik
L-0138	Dr. Neera Charturvedi
L-0139	Dr. A K Kandya
L-0140	Dr. P S Dhinwa
L-0141	Shri N S Mehta
L-0142	Shri R M Dwivedi
L-0143	Dr. R K Sood
L-0162	Shri O P N Calla
L-0163	Shri C K Joshi

L-0164	Shri B P Pathole
L-0165	Dr. D J Talati
L-0166	Shri J M Patel
L-0167	Shri N Madhukar
L-0169	Shri R K Goel
L-0170	Dr. Pranav Desai
L-0172	Shri R P Dubey
L-0177	Shri K K Nayak
L-0180	Dr. Panubhai Bhatt
L-0181	Shri Vikas S Desai
L-0194	Shri S C Dhar
L-0206	Prof. S D Verma
L-0210	Shri M H Raval
L-0211	Shri M M Patel
L-0212	Shri T Madhavan
L-0215	Shri J K Garg
L-0216	Shri N S Pillai
L-0232	Dr. R T Shukla
L-0234	Shri J V Bhatt
L-0245	Shri K M Saini
L-0280	Dr. Ajai
L-0281	Dr. Shiv Mohan
L-0282	Dr. George Joseph
L-0295	Dr. K K Gupta
L-0330	Prof. D S Kamat
L-0398	Dr. V K Dadhwal
L-0399	Shri Bhaskar Das
L-0400	Mrs. Tara Sharma
L-0401	Dr. K V G Murthy
L-0402	Shri S K Pathan

L-0403	Dr. R Ramani
L-0404	Shri Rajeev Sharma
L-0405	Dr. M C Gupta
L-0406	Shri A Narayana
L-0407	Shri T J Majumdar
L-0408	Ms Beena Kumari
L-0409	Shri S K Sharma
L-0410	Dr. M M Kimothi
L-0411	Dr. V K Srivastava
L-0412	Shri Ram Lal Mehta
L-0413	Shri A S Rajawat
L-0414	Dr. P Jothimani
L-0416	Shri Mustak G Shaikh
L-0417	Ms Anjali Pandeya
L-0418	Dr. V N Sridhar
L-0419	Dr. S S Pokharna
L-0420	Shri S S Thakur
L-0421	Shri R M Patel
L-0422	Shri Pramod P Kale
L-0423	Shri H B Chauhan
L-0424	Dr. Manab Chakraborti
L-0425	Ms Yogini Vanikar
L-0426	Shri H U Solanki
L-0427	Shri G V Sarat Babu
L-0428	Mrs. K S Sudha
L-0429	Shri D M Pancholi
L-0430	Shri E S Murthy
L-0431	Shri S Palaria
L-0432	Shri T V R Murthy
L-0433	Shri K N Padia
L-0436	Shri H I Andharia
L-0437	Shri S P Vyas
L-0438	Shri P N Pathak
L-0439	Shri T T Medhavy
L-0440	Ms Kavita Dwivedi
L-0442	Shri H P Bhatt

L-0443	Dr. N K Vyas
L-0444	Dr. A Sarkar
L-0445	Dr. M B Potdar
L-0482	Shri Sudhir Vinayak Thakur
L-0514	Shri Sushmaoy Chatterji
L-0519	Dr. P C Mankodi
L-0625	Shri R C Garg
L-0672	Dr. P C Pandey
L-0673	Mrs. S S Palsule
L-0733	Shri A M Buch
L-0734	Ms Anjana Vyas
L-0736	Shri Malaykumar K Shah
L-0737	Shri P Narayananbabu
L-0738	Shri N Ravi
L-0792	Mrs. Parul Patel
L-0838	Shri A K Muley
L-0839	Shri S D Kapse
L-0887	Shri G P Sharma
L-0888	Shri K L N Sastry
L-0889	Shri J G Patel
L-0890	Shri T G B Srikanth
L-0891	Shri B S Lole
L-0892	Shri G Ram Mohan Rao
L-0915	Dr. Shashi Bhushan Sharma
L-0916	Shri Lalit Bhalotia
L-0917	Shri A S Arya
L-0918	Dr. Satyendra Bhandari
L-0919	Dr. Shabbar F Barodawala
L-0930	Ms Ketaki Kharod
L-0931	Shri A K Sharma
L-	Shri C M Nagrani
L-	Shri Y P Desai
L-	Dr. K L Majumder
L-	Shri Bharat Dave
L-	Shri Shirish Avarani
L-	Shri B N Mankad

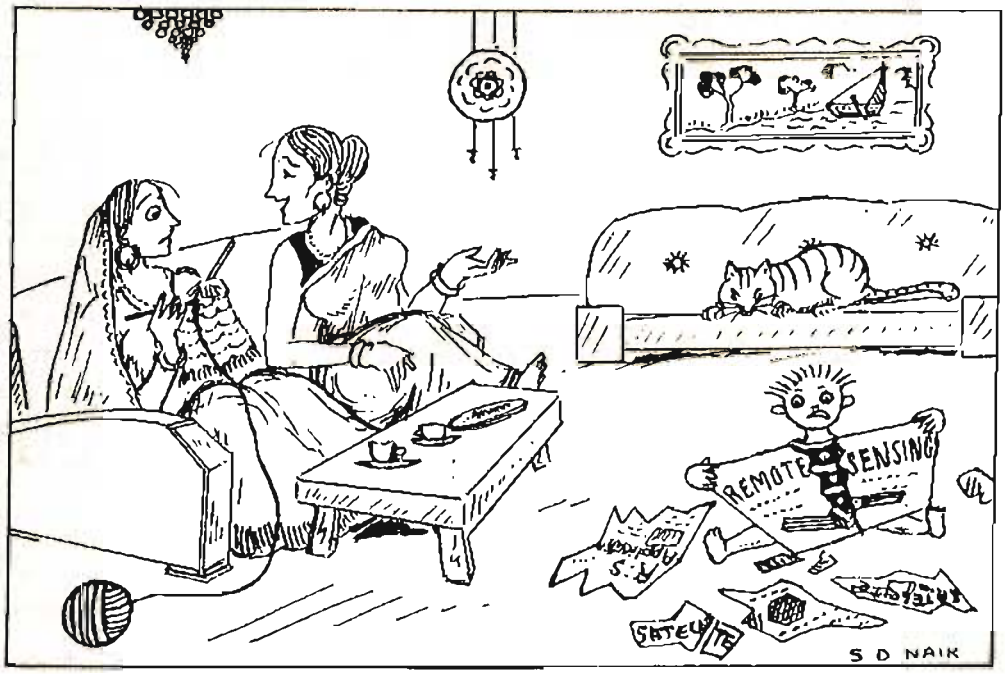
ANNUAL MEMBERS

C-0007	Shri R S Rao
C-0011	Shri R N Shukla
C-0219	Shri C L Roy
C-0226	Shri K D Mallick
C-0239	Shri R Nandkumar
C-0241	Shri Vijay Ayachit
C-0274	Shri G B Pandya
C-0275	Shri R D Shah

C-0277	Shri R M Pandya
C-0360	Shri S Illanthirayan
C-0370	Shri SVC Sastry
C-0374	Shri I M Bahuguna
C-0414	Shri Harshad M Shah
C-0453	Shri M Salim Vohra
C-0516	Dr. M P Ojha
C-0518	Shri Sandeep Oza

C-0519	Shri U G Desai
C-0520	Shri Shashikant Sharma
C-0535	Shri S S Manjul
C-0636	Shri H S Oza
C-0637	Shri B S Munjal
C-0791	Shri Jagdish J Nazreth
C-0803	Ms Nita D Bhagia
C-0882	Shri B Gopalkrishna
C-0883	Dr. P K Srivastava
C-0892	Shri Pradip Jha
C-0903	Shri I M Patel
C-0942	Shri C R Vaidya
C-0944	Mrs. Sunanda P Trivedi
C-0945	Shri P K Dave
C-0946	Shri S K Kothari
C-0949	Dr. P C Joshi
C-0950	Shri A K Shukla
C-0951	Shri Kandarp D Vaisnav
C-0952	Ms Smita A Vaishnav
C-0953	Ms Neela B Patel
C-0954	Ms Haresh K Vaishnav
C-0955	Shri Raj Kumar
C-0956	Shri B N Pandya
C-0957	Shri A K Verma
C-0958	Shri Nitin Gautam
C-0959	Shri Aloke Kumar Mathur
C-0960	Shri Baby Simon
C-0976	Shri N Y Bhatt
C-0977	Ms Pushpalata B Shah
C-0978	Dr. K S Dasgupta
C-0979	Dr. Mannit Mohan
C-1064	Prof. A B Vora
C-1065	Ms Sangeeta Sen
C-1067	Shri Vikas Sudesh
C-1068	Ms Rashmi Sharma
C-1069	Shri J W J Prakash
C-1070	Shri Vinay K Sehgal
C-1071	Shri Kamini Kanta Mohanty
C-1072	Shri K R Manjunath
C-1073	Shri Chaudhari Karshanbhai N
C-1074	Shri Prakash Chauhan
C-1075	Ms Shilpa Bahri
C-1077	Ms D Ramalaxmi
C-1078	Mrs. Medha S Alurkar
C-2026	Shri R J Bhandari
C-2027	Shri K M Mathur

C-2028	Shri B K Sharma
C-2029	Shri G S Bhatia
C-2030	Shri Rajeev Saxena
C-2031	Shri Arun Kumar
C-2032	Shri Anil Kumar Jain
C-2033	Shri Lalit Kumar Mathur
C-2034	Shri P R Gupte
C-2035	Shri V S R Krishna
C-2036	Shri Sunil Kumar
C-2037	Shri J N Bhagat
C-2038	Shri A Kannan
C-2039	Shri Ashok Kumar
C-2040	Shri Gaurang B Prakash
C-2041	Shri R C Jain
C-2042	Shri S Pandey
C-2043	Shri D R M Samudraiah
C-2044	Shri R P Prajapati
C-2045	Dr. P K Gupta
C-2046	Dr. Ranendu Ghosh
C-2047	Shri Pravinchandra D Yadav
C-2048	Shri Kcran R Kotak
C-2049	Shri Hari Shanker
C-2050	Shri Arijit Dey
C-2051	Shri R Arumugam
C-2052	Shri Anoop Nayar
C-2053	Shri P K Jain
C-2054	Shri Ajit Malaviya
C-2055	Dr. A D Vyas
C-2056	Shri Kannan V Iyer
C-2057	Shri R K Malaviya
C-2058	Shri D B Dave
C-2095	Shri Ananth Rao
C-2096	Shri Sujay Dutta
C-2097	Shri Pradeep Kumar Parchure
C-2098	Shri B M Rao
C-	Shri I C Matieda
C-	Shri T P Srinivasan
C-	Ms Mini Raman
C-	Shri Nikunj P Desai
C-	Dr. Arbind Sinha
C-	Shri C S Bhumrah
C-	Shri S S Ray
C-	Shri Kashiram
C-	Shri Shekhar Sarabhai
C-	Shri P M Udani



I am afraid if my son also makes career in remote sensing like his father

BOOK POST

If undelivered, please return to :
Secretary
ISRS-Ahmedabad Chapter
C/O. Remote Sensing Area
Space Applications Centre
Ahmedabad 380 053

Mr. Anjali Bhatnagar
HRD/RSAG/RSA,
Space Applications Centre
Ahmedabad-380053

Edited by :
R.K.Goel, V.K.Dadhwal, Parul Patel, K.N.Padia, A.K.Mathur, R.K.Dave, B.S.Munjal, Space Applications Centre, Ahmedabad.
G.B.Pandya, M.G.Science College, Gujarat University, Ahmedabad.
Printed at:
Library , Space Applications Centre, Ahmedabad.

Indian Society of Remote Sensing

Ahmedabad Chapter

NEWSLETTER

Volume 7 Number 2 & 3 *July 1, 1993*

Mr. Pramod Kale, director of the Space Application Centre, discussing a point with Mr. Kartikeya Sarabhai at a panel discussion on 'Environmental scenario of Ahmedabad in 21st Century' in Ahmedabad on Wednesday. Also seen are: Mr. N. G. Mavalankar, Mr. Kirti Shah and Prof. N. I. Dani.

Times of India, Ahmedabad, July 1, 1993

ISRS-AC has proposed a National Symposium on Microwave Remote Sensing and User's Meet (MRSUM) during January, 1994. Preparations are currently underway for successful organisation of the symposium.

CONGRATULATIONS ON SUCCESSFUL LAUNCH OF INSAT II B

IN THIS ISSUE	.... On	Page

Evolution of Remote Sensing Systems - Current Scenario & Future Prospects	Dr George Joseph	2
Changes in River Ganga as seen in IRS-IA between Devprayag and Haridwar	T V R Murthy et. al.	5
Imaging Spectrometers	Sensors Group at SAC	5
Fire Prone Area Mapping - Gir National Park	Dr A K Kandya et. al.	7
CHAPTER ACTIVITIES		7

Editor : R K Goel

RESEARCH NOTES

EVOLUTION OF REMOTE SENSING SYSTEMS - CURRENT SCENARIO AND FUTURE PROSPECTS

Dr George Joseph, Associate Director, Space Applications Centre

Systematic earth observation from space started in 1960 with the launch of Television Infrared Observation Satellite (TIROS-1), designed primarily for meteorological observation. Space photography also became available from Gemini and Apollo missions. Though the inclusion of cameras on Gemini and Apollo missions was an offshoot of the decision to land men on the moon, the US Geological Survey (USGS) used these photographs to generate a general plan for repetitive surveys of the earth for resources and environmental investigations. The efforts by the USGS to establish an Earth Resources Observation Satellite Programme led to the Earth Resources Technology Satellite (ERTS) project under NASA and the first satellite designed specifically for earth resources survey ERTS-1 was launched in July 1972. With the launch of the 2nd satellite in January 1975, the name of the series was changed from ERTS to LANDSAT. LANDSAT 1 and 2 carried a four-band Multispectral Scanner (MSS) and a three-band RBV camera. In LANDSAT 3, a fifth band in thermal IR was added to MSS.

The large amount of data obtained from LANDSAT gave a new impetus to remote sensing scientists to apply various techniques and methodolcgies to evaluate the utility of this new technology for various applications. The systematic study using LANDSAT MSS showed the necessity of going in for a higher spatial and spectral resolution. This led to the development of the advanced scanner called Thematic Mapper (TM) with 30 m spatial resolution and the central band and band width specifically chosen for various thematic applications. The TM covered visible, near IR, middle IR and thermal IR regions of the electromagnetic spectrum in seven bands. The first Thematic Mapper was launched on LANDSAT 5.

A quantum jump has been achieved in the capability of space imaging with the French Remote Sensing System called SPOT. It has a three-band multispectral camera of 20 m resolution and a panchromatic band of 10 m resolution. There are two such cameras onboard, each providing 60 km swath. One specific advantage of the SPOT system is that the view axis of the satellite is movable off nadir by $\pm 27^{\circ}$ thereby increasing the repeat coverage of a particular scene and facilitating stereo coverage.

A number of other countries like Japan, USSR, China operate remote sensing satellites. India has joined the international community of operational remote sensing satellite operators with the launch of IRS-1A in March 1988 followed by an identical satellite IRS-1B in August 1991.

The IRS-1A/1B satellites have two types of sensors. One provides a spatial resolution of about 72 m (LISS-I) and a swath of 148 km. Another one consists of two cameras each with a spatial resolution of 36 m and swath of 74 km (LISS-II). The two LISS-II cameras combined provide a swath of 145 km. All the cameras have four spectral bands covering visible and near IR region.

In the area of microwave remote sensing the first active microwave sensor, specifically designed for ocean applications, was L band SAR carried on board SEASAT in 1978. This had a capability to produce image with 25 m spatial resolution and swath of 100 km. SEASAT was followed by Shuttle Imaging Radar (SIR-A & B) in 1982 and 1984 with capabilities similar to SEASAT. The first commercial SAR satellite is the Soviet satellite ALMAZ-1 launched in March 1991 carrying a SAR operating in L band with spatial resolution of about 15-30 m and swath 20-45 km. The European Remote Sensing Satellite (ERS-1) launched in July 1991, probably is the first satellite having various microwave sensors for land and sea applications. The data from ERS-1 has found application potential in various areas such as geology, soil moisture, physical oceanography, etc. Thus currently remote sensing user community has data coverage from visible, near infrared, middle infrared, thermal infrared and microwave regions.

THE CAPABILITY OF FUTURE SYSTEMS

Though the data available in the various sensors are adequate for most of the applications, the user community is looking for systems with better spatial, spectral and temporal resolution. In the existing current system, LANDSAT 6 will carry an improved Thematic Mapper which is called Enhanced TM (ETM). ETM has an additional band with 0.5-0.9 micrometer band width, having a spatial resolution of 15 m. The next generation SPOT (SPOT-4) is expected to carry a band in the middle infrared (1.5-1.75 micrometer). In addition it is also likely to have a Wide Field Sensor (WIFS) having coarse spatial

ISRS-AC EXECUTIVE COUNCIL 1992-94

Chairman	Shri R C Garg
Vice-chairman	Shri C K Joshi
Secretary	Dr M V Muley
Joint Secretary	Ms Anjana Vyas
Treasurer	Shri T T Medhavy
Members	Dr J P Aggarwal, Prof A B Vora, Shri P S Thakkar, Shri A K Shukla, Shri A S Rajawat, Shri B P Pathole, Shri K M Saini, Shri R N Shukla, Shri Arun Kumar

NOTABLE FUTURE REMOTE SENSING SYSTEMS

Spacecraft/ Agency/ Year	Sensor	Spectral Specs(s)		Spatial Spec(s)		Remarks
		Range (um)/ Width	Resol (bits)	Swath (Km)	Resol. (m)	
IRS-P2/ INDIA/	MOS-A	0.76 0.763 0.766/ 0.0014	12	195	5800	
	MOS-B	0.408 0.443 0.485 0.520 0.570 0.615 0.650 0.685 0.750 0.870 1.010 0.815 0.945/ 0.01	12	196	1500	
	MOS-C	1.6 2.3/ 0.1	12	195	1500	
	LISS-II	Same Spec(s) as IRS-I A/B				
IRS-I C/D / INDIA	LISS-III	0.52-0.59 0.62-0.68 0.77-0.86	7	141	23	On-board recording for 24 minutes
		1.55-1.70	7	148	69	
	WiFS	0.62-0.68 0.77-0.86	7	770	188	
	PAN	0.5-0.75	6	70	<10	Off-nadir viewing $\pm 26^{\circ}$
LANDSAT-6/NASA	MSS	0.5-0.6 0.6-0.7 0.7-0.8 0.8-1.1	6	185	80	
		10.5-12.5			240	
	ETM	0.45-0.52 0.52-0.60 0.63-0.69 0.76-0.90 1.55-1.75 2.08-2.35	8	185	30	
		10.40-12.50			120	
	PAN	0.50-0.90			15	
SPOT-3/ FRANCE/ 1994 end	HRVIR	0.50-0.59 0.61-0.68 0.78-0.89 1.54-1.75			20	
	VEG-INST	HRVIR + 0.43-0.47	10	2200	1100	
	PAN	0.61-0.68			10	
SPOT-4/ FRANCE	HRVIR	Same as SPOT-3				
	HRG	VNIR (1 or 2 Bands)		30-60	<5	Along-track stereo : 2-3m height accuracy
NASA/ 1993	SeaWiFS	0.402-0.422 0.433-0.453 0.480-0.500 0.500-0.520 0.545-0.565 0.660-0.680 0.745-0.785 0.785-0.885	10	2800		Ocean Colour
ADEOS/Japan/ 1995	AVNIR	0.42-0.50 0.52-0.60 0.61-0.69 0.76-0.86	8	80	16	$\pm$300 Km Cross-track
		0.52-0.69	7	80	8	
	OCTS	0.412 0.443 0.49 0.52 0.565 0.665/ 0.02	10	1400		
		0.765 0.865/ 0.4				
		3.7/ 0.3				
		8.5/ 0.5				
		11.0 12.0/ 1.0				
AM-1/ NASA/ 1998	ASTER	0.52-0.60 0.63-0.69 0.76-0.86	8	60	15	$\pm$116 Km Cross-track
		1.6-1.7 2.145-2.185 2.185-2.225 2.235-2.285 2.295-2.365 2.360-2.430			30	
		8.125-8.475 8.475-8.825 8.925-9.275 10.25-10.95 10.95-11.65	12		90	
	MODIS-N	Imaging Spectrometer- Details given in note from Shri K M Mathur				
/ DLR/ Germany/ 1996	ROSIS					

resolution (1 km) covering about 2000 km so that a better temporal resolution is possible. Another improvement in the SPOT-4 is the modified spectral band in the Panchromatic channel same as the red band (0.61-0.68) of the HRV Multispectral Camera. The use of same B-2 channel for both panchromatic and multispectral imaging makes it simpler and more radiometrically accurate to produce merged product using both panchromatic and multispectral band to generate 10 meter FCC. In the case of IRS, IRS follow-on system (IRS-1C/1D) will have three bands in the visible and near infrared with about 23 m resolution and one band in the middle infrared (1.55-1.75 micrometer) with about 70 meter resolution. In addition a Panchromatic camera, better than 10 m resolution with

off axis pointing capability and a third camera (WiFS) having spatial resolution of about 188 m and swath of 770 km providing a temporal resolution of 5 days have also been included in IRS-1C/1D.

The second PSLV will carry a satellite (P2) having LISS-2 and three sensors (named Modular Optical Scanner MOS-IRS-A, B and C) developed by DLR. MOS-A sensor operates in four narrow spectral channels in the range of 755-768 nm, has swath of 195 km, ground resolution of 5.81 x 5.57 km and high radiometric sensitivity of 0.3% in 0.1 to 40 micrometer/cm^2.nm.sr. Data from MOS-A would be useful in atmospheric correction studies. The MOS-B sensor has been designed for oceanographic and atmospheric applications. It has five spectral bands in the blue-green region for chlorophyll estimation, three spectral bands in the red region for suspended sediment measurements, three bands in the near infrared for estimation of aerosol optical thickness and two water vapour absorption channels. The MOS-C sensor operates at two short wave infrared spectral bands centered at 1.6 and 2.3 micrometer. Data from MOS-C used conjunctively with IRS-LISS-II will be useful in large area plant water stress estimation and other applications.

In addition to this a number of future systems are planned by various space agencies. The Advanced Earth Observation Satellite (ADEOS) of Japan will carry a combination of sensors from various space agencies. These include Ocean Colour Temperature Scanner (OCTS) and Advanced VNIR Radiometer (AVNIR) from NASDA, Japan as core sensors. In addition there are a number of sensors termed as Announcement Opportunity Sensors (AO Sensors). These include interferometric monitor for green gases (IMG), improved limb atmospheric sounder (ILAS), Retro reflector in space (RIS) from Japan, NASA scatterometer (NSACAT), Total ozone mapping spectrometer (TOMS) from NASA, Polarisation and directionality of earth's reflectance (POLDER) from CNES. The satellite weighs about 3.5 tones and produces 4.5 kw power. It is supposed to be launched sometimes beyond 1995. Of this the AVNIR has four spectral bands very similar to IRS-1A/1B with 16 m resolution and 80 km swath, and also a Panchromatic band with 8 m resolution and 80 km swath. The instrument has a cross track pointing capability so that 300 km on either side of the sub-satellite track can be imaged.

ESA Polar platform will have a set of meteorological instruments which are primarily improved NOAA payloads such as advanced very high reso-

SOME ABBREVIATIONS

(System specifications given elsewhere)

ADEOS	Advanced Earth Observation Satellite of Japan
AIS	Airborne Imaging Spectrometer
AMSS	Advanced multispectral scanner
AOS	Announcement Opportunity Sensors
AOTF	Acousto-Optically Tunable Filter - Field Spectrometer for future NASA space exploration
ASAS	Advanced solid state array spectro-radiometer
ASTER	Advanced Spaceborne Thermal Emission and Reflection Radiometer
AVIRIS	Airborne Visible/ Infrared Imaging Spectrometer
AVNIR	Advanced VNIR Radiometer from NASDA, Japan
CERES	Cloud and Earth's Radiant Energy System
EOPP	European Observation Preparatory Programme
FIIS	Far Infrared Imaging Spectrometer
FLI/PMI	Flourescence line Imager/ programmable mapping Imager
HIRIS	High Resolution Imaging Spectrometer - follow on to SISEX
ILAS	Improved limb atmospheric sounder
IMG	Interferometric monitor for green gases
MERIS	Medium Resolution Imaging Spectrometer
MISR	Multi-Angle Imaging Spectro-Radiometer
MODIS	Moderate Resolution Imaging Spectrometer MODIS-T (tilt) MODIS-N (nadir)
MOPITT	Measurements of Pollution in the Troposphere
NIMS	Near IR mapping spectrometer
NSACAT	NASA scatterometer
OCTS	Ocean Colour Temperature Scanner
POLDER	Polarisation and directionality of earth's reflectance from CNES
RIS	Retro reflector in space from Japan
ROSIS	Reflective optics system imaging spectrometer
SISEX	Shuttle Imaging Spectrometer Experiment - Pushbroom approach
TIIS	Thermal IR imaging spectrometer
TOMS	Total ozone mapping spectrometer from NASA
VIMS	Visible and IR mapping spectrometer - Wishkbroom approach
WBDCS	Wide-Band Data Collection System

lution radiometer, high resolution infrared sounder and advanced microwave sounding unit. A set of facility instruments are proposed to be developed by ESA such as Altimeter-2, Medium Resolution Imaging Spectrometer, Michelson Interferometric Passive Atmosphere Sounder. In addition there are Announcement Opportunities instruments such as Global ozone monitoring by occultation of stars, scanning imaging absorption spectrometer for atmospheric cartography, advanced along-track scanning radiometer, cloud and earth's radiant energy system.

The US programme **Mission to Planet Earth** is aimed at providing support to US global change research programme by having a wide variety of observations using both space and ground based facilities. The main space components of Mission to Planet Earth are:

* unmanned earth observation system (EOS)
* earth probes (low orbits) over equator (TRMM, MFE, TOMS, etc.)
* space station freedom (manned research facility: ~ 400 km, inclination : 28.5°)
* advanced geostationary platforms
* series of NOAA free flyers.

A series of satellites have been planned under the **Earth Observation Programme**. Of these, one set of satellites termed as AM-1, will have equatorial crossing time in the forenoon and 2nd set of satellites termed as PM-1, will have equatorial crossing time in the afternoon. The first AM satellite is planned to be launched in 1998 and will carry the following payloads:

* Advanced Spaceborne Thermal Emission and Reflection Radiometer (ASTER)
* Moderate Resolution Imaging Spectrometer-Nadir (MODIS-N)
* Multi-Angle Imaging Spectro-Radiometer (MISR)
* Cloud and Earth's Radiant Energy System (CERES)
* Measurements of Pollution in the Troposphere (MOPITT)
* Wide-Band Data Collection System (WBDCS)

Of these payloads, MODIS-N provides almost spectroscopic observation with coarse spatial resolution and wide swath. The ASTER has three bands in the visible and near infrared with 15 m resolution, six band in the middle infrared with 30 m resolution and 5 bands in the thermal infrared with 90 m resolution. However, all these have only 60 km swath with the cross track capability of ±116 km. The ASTER also has forward tilted camera for stereoscopic observation.

All these advanced systems unfortunately do not provide data for operational use. I define here operational use such that user community should be able to get data on any specific location with a specified temporal resolution. Since the intrinsic swath of these cameras are low, though a high repetitivity capability can be obtained by cross track scanning, these do not guarantee a systematic coverage of the surface of the earth. *The future sensors onboard SPOT, IRS and LANDSAT will be the systems with OIR region providing data for operational applications.* In addition the microwave data will be available on a continued basis from ERS follow ons, RADARSAT and JERS.

CHANGES IN THE RIVER GANGA AS SEEN IN THE IRS-1A IMAGES : A CASE STUDY BETWEEN DEVPRAYAG AND HARIDWAR

T V R Murthy and M V Muley, Space Applications Centre

Water through the river system is considered as the basic building block of the structure of civilization, modernization, and industrialization. The tremendous growth in this direction needs attention towards the activities that minimize environmental degradation and maximize the overall return to mankind. The present study covers the study carried out on the river Ganga between Devaprayag to Haridwar. Various geomorphic/ hydrogeomorphic, land use and urban features present along the course of the river Ganga were interpreted using IRS-1A, LISS-II false colour composites. Due to increase in the use of river's regime by man, the various activities are being concentrated in this belt. The natural and anthropogenic forces were studied and found responsible for the changes taking place in the course of the river. The changes like reduction of water channels, reduction in water flow, increase in sedimentation, channel migration etc., may have various impacts on the riverine environment. This data is useful to planners and managers of the water resources especially for those who are engaged in flood management, canal development and irrigation management. The details of this study are described in a technical report.

IMAGING SPECTROMETERS

Electro-Optic Sensors Development Group, Space Applications Centre

In the recent past the application scientists have been stressing the need of narrow band spectral data for extracting distinct spectral features contained in the multispectral remotely sensed data. The latest advancements in the detecter technology and sophisticated complex optical systems have led the sensor technologists to develop Imaging Spectrometers. The principle of acquiring spectrometer data is based on the physical phenomena of interaction of photons with molecular structure of the matter to be observed. It shows absorption features that are matter specific. Imaging spectrometer, therefore, is a tool to collect data more quantitatively. Various agencies have developed, or are developing, the imaging spectrometers. Some of these are presented in the table below.

For further details contact Shri K M Mathur

AIRBORNE IMAGING SPECTROMETERS

Spectrometer	Agency/ Aircraft	Year	Alt. (Km)	Spectral Specs		Spatial Resolution	Applications
				Range (um)	Resol. (nm)/ Channels		
A IS-I	NASA/C-130	82-85	3	1.2 - 2.4	9.5	IFOV - 10 m	
AIS-II	-do-	early 86	6	0.9-2.4	11	FOV : 128 mrad	Optical depth data from measurement of incident solar illumination
FLI/PMI	Canadian Fisheries/ Piper Navajo Chieftain	83 - 87	3	0.43-0.805	2.6 / 288	FOV- 80.65 mrad	Chlorophyll Geobotany &Bathymetry
AVIRIS	JPLNASA/ U-2	87 - 89	20	0.4-2.45	10/224	IFOV- 20 m	Mining atmsopheric science plant biology hydrology etc.
ROSIS	DFVLR Germany	89 - 92	4	0.43-0.85	5/256	FOV- 2.2 Km IFOV - 0.55 mrad	Water colour monitoring : marine biology
ASAS	NASA / C-130B	83...	5	0.465-0.871	14	FOV- 2200 m	Geologic targets like fans
AMSS	Geoscan Australia	88 90		0.48-11.8		FOV - 28m	Mineral exploitation - Gold mining.
TIIS	NASA / C-130	90	2.438	7.5-14	100	IFOV- 10 m	Compositional Surface Mapping of terrain for categorising rock families

SPACEBORNE IMAGING SPECTROMETERS

Spectrometer	Agency/ Carrier	Year	Orbit (Km)	Spectral Specs.		Spatial Resolution		Applications
				Range (um)/ channels	Resol. (nm)	FOV (Km)	IFOV (m)	
NIMS	JPL-NASA/ Galileo	89	10000	0.7 - 5.2 / 204		100	0.5 mrad	Mineral content and atmosphere (Jupiter)
				< 1	25			
				> 1	13			
VIMS	JPL- NASA	92	361	0.4 - 5.2 / 320		41.6	1 650	Identification of materials composition (MARS & Comet)
				0.4- 3.2	10			
				3.2- 5.2	20			
SISEX	JPL - NASA/ Shuttle	90	250	0.4 - 2.4 / 128	10	12.1	30	World wide samples of imaging spectroscopy data
ROSIS	DFVLR Germany	92	824	0.4 - 1.04 / 256	5	500	450	
MODIS-N	NASA/ EOS	95	824	0.4 - 14.2		64 / 1780	1000	
MODIS-T				0.4 - 1.0				
MERIS	ESA / EOPP	97	824	0.4 - 1.05 / 15	1.25	1500	260 / 1040	Ocean colour environmental factors
HIRIS	NASA / EOS	95	824	0.4 - 2.5 / 192		24/30	30	Detection of blue shift of chlorophyll absorption edge
				0.4 - 1.0	9.4			
				1.0 - 2.5	11.7			
FIIS	Ariane 5	Eliptical - 1000/ 70,570		80-200	Selectable			Cooling lines of inter stellar and circumstellar gas clouds
AOTF		Bread board 1990		0.4 - 2.5	Selectable	12°		Validation

FIRE-PRONE AREA MAPPING OF A PART OF GIR NATIONAL PARK INTEGRATING SATELLITE AND TOPOGRAPHICAL DATA USING GEOGRAPHIC INFORMATION SYSTEM

A K Kandya, M M Kimothi and R N Jadhav, Space Applications Centre
J P Aggarwal, Gujarat State Forest Department

Occurrence of frequent fire is one of the reasons for degradation of forests in the country/elsewhere in the world. The forest fires affect (a) standing crop, (b) soil, (c) productive capacity of the forest, (d) productive value of the forest, (e) wild life and (f) recreational or scenic values. An attempt has been made to map the fire-prone areas of a part of Gir National Park. IRS- 1B, LISS-II data were visually classified to ascertain the vegetation status of the study area. The road-network and the huts/settlements were mapped through the Survey of India (SOI) topographical map. Finally, all the parameters having direct/indirect influence over the occurrence of fire were integrated using Geographic Information System (GIS) approach resulting in a 'fire-prone' map of the area.

CHAPTER ACTIVITIES

MEMBERSHIP

Our strength has increased to 268. We provide herewith a list of new members enrolled during the period Jan 1, 1993 to Jun 30, 1993.

Life Members

Shri Shravan Kumar Acharya
Shri A C Dave
Shri R K Malaviya
Shri Rajkumar Arora
Shri Markand P Oza
Shri Shashikant A Sharma
Shri Sandip R Oza
Shri K D Acharya

Annual Members

Shri V K Jain
Shri N J Shelat
Shri Vikram Desai
Shri S C Agrwal
Shri K Vellimalai
Shri C N Lal
Shri H K Dave
Shri Pankaj Laghate
Shri D R Rajak
Shri Raghavendra Pratap Singh
Shri R Ramakrishnan
Shri A P Shukla
Shri R M Gairola

EXCURSION TOUR TO NALSAROVAR

An excursion tour to Nalsarovar was organised on January 31, 1993. The tour, organised in order to promote closer interaction amongst the members and their families and was availed of by 165 persons. On this occasion an excursion card was distributed which included satellite image of Nalsarovar and its environs, an interpretation of this image showing the use of satellite images for monitoring the lake environment and a glossary of visiting birds at the Sarovar. A boat sailing trip was organised for the participants in order to provide them an opportunity of getting the first hand information by way of practical demonstration about the aquaculture existing at the Nalsarovar. Moreover, the bird species and their population was supported by this aquaculture and the Nalsarovar environment was watched and assessed by the enthusiastic participants.

Shri J P Aggarwal, the host, welcomes the tourists and briefs them about the Sarovar

Flora and Fauna - On the way to virgin island

Birds Watching !!

FUTURE ACTIVITIES OF THE CHAPTER

SCIENCE QUIZ for higher secondary level students during october, 1993.

EXCURSION TOUR (I) during november, 1993.

NATIONAL SYMPOSIUM on ' **Microwave Remote Sensing and Users Meet (MRSUM)**' during Jan 10 - 11, 1994.

ELECTIONS for the executive council are to be held during March, 1994. Keeping this in view the executive council , in its meeting held on july 20, 1993, decided that Dr P C Joshi of Space applications Centre will be the returning officer.

Please be on the lookout for detailed announcement

POPULAR LECTURE BY Dr M K Mehta

Dr M K Mehta, Director, Vikram Sarabhai Community Science Centre, Ahmedabad, delivered a popular lecture **Nuclear Physics : Techniques and Applications** on March 1, 1993, at SAC Ahmedabad. The lecture was jointly organised by ISRS-AC, SAC Society of Mechanical Engineers (SSME) and Indian Meteorological Society, Ahmedabad chapter(IMSA).

Memento of remembrence to Dr Mehta - presented by Shri Pramod Kale.

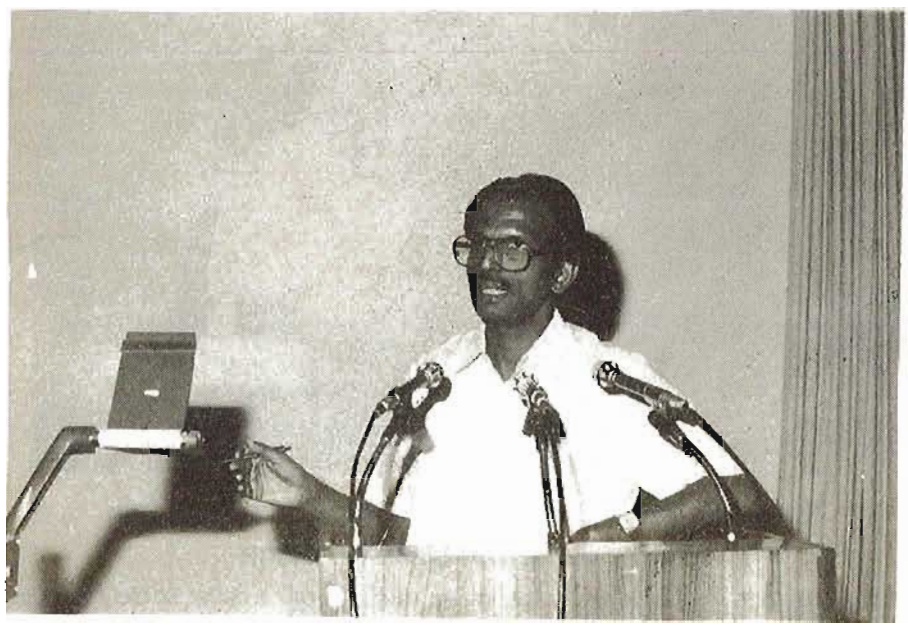
INAUGURATION OF SOCIETY OFFICE

Shri Pramod Kale, Director Space Applications Centre, inaugurated the office of the Society Chapter at SAC premises (Bldg no. 34, Room No. 23)on March 1, 1993. The inauguration, witnessed by a large number of members was, graced by lighting of a lamp. The office, kindly provided by Director SAC is to be shared with two other professional bodies, viz. SAC Society of Mechanical Engineers (SSME) and Indian Meteorological Society, Ahmedabad chapter(IMSA). The office will remain open on weekdays starting from Aug 1, 1993 during 1300 - 1400 hrs.

Shri Pramod Kale, Director SAC, Inaugurates the society office in SAC Campus.

POPULAR LECTURE BY Dr George Joseph

Dr. George Joseph, Associate Director, Space Applications Centre, delivered a popular lecture **IRS-1A and Beyond the world Scenario of Remote Sensing** on March 17, 1993 at SAC Ahmedabad. The lecture delivered on the occasion of the successful completion of 5 years of IRS-1A in orbit, was attended by more than 250 participants. Lecture covered all the aspects related to IRS-1A and put it in a perspective vis-a-vis contemporary RS satellites in global scenario. It also provided a peep into the future Remote sensing technology giving a detailed description of the proposed sensors on satellite platforms and likely advances in this area.



Dr George Joseph addressing the space enthusiasts

ANNUAL GENERAL BODY MEET

Annual General Body Meeting of the Society chapter was held on May 5, 1993 at 1600 hrs in Vikram hall within the premises of Space Applications Centre, Ahmedabad. The meeting was attended by a total of 77 members.

PANEL DISCUSSION

The Ahmedabad Chapter of Indian Society of Remote Sensing organized a Panel discussion on the **Environmental Scenario of Ahmedabad in 21st Century**. The panel discussion was held at Vikram Hall, Space Applications Centre. The panel consisted of eminent personalities representing vide canvas of environmental aspects, specifically in the context of Ahmedabad city and included

- Shri Pramod Kale, President Indian Society of Remote Sensing and Director, Space Applications Centre
- Shri Kartikeya Sarabhai, Director, Centre for Environment Education, Ahmedabad
- Shri J P Aggarwal, Conservator of Forests, Government of Gujarat
- Shri S C Sharma, Director, Gujarat Water Resources Development Corporation
- Shri N G Mavalankar, Industrialist
- Shri Kirti Shah, Ahmedabad Study Action Group
- Prof. N I Dani, Head, Biology Department, M G Science Institute

The discussions were initiated and moderated by Shri Pramod Kale. The audience, including ISRS members,specialists from various state and central government agencies, academic institutions and the members from

Member's Views about Newsletter

My compliments on the Jan 1993 Special Issue of ISRS-NL. Everyone must appreciate the amount of effort that has gone into the thoughtful preparation and presentation of extensive material.

It is indeed a good idea to intersperse densely packed scientific material with some light reading. However, I feel that the place allotted to Funtoons could have been better utilized as their quality is certainly not up to the mark. And they are to many. More stricter censure is called for. Also, it would be a good idea to devote a separate issue covering the subject "Information about Remote Sensing", i.e. source of data, lists of RS books and journals, training programs, RS education, RS policy etc.

Dr. Satyendra Bhandari

press, took active part in the discussions. Open discussions amongst the panelists and the audience were really open. Many of the points made by the panellsts were supplemented, challenged or argued.

It was concluded that the role of citizinery in terms of their being alert, protestive, demanding and at the same time accountable about the surroundings would be crucial for the development of Ahmedabad city as a city worth living in the 21st century. We reproduce below the report by the two national dailies i.e Times of India and Indian Express.

REPORT ON PANEL DISCUSSION BY THE TWO NATIONAL DAILIES PUBLISHED FROM AHMEDABAD

Times of India, July 1, 1993

City's environmental degradation decried

By A Staff Reporter

AHMEDABAD, June 30.

THAT the environmental scenario of the Ahmedabad city was extremely bad, no one had any doubt and the participants at a panel discussion had various answers such as massive tree plantation, recycling of waste water. But what marked the discussion organised here by the local branch of the Indian Society of Remote Sensing was the angry outburst by Mr. Kirti Shah of Ahmedabad Study Action Group, who felt that the people had become insensitive to the deteriorating standard and there was absolutely no hope for the city as it was "at the worst stage of its development".

There were also conflicting views on many aspects of development and organisational structure. For instance, Prof. N. I. Dani, educationist, suggested dispersal of industries to various parts of the state to minimise concentration of the pollutants. But this was immediately contested by Mr. Shah, who was very critical of the city's inability to generate new employment potential.

Even the panel moderator, Mr. Pramod Kale, director of Space Application Centre, did not agree with the views of Prof. Dani that the city was too vast and unmanageable and should be developed as different smaller entities, which could be provided with better infrastructural facilities.

Mr. Shah also differred with the views of Mr. Kartikeya Sarabhai of the Centre for Environment Education that the non-government agencies (NGOs) should link up their activities for better coordination and strength in unity. This was a long drawn out process, Mr. Shah felt and suggested evolution of a new sector. people's sector. Mr. Shah said that the tendency of increased dependence on NGOs for every bit was a dangerous portent.

In his opening remarks, Mr. Kale said that what the city would need in the coming decade was a proper planning for constructing inner and outer ring roads, circular railway line, three to four additional bridges over the Sabarmati river, and more fly-overs over the railway tract, huge water recovery system, massive tree plantation, restoration of the two lakes of Kankaria and Chandola, new campus of the university and last but not least an additional airport somewhere between Ahmedabad and Baroda. This was essential to cater to the need of the increasing city population, which was likely to increase to 65 lakhs in the coming four decades.

Mr. Kartikeya Sarabhai was of the opinion that the city now lacked leadership, of which it once rightfully boasted and had the vision to create so many institutions and will to put these in reality. He still felt that the city was still vibrant and active. What was required was for the people to give up their passivity.

Indian Express, July 2 , 1993

City sliding into rot, feel observers

EXPRESS NEWS SERVICE

AHMEDABAD - A panel discussion on "Environmental scenario of Ahmedabad in the 21st century" organised by the Indian Society for Remote Sensing (ISRS) here on Wednesday, painted grim prospects for the city which is burdened with unemployment, poverty, and besieged by a combination of poor political leadership and increasing mafia influence.

Director of Ahmedabad Study Action Group Kirti Shah said it was shocking that the city elected a bootlegger like Latif from as many as five constituencies. "It shows the hold the mafia has on the city," he said

Shah said the growing unemployment could spell real danger in the 21st century.

Director of the Space Application Centre Pramod Kale said it was important to find out why a city which had survived so many centuries was now on the downslide. He said the industrial development in the Bombay city corridor during the past 30 years had contributed to significant environmental degradation and suggested application of remote sensing to understand the problem better.

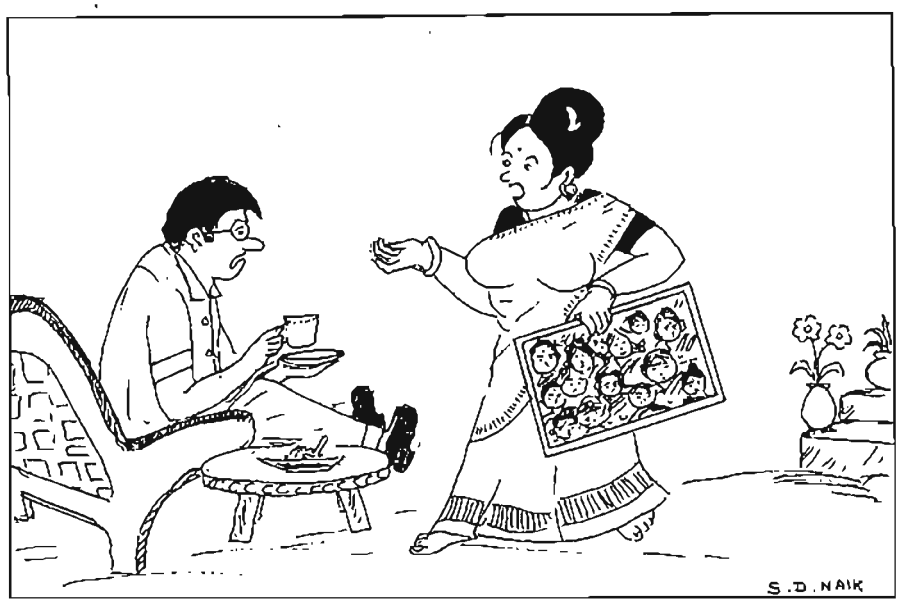
Director of the Centre for Environment Education Kartikeya Sarabhai suggested an imaginative leadership for the city, the identity of which had changed over the years. The city which was one whole entity had got fragmented into different suburban areas. Green belt had vanished. People's participation is essential, in and NGOs cannot be burdened with solving the city's problems, he said

Conservator of forests J. P. Agarwal said that total forest cover of the state had come down to six per cent from 10 per cent. The forest department's social forestry programme has lost out to the pressure of population growth, he said.

Director of Water Resources Development Corporation S. C. Sharma said industrial effluents had polluted the ground water.

CONDOLENCE

With profound shock we learned the sad demise of Sq. Ldr. Dastidar and Capt. V Ramakrishna from NRSA and Shri Anjenayalu and Shri Sudhir Panda from Airworks India on july 15, 1993. This shocking event occured near Bombay on jul 15, 1993 when the Beachcraft plane crashed while returning after completion of an aerial survey campaign around Ahmedabad. We had long association with them. The chapter feels deep sense of loss and expresses condolence on the sad demise. May God almighty give strength to the grief stricken family members.



What kind of remote sensing expert you are when you can't even identify me in this group photo ?

BOOK POST

Shri A.S. Rajawat
LRD/RSAG/RSA,
Space Applications Centre
Ahmedabad-380053

If undelivered, please return to :
Secretary
ISRS-Ahmedabad Chapter
C/O. Remote Sensing Area
Space Applications Centre
Ahmedabad 380 053

Edited by :
R.K.Goel, V.K.Dadhwal, Parul Patel, K.N.Padia, A.K.Mathur, R.K.Dave, B.S.Munjal, Space Applications Centre, Ahmedabad.
G.B.Pandya, M.G.Science College, Gujarat University, Ahmedabad.
Printed at:
Library , Space Applications Centre, Ahmedabad.

SIGNATURES

Vol. 8, No. 1 & 2
August 1994

Newsletter of the Ahmedabad Chapter of the Indian Society of Remote Sensing

CONTENTS

Evolution and Future of Decentralised Planning in India - *P P Pangotra* p2

Satellite Radar Interferometry - *P Chauhan* p4

Pictorial Guide to Island of Research - *T T Medhavy* p7

Artificial Neural Networks in RS applications - *K K Mohanty* p8

Humour in graphics
- by Dr. S D Naik p9
- by Dr. S D Naik p16

ISRS-AC Executive Council p3

Chapter Activites p12

Article Update p14

Forthcoming Symposia p14

About Members p15

(Edited by Dr. V K Dadhwal)

Message from Chairman ISRS-AC

Congratulations! The first "Signatures" of ISRS-AC is in your hands. This is a modest effort of our editorial team with active support from all of you. Enjoy it with your family who are in background to bring you in foreground.

Over the years, the traditional methods have given important realisation about the importance of national problems. The myths and realities of leaps and bounds growth of remote sensing activities in national development is also becoming increasingly clear. In this modern world of information explosion, conversion of 'bits' into 'knowledge' and a synergistic approach has become a necessity. To provide you a small window to the outside world has been our motto.

Greetings.

Dr. Prem Chand Pandey
Chairman ISRS-AC

Hello readers! We are back and your long wait for your favourite newsletter is over. In response to our appeal for naming our 8 year old baby, Dr. S M Bhandari floored us with a booklet of "1000 Names for ISRS-AC-NL" (well, actually there were a dozen). We picked the winner as 'SIGNATURES'. Dr. P Pangotra, who was invited to 'talk' to ISRS-AC members, also kindly accepted the invitation to communicate in a second 'spectral region'. There are two articles which highlight our optimism that best in RS is yet to come. And of course, cartoons, which are a signature of this newsletter, as Dr. S D Naik and Shri T T Medhavy survey RS and science, respectively, with a different viewing geometry. Write to us about this issue and what you would like in future issue. Previous Editorial Committees have set very high standards and we hope to measure upto their level. Happy reading, viewing, scanning, ...

Editorial Committee.

EVOLUTION AND FUTURE OF DECENTRALISED PLANNING IN INDIA*

Prem P Pangotra

Director
School of Planning (CEPT)
Ahmedabad 380 009

Shortly after independence, Indian leaders proclaimed the path of decentralised planning and administration in pursuit of developmental goals. It was a national dream that the process of development in independent India would be perfectly inclusive, in that it would involve everyone and that the national and state plans would reflect the needs and aspirations of people at the grassroots level. The record of planning process which has since evolved bears little resemblence to these goals, although we continue to pay lip service to the original dream of "planning from below".

EVOLUTION

With the setting up of the Planning Commission in the early 1950s, it became clear that the existing political and administrative structures of government favoured "top down" approaches for development planning and administration. Even the Community Development experiments, which sought to create "half a million planning commissions" through local initiative and community participation, fitted into the established channels of administration resulting in overcentralisation. The Balwant Rai Mehta Committee (1957) proposed a three tiered system of elected local bodies at village, block and district levels to actualise the ideas of decentralised planning. While this led to the establishment of the Panchayati Raj system of development administration, these institutions never really had a chance to engage in local planning. Despite the key role played by them in the success of the Green Revolution Programmes, they remained extension agencies for implementing plans of state governments and foreign aid projects.

During the next three decades the "planning from above" process got fully entrenched, as did the power of vested interests, and the administration of development programmes was increasingly centralised. Consequently, development plans today are essentially handed down by the central and state governments to the local bodies for implementation. these plans do little more than allocate funds according to predetermined sectoral priorities and in no way do they represent the democratic ideals of decentralisation. Although the Planning Commission developed guidelines for district and block level planning, these were meant to streamline the administration of development rather than any meaningful decentralisation of the planning process.

Perhaps, the most significant progress towards decentralised planning in India came through the enactment in 1992 of the 73rd and the 74th amendments to the constitution to legislate the Panchayati Raj Act and the Municipal and Town Planning Acts, respectively. The latter act provides consitutional sanction for local self government in urban areas and has important provisions for granting greater autonomy to these units for instituting rational structure and functions as well as participatory decision making processes. However, the actual devolution of power, authority and responsibilities is left to the discretion of the state governments. Therein lies the problem. Political and bureaucratic culture at the state level has always resisted the sharing of power and resources with local level institutions. It is not possible to simply wish away this resistance.

ISSUES AND LEGACY

The Panchayati Raj institutions are dominated by the rural elite who are generally quite happy leaving the headaches of planning to state line departments while appropriating development funds for their personal benefit under the patronage of state level power centres. They seem comfortable with the present system in which policy decisions, financial allocations and technological inputs all come from the top. The issue is whether this nexus can be broken and replaced

*Lecture delivered on June 22, 1994 at Vikram Hall, SAC under auspices of ISRS-AC.

regular elections of local bodies and does not exclude the rural and urban poor.

The experience of district planning across various states has brought out some interesting issues. It has been observed that the relatively smaller states which undertook effective land tenure reforms, e.g. Punjab and Haryana, have grown faster and with better distribution of benefits with fairly centralised state level planning. On the other hand, larger states like UP, Bihar, MP and Rajasthan where decentralised planning has been strongly advocated, have failed miserably in terms of economic development and reduction of regional inequalities. The states like Gujarat, Maharashtra and West Bengal which are considered pioneers decentralised planning in India have also not been very successful.

PROSPECTS

For assessing the propsects of decentralised planning in India, it is important to recognize that statutory provisions are a necessary but not sufficient condition. These cannot substitute the political culture and will be required to set up a new system. Consent, commitment and active support of state governments is absolutely essential to strengthen local governments.

There is no doubt that the future of decentralised planning in India will ultimately depend on the success of political reforms for adequate representation of the poor, which will lead to more meaningful involvement of people at the grassroots. All local government institutions in the process must devise ways and means to ensure the accountability of their public officials.

At the policy level, a major shortcoming of the planning process in India has been the limitation of the overall goals. The twin goals that have defined the parameters of planning until now have been economic growth with equitable redistribution. These goals are at least partially responsible for the centralisation of the process. These goals need to be reformulated to give priority to resource management and environment. In addition, the success of decentralised planning would need a variety of technical inputs which may enhance local level planning capabilities. Multidisciplinary approaches to planning will be necessary and applications of remote sensing technologies can make significant contribution towards enhancing the scope of local level planning. The challenge for the remote sensing community is to foster the freedom of information and increase user access to and friendliness of applications software. The values of sustainable development are common to the field of remote sensing and local planning and these must be incorporated in our strategies for decentralised planning.

- * -

ISRS-AC Executive Council 1994-96

The following have been elected to EC for the term 1994-96:-

Dr. P C Pandey	Chairman
Dr. S K Pathan	Secretary
Ms Beena Kumari	Treasurer
Shri I M Bahuguna	Member
Dr. S M Bhandari	Member
Shri S S Manjul	Member
Shri N S Mehta	Member
Dr. S V C Sastry	Member

Shri R C Garg, Chairman, ISRS-AC (1992-94) will continue in EC as Ex-officio.

The EC has co-opted the following members:-

Dr. J P Aggarwal	Vice-Chairman
Shri S V Raghava Rao	Joint Secretary
Shri G B Pandya	Member

SATELLITE RADAR INTERFEROMETRY

Prakash Chauhan

MWRD/RSAG/RSA
Space Applications Centre
Ahmedabad 380 053

Exposure to impressive satellite images of crinkled coastlines or mountains is now common among scientific community. Although satellite images provides magnificent visual perception of different earth features, at the same time they can be used to retrieve the useful quantitative information to understand different earth processes. As Remote Sensing is moving towards more and more quantitative approach, an exciting and promising technique called Synthetic Aperture Radar (SAR) interferometry, or INSAR makes its claim further strong. In the recent years it has been demonstrated that it is possible to produce detailed and accurate three-dimensional relief maps of the Earth's surface directly from SAR image data using INSAR technique. In addition, an extension of the basic technique, known as Differential INSAR (D-INSAR), presents the opportunity for measuring surface displacement fields (cm-scale) interferometrically by use of the coherence of the radar beam. Both of these possibilities open up many new potential application areas of space borne SAR data.

Radar Interferomerty was introduced almost twenty years ago (ref. 1), but its space borne multi-pass utilisation was actually pioneered by Jet Propulsion Laboratory scientists (ref. 2) using SEASAT and SIR-B SAR data. In SAR data each picture element (pixel) of a SAR image contain information on both the intensity and phase of the signal backscattered from the Earth's surface. However it is the phase information only (not the image intensity) that is exploited in the INSAR technique. A SAR interferometer typically consists of two SAR antennae separated by a fixed distance or baseline. Both antennae measure the backscattered signal of the Earth's surface from a single microwave source. The backscattered signals received at each antennae can then be interfered. To date no SAR interferometer have been flown in the space, but ESA's first microwave satellite ERS-1 provides an opportunity to synthesise a SAR interferometer by ingenious use of the repeat feature of the ERS-1 orbit. This is known as multi pass INSAR. If two side looking radar observations of the same scene are made from satellite locations sufficiently close together, interference between the two resulting SAR images can be obtained by comparison of the phases of the synthesized signals making up the two images. The cross orbital separation between the two orbits forms the interferometer baseline.

The complex images from each pass are superimposed (or interfered) as though they were from a single SAR interferometer. For each pixel corresponding to the same area of the ground in both images, the phase values are sub-tracted to produce the phase difference image known as an interferogram. This phase difference is a measure of the difference in path length from a given pixel to each antenna of the SAR interferometer. Using the knowledge of the orbit parameters, the phase interferogram can be related directly to the altitude on a pixel by pixel basis to generate a Digital Terrain model of the terrain. The basic difference between classical DTM extraction, using stereopairs of optical data such as SPOT stereopairs and INSAR lies in the accuracy of the final product. The phase variation between co-registered pixels gives information at the wavelength level, which ensures a better accuracy compared to coarse resolution optical data. Fig.1 shows the Interferometric SAR geometry in a pass-to-pass configuration. The spatial separation or baseline is described by B_x and B_y. The phase difference, ϕ, between the two parallel or nearly parallel orbits is a function of the difference of slant ranges f_2 and f_1 and inversely proportional to the wavelength of the SAR signal.

The differential use of Radar interferometry can be assessed in terms of detection of small surface changes, such changes could be the result of shifting geological faults or the buckling of the surface due to volcanic activities, glacier flowing or slowly progressing landslides. Differential INSAR involves taking three (or more) images of the same ground area (ref. 3). Pass-s

1 and 2 are used to form an interferogram of the terrain topography using the basic INSAR technique. Similarly, passes 2 and 3 produce a further interferogram of the same area. The two interferogram are then themselves difference to reveal any changes that have occurred in the Earth's surface.

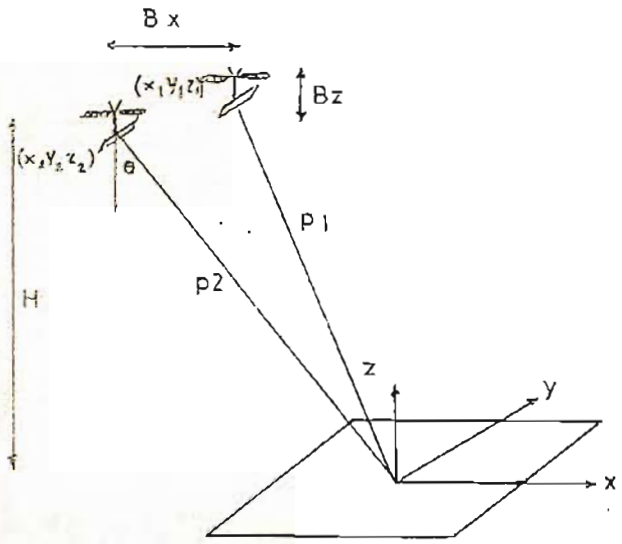


Fig. 1 : Interferometric SAR Geometry in a pass-to-pass configuration

The success of the D-INSAR method has been demonstrated for an agriculture region in the Imperial valley, California (ref. 3) using the data sets of SEASAT-L band radar. The technique was used to show regions where correlation was lost due to plowing or harvesting of fields and regions where coherence was preserved. In an another study a controlled experiment was conducted utilizing a 15 Km. array of 19 corner reflectors around Bonn, Germany. The reflectors were provided movable support and were displaced by precisely known amount. Interferometric processing were carried out by a different group which has no idea of reflector movements. The experiment produced unambiguous positive results and clearly demonstrated the capabilities of ERS-1 data to measure movements of surface features on centimetric scale. This study established that using interferometric data the height of buildings, electrical poles, depths of gravel pits can be reliably estimated (ref. 4). Interferometric data was also used to evaluate tree height and biomass for boreal forest (ref.5). Spectacular results were obtained using differential ERS-1 SAR interferometry for the estimation of millmetric scale co-seismic motion of Landers earthquake, California (ref. 6). Satellite radar interferometry has also been used for monitoring Ice sheet motion for an Antarctic Ice stream (ref. 7).

The successful demonstration of INSAR and D-INSAR methods has opened up many new potential application areas for the satellite radar data. Some of the application areas where radar interferometry can be used to get precise quantitative information are:

a) **Geosciences**

The use of differential interferometry can provide useful information on crustal dynamics after major tectonic events such as Earthquakes. The computation of co-seismic and post-seismic displacement fields for a major earthquake provides important clues in understanding the source mechanism. The technique has already been validated for long term survey of slow moving faults (typically 10 mm/year). The detection of landslides, subsidence and glacier flows are another areas where D-INSAR can emerge as a powerful tool.

b) **Terrain slope estimation**

The terrain slopes are of interest for a wide variety of applications, for example in erosion and avalanche hazard studies. For both processes terrain slope is a key parameter. Besides the direct applications mentioned above the terrain slope is required in radiometric calibration of SAR data. The local slopes can be estimated directly from the interferograms using phase gradients (ref. 8).

c) **Digital Terrain Modeling**

This is the most standard application of interferometry. DTM computation

and product generation has wide variety of usefulness in different application areas and it has been demonstrated that INSAR can produce industrial quality products.

d) **Soil Moisture Estimation**

The penetration of the electromagnetic waves of the SAR into the surface becomes smaller with increasing water content in the soil. The higher the moisture content of the soil the higher the level at which radar signal is reflected. This fact can be used in quantifying the soil moisture as it will be lead to the phase variations due to changing penetration of SAR signal. The advantage of the INSAR technique would be that it is less dependent on the surface roughness than the corresponding grey level change measure, which is presently used to determine soil moisture.

e) **Forestry applications**

Interferometric phase measurements show that the scattering at C-band is close to the tree top when the forest is dense, otherwise it is related to the height and density of the trees. This fact has been utilised to estimate bole volume or biomass (ref. 5).

f) **Environmental Studies**

Change detection due to anthropogenic activities (Building of roads, mining activities, etc.) can be precisely monitored.

However like any other technique radar interferometry has its own constraints (ref. 9). The major constraint in multi-pass INSAR is that the interferometer baseline has to satisfy a condition determined by radar characteristics and the imaging geometry. The quality of interferograms can be affected by change in the nature of the terrain during successive passes (growing vegetation, man made changes, water content, etc.). Varying atmospheric depth within the different scenes can also lead to error in the phase recovery. The development of phase unwrapping algorithm for phase recovery is the most important aspect of any Interferomerty program. The studies carried out using ERS-1 SAR data have shown that it is extremely well suited for the purpose of SAR -interferometry and that this method will become of enormous importance for scientific and practical applications.

REFERENCES

1. L.C. Graham (1974), Synthetic Interferometer radar for topographic mapping, Proc. IEEE, 62(6):763-768.

2. H. Zebkar & R. Goldstien (1986), Topographic mapping from interferometric SAR observations, Geophys. Res., 91 (B5):4993-4999.

3. A.K. Gabriel et. al. (1989), Mapping small Elevation Changes over large areas : Differential Radar Interferometry, Geophys. Res., 94, (B7):9183-9191.

4. P.H. Hartl et. al. (1983), Practical application of SAR-Interferometry : Experiences made by the Institute of Navigation, Proc. second ERS-1 symp., Hamberg, Germany, pp.708-710.

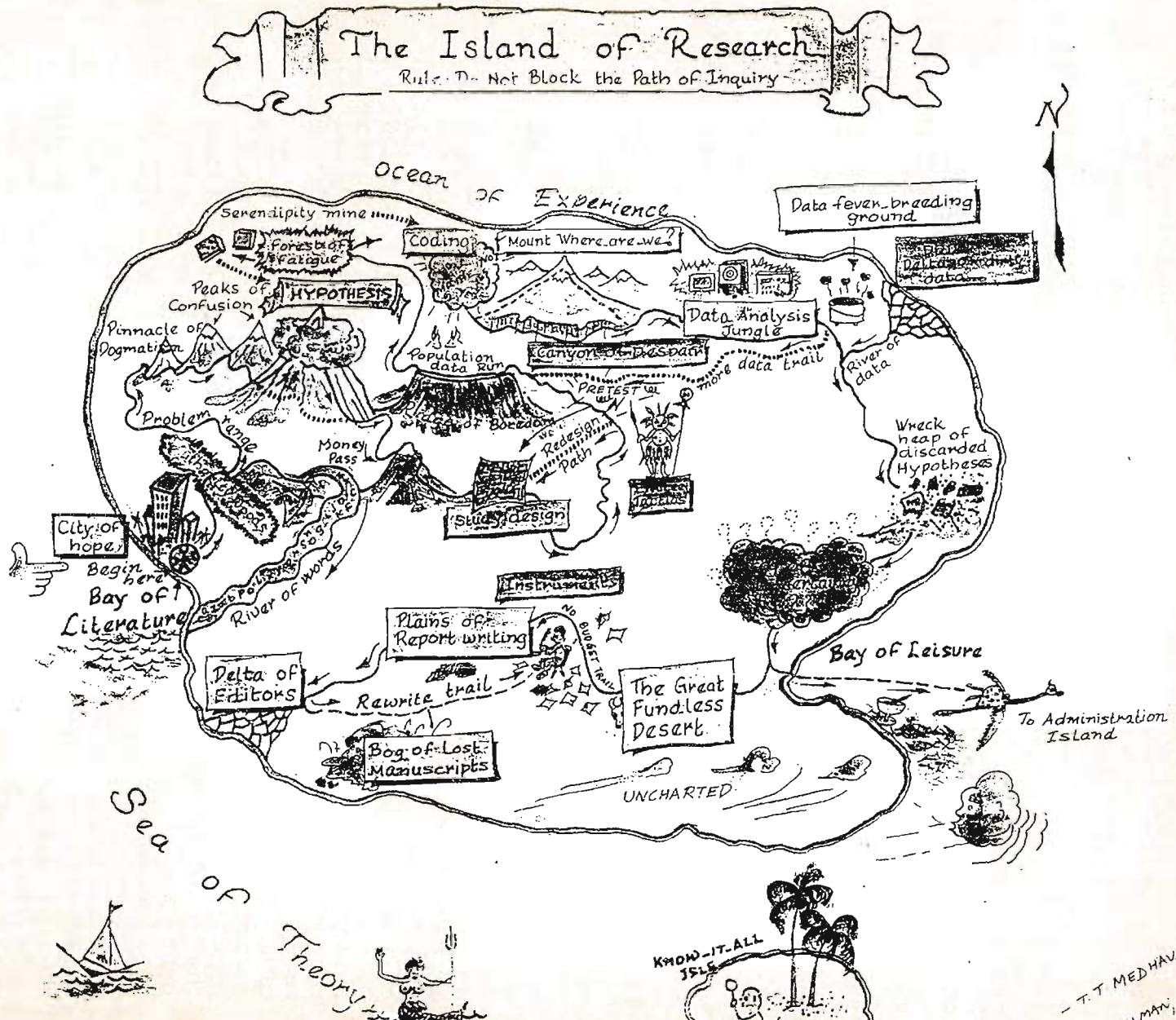
5. L.M.H. Ulander & J.O. Hagberg (1993), ERS-1 Interferometry over forested terrain., Proc. second ERS-1 symposium, Hamburg, Germany, 11-14 Oct. 1993, pp.475-480.

6. D. Massonnet et. al. (1993), The displacement field of the Landers earthquake mapped by radar interferometry,Nature,364:138-142.

7. R.M. Goldstein et. al. (1993), Satellite radar interferomerty for monitoring Ice sheet motion : Application to an Antarctic Ice stream, Science, 262:1525-1530.

8. Wegmuller. U et. al. (1993), Derivation of terrain slope from SAR interferometric phase gradient., Proc. second ERS-1 symposium, Hamburg, Germany, 11-14 Oct., 1993, pp.711-715.

9. D. Massonnet & T. Rabaute (1993), Radar Interferometry: Limits and Potential, IEEE Trans. Geo. and Remote Sensing, 31:455-464.


The Island of Research
Rule: Do Not Block the Path of Inquiry
N
Ocean of Experience
Serendipity mine
Coding
Mount Where-are-we?
Data fever-breeding ground
Foresight
Fatigue
Peaks of Confusion
HYPOTHESIS
Pinnacle of Dogmatism
Data Analysis Jungle
Canyon of Despair
Population data Rim
more data trail
River of data
Problem range
Valley of Boredom
PRETEST
Wreck heap of discarded Hypotheses
Money Pass
Redesign Path
Study design
City of hope
Begin here
Bay of Literature
Instruments
River of Words
Plains of Report writing
NO BUDGET TRAIL
Delta of Editors
Rewrite trail
The Great Fundless Desert
Bay of Leisure
To Administration Island
Bog of Lost Manuscripts
UNCHARTED
Sea of Theory
KNOW-IT-ALL ISLE
T. T MEDHAVY
MAN, 1965

POTENTIAL OF ARTIFICIAL NEURAL NETWORK (ANN) IN REMOTE SENSING APPLICATIONS

K. K. Mohanty

MWRD/RSAG/RSA
Space Applications Centre
Ahmedabad 380 053

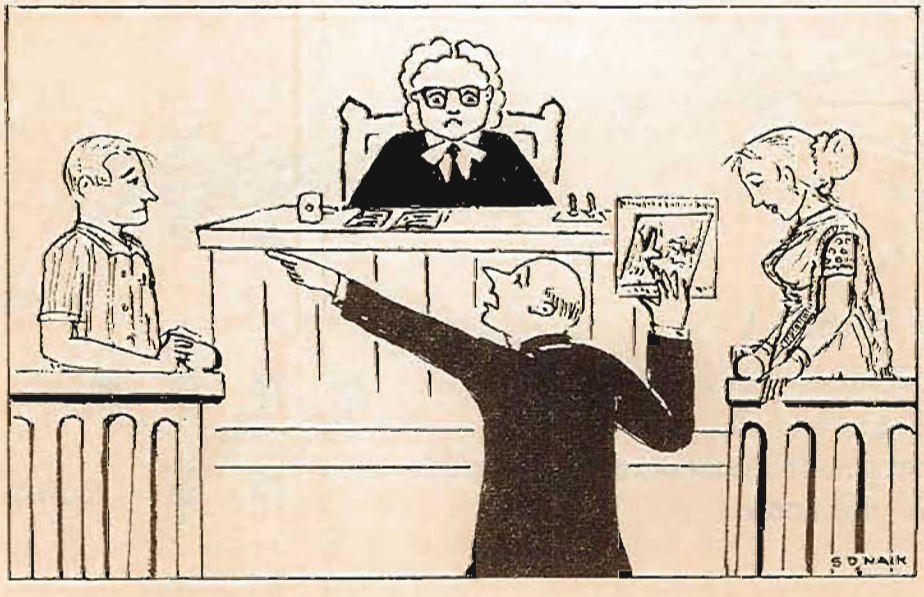
Remote Sensing has come over a long way from visual interpretation of aerial photographs to the age of digital image processing and Geographic Information System (GIS). With continuous availability of higher resolution remote sensing data in more and more number of spectral bands with increasing repetitivity, the volume of information available to application scientists is constantly on increase. There has also been a greater emphasis on use of remotely sensed data in conjunction with other conventional ground based data. This has resulted in a constant pressure on existing processing power and algorithms. Remote sensing today is no longer a mere tool to serve various branches of science, it is a technology of its own, responsible for complete solution to various real life problems. It no longer can remain aloof to developments taking place in other branches of science, particularly information processing.

Most of the processing and analysis in remote sensing *e.g.* image pattern recognition, multisource data classification *etc.*, are of logical and reasoning nature. As far as the logical and reasoning operations are concerned, the biological system like human brain generally outperforms even our most sophisticated computer system. A understanding of the broad features of human brain and its simulation to achieve human-like performance has resulted in a new school of thought, variously known as artificial neural network (ANN), connectionist model, parallel distributed processing model and neuromorphic system. Analogous to a neuron in human brain, ANN consists of many simple nonlinear (often analog) computational elements, called neurons or nodes, linked together through a dense interconnection among the individual neurons (*For a review, see Brunak and Lautrup, 1988*). Each of the neurons receives inputs from a large number of other neurons and generates a single output which passes through many pathways to provide inputs to many other neurons (Fig. 1). The connections between various neurons are of varying strength or weightage and are generally trained or adopted using a set of training data set or illustrated examples. Each of the neurons is also associated with an internal threshold, and a nonlinear transfer function *e.g.* sigmoid, threshold logic, hard limiter *etc.*, to map its input to its output. Like the conventional image processing techniques, an ANN is either of parametric (supervised) or nonparametric (unsupervised) type. Neurons, the basic building blocks of an ANN are organised in various ways resulting in a variety of neural networks *e.g.* Perceptron, Hopfield net, Hamming net, Kohonen self-organising feature maps *etc.* (*see Lippmann, 1987, for details*). A block diagram of multilayer perceptron, a network most widely used in remote sensing is shown in Fig. 2. A brief comparison of some the important neural networks is listed in Table-1.

For the last two decades, the statistical analysis and signal processing have virtually reigned over the field of processing/analysis of remotely sensed data. Even though, there are some similarities between classical statistical approach and ANN approach, ANN offers a number of advantages over the conventional statistical approach (*see Bendiktsson et al., 1990*) (Table-2). The most important similarity between the two approaches is that both allow mapping between a set of input and output vector pairs. ANN provides a highly nonlinear mapping and, in general, is more robust than the statistical approach. For example, in case of image classification a statistical classifier generally starts with an assumption *e.g.* maximum likelihood classifier assumes the distribution of input patterns to be strictly Gaussian, and generates a decision region based on the statistical parameters of the input patterns. A multi-layer perceptron, on the other hand, doesn't need any assumption regarding the distribution of input pattern classes and can model any complicated decision boundary separating the pattern classes (*see Mohanty, 1993*). It can also take into account both spec-

TABLE 1 : BASIC FEATURES OF SOME OF THE WELL KNOWN ARTIFICIAL NEURAL NETWORKS

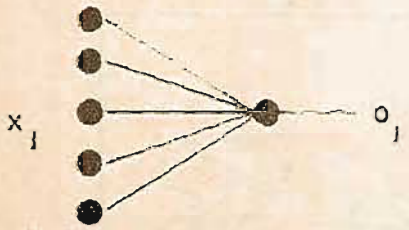
Basic feature of the network	Hopfield network	Perceptron	Kohonen's self organising map
Inventor/ developer	John Hopfield, California Inst. of Tech.	Frank Rosenblatt, California U.	Teuvo Kohonen, Helsinki U. of Tech.
Year	1982	1957	1980
General topology or network configuration	A series of neurons with output of each neuron being fed to all neurons in the net	Feedforward type network with layers of neurons without any inter-layer connection	Inputs connected to a layer of output neurons which are highly interconnected
Major applications or usage	Used as associative memory. Solves optimisation problems and retrieves image or complete data from noisy data	Most widely used in remote sensing Performs mapping for both continuous valued and binary inputs	Maps one geometrical region to another. Used mainly for image clustering in remote sensing
Limitations	Can use only binary inputs	Sensitive to scale of input patterns	Needs large scale training



Moreover, instead of taking my client for outing he showed the places on satellite imagery

TABLE 2 : ADVANTAGES OF ANN APPROACH OVER CLASSICAL STATISTICAL APPROACH

	ANN APPROACH	STATISTICAL APPROACH
1.	Parallel computation; supports analog VLSI implementation	1. Serial computation; does not support VLSI implementation
2.	Adaptive in nature i.e. network can be trained for additional training data	2. Generally processes all training data simultaneously and, hence, not adaptive in nature
3.	Distribution-free i.e. doesn't need any assumption regarding distribution of input patterns	3. Starts with some assumption regarding distribution of input patterns e.g. Gaussian
4.	Mapping function is highly nonlinear	4. Mapping functions are simple mathematical functions of fixed degree and order



$$o_j = f\left(\sum_i^n w_{ji}\, x_i - \theta_j\right)$$

o_j = output of node j

w_{ji} = weight from a node j to a node i

f = a non-linear transfer function

n = no. of input nodes connected to the node

x_i = output of the node i

Fig. 1 : A typical neuron in ANN

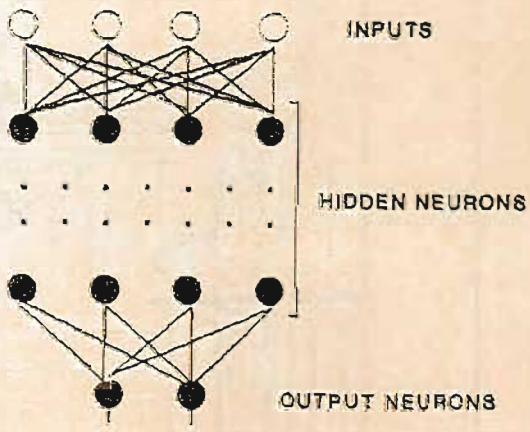


Fig 2 A multi-layer perception

tral and spatial information available in remotely sensed data. Applications of ANN have been demonstrated widely in the fields of image classification, clustering, texture analysis, noise removal and pattern recognition.

In case of a wide range of applications in remote sensing *e.g.* crop yield modeling, soil moisture estimation, meteorological and oceanographic forecasting *etc.*, it is possible to measure/quantify a large set of data comprising of effects/outputs *e.g.* crop yield, soil moisture *etc.* and causes/inputs *e.g.* rain fall, sun shine hour, soil temperature *etc.*, and the problem lies in establishing a relation between the inputs and the outputs. Being nonalgorithmic in nature, ANN allows mapping between a set of inputs and outputs without knowing the physical processes governing the phenomenon *e.g.* it is possible to relate soil temperature with soil moisture without knowing the thermal diffusivity/conductivity relation and bulk density, provided a large set of observations of soil temperature and moisture is available (*see Altendorf et al.*, 1992). A statistical analysis (regression) also serves the same purpose. However, the real strength of ANN lies in nonlinear mapping, since most of the physical processes are believed to be nonlinear in nature.

In remote sensing, the main trend in research involving ANN has been to establish its usage and to assess its advantages using the present day von Neumann type serial computers. However, all such studies fail to make use of its massive parallelism and support for analog VLSI implementation. A VLSI implementation of ANN yields tremendous processing power which can even lead to real time processing of remote sensing data. For instance, study has already indicated potential of ANN for real time processing of polarized SAR data to identify broad scale features like urban, park and water bodies (*see Azimi-Sadjadi et al., 1993*). At present, ANN research in remote sensing is only at its infancy. However, it is already established as a promising general purpose tool for a wide range of problems in remote sensing. Keeping in mind the large volume of remote sensing data to be handled in future, it seems to be the only solution.

Suggested readings

Alterndorf, C. T., Stone, M. L., and Elliott, R. L. (1992), Using a neural network for soil moisture predictions. An American Society of Agriculture Engineers (ASAE) Meeting Presentation, Paper No. 923557, p. 1-17.

Azimi-Sadjadi, M. R., Ghaloum, S., and Zoughi, R. (1993), Terrain classification in SAR images using principal component analysis and neural networks, IEEE Trans. on Geos. & Rem. Sens., 31(2):511-515.

Bendiktsson, J. A., Swain, P. H., and Ersay, O. K. (1990), Neural network approaches versus statistical methods of classification of multisource remote sensing data. IEEE Trans. on Geos. & Rem. Sens., 28(4):540-552.

Brunak, S., and Laurup, B. (1988), Neural networks -computer with intuition. World Scientific Publishing Co., 180 p.

Lippmann, R. P. (1987), An introduction to computing with neural nets. IEEE ASSP Magazine, 4(2):4-22.

Mohanty, K. K. (1993), An artificial neural network approach for land cover classification. Proc. Nat. Symp. on Rem. Sens. Applications for Resource Management with Special Emphasis on N. E. Region, Guwahati, Nov. 25-27, 1993, pp. 444-451.

CHAPTER ACTIVITIES

ISRS-AC continues as one of the most active chapters of ISRS. These activities are a success because of the support and selfless service by all members and Executive Council. We record these activities in order to say 'thank you' and hope you will continue to make future activities a success too.

*

A popular lecture "Remote Sensing and its Applications" was delivered by Shri D.S. Kamat at School of Planning, Gujarat University on September 10, 1993.

*

A science quiz for higher secondary school students was organised at SAC on October 7, 1993. Prof. N.V. Vasani, Pro-Vice Chancellor of Gujarat University was Chief Guest. The first and second prizes were won by BEST Higher Secondary School, Maninagar and Vidyanagar Higher Secondary School, Wadaj, respectively.

*

National Symposium on "Microwave Remote Sensing & Users' Meet" was organised at SAC on January 10 & 11, 1994 to commemorate completion of 10 years of ISRS-AC in December 1993. The proceedings was also brought out.

*

Election for the Executive Council (1994-1996) was held on March 8, 1994, at SAC with Dr. P.C. Joshi officiating as returning officer. The new executive council is reported elsewhere. You haven't seen it!!! Please improve your "sensing" and instead of "passive" become "active" member of ISRS-AC.

*

The Ninth Annual General Body Meeting, 1993-94 was held at SAC on May 5 and 77 members attended the meeting. What transpired at meeting can be viewed by Scanning minutes of meeting. However, it ended on a high note with Sumptous high tea.

*

A lecture on 'Evolution and Future of Decentralised Planning in India' was delivered by Dr. Prem P Pangotra, Director, School of Planning (CEPT), Ahmedabad on June 22, 1994 at SAC. We report this lecture in Speaker's own words on page 2.

Activities Planned for coming months:-

a) Professor Narendra Bhandari, PRL, will deliver a lecture on "Collisions and Catastrophs" on October 3, 1994, at 1600 hours at Vikram Hall, SAC.

b) Dr. Baldev Sahai, Dy Director (RS) and Mission Director RSAM will deliver a lecture on "Remote Sensing in implementation of Agenda 21" on October 14, 1994 at 1600 hours at Vikram Hall, SAC.

b) An educational tour to Balaram watershed (160 kms from Ahmedabad) and marble quarrying site at Ambaji is tentatively planned for November 26, 1994. The members may await for more details from Secretary ISRS-AC.

c) A painting competition for children of ISRS-AC members is planned for November 1994. This event is likely to be sponsored by a reputed drawing materials manufacturing company. Complete information would be available soon.

NEWS - INTERNATIONAL

SMALLSAT

NASA awarded two contracts on June 8, 1994 to two private USA companies to build two small high-tech Earth-observing satellites within two years for less than $110 million, under SMALLSAT program. The satellite 'Lewis' will be built by TRW Space & Electronics Group of Redendo Beach, California for $59 million and will feature 384 spectral bands. The second satellite 'Clark' will be built by CTA Inc. of McLean, Virginia for $49 million and will provide 3-meter resolution images. This will compete with 1 m satellite image being planned by Eyeglass Corporation.

LANDSAT-6

Landsat-6 satellite carrying Enhanced Thematic Mapper (ETM) was launched on October 5, 1993 from Vandernberg Air Force Base, California. The satellite was declared "lost". Earth Observation Satellite Company (EOSAT) which markets MSS and TM data has started receiving and marketing IRS LISS-I and LISS-II data.

1-m SPATIAL RESOLUTION SPACEBORNE DATA

After several months of debate within US administration, the US government announced on March 10, 1994 that it would permit US companies to launch privately owned, commercial remote sensing satellites and to export the images having ground resolution of upto 1 m. Uptil now this has been the domain of spy satellites. SPOT-5, expected launch date 1999-2000 is expected to provide only 5 m pan and 10 m multispectral data. Two US companies have already obtained licence from US government. Eyeglass a company floated by Orbital Sciences Corporation (Dulles), Itek Optical Systems (Lexington) and GDE Systems of San Diego, plans to launch its satellite in early 1997 and has tied with Eirad Co. Ltd. of Riyadh for providing majority of the funding for its $150 million, 1m resolution satellite. Space Imaging Inc. is also planning to sell 1 m spatial resolution data and is backed by Lockheed Corporation and E-Systems Incorporated. It has already secured finances of $220 million to build and operate its satellite. Both companies believe that 1 m spatial resolution imagery would compete with aerial photography. Technical details and optical designs would be frozen in 1995 and planned launches are in 1997.

NEWS - INDIA

The name of Dr. Vikram Sarabhai, the father of Indian Space Programme, was inducted into the International Space Hall of Fame at the Space Centre, Alamogordo, New Mexico, USA, on Saturday, October 2, 1993.

*

Dr. Krishnaswamy Kasturirangan took over the Chairmanship of Indian Space Research Organisation (ISRO) from Prof. U R Rao on March 31, 1994.

*

The first developmental flight of indigenously developed Polar Satellite Launch Vehicle (PSLV-D1) took place on September 20, 1993 from the Sriharikota Launch Complex. PSLV-D1 carried 846 kg IRS-1E satellite which had Monocular Electro-Optical Stereo scanner (MEOSS) payload supplied by the German Space Agency, DLR and Linear Imaging Self Scanner (LISS). The first two stages performed as per specification, however, deviations developed from flight path in third stage. A Failure Analysis Committee looked into flight data and attributed the failure to a software error in the pitch control loop of the on-board guidance and control processor.

*

An agreement was signed by Prof. U. R. Rao and Dr. Arturo Silvestrini, President EOSAT at IAF Congress in Graz, Austria on October 21, 1993 under which EOSAT will receive and market IRS data. The ground station at Norman, Oklahoma has been now modified and started receiving IRS-1B data.

*

After successful launch on July 23, 1993 by Ariane Vehicle of Arianespace, INSAT-2B was declared operational on August 10, 1993.

Article Update

We bring to readers' notice some Indian work on remote sensing which is published outside the core remote sensing journals (Photonirvachak, Int. J. Remote Sensing, Remote Sensing Environment, Photogram. Engineering & Remote Sensing, ITC Journal, IEEE Trans. Geoscience & Remote Sensing) but is of interest to our readers. Readers may also submit such a selection to the Editorial Committee members.

1. Joseph, G., Iyengar, V.S., Nagachenchaiah, K., Kiran Kumar, A.S., Aradhye, B.V., Kaduskar, V.N., Dave R.K. and Nagrani C.M. (1994), Very High Resolution Radiometers for INSAT-2. Current Science, 66 (1):42-56.

   This paper describes design, development and qualification of VHRR from INSAT-2. Their ground truth results and inorbit performance parameters are compared with the design specifications.

2. Hegde, V.R., Shreedhara, V., Hegde, V.S. (1994), Changing land use/land cover pattern in the Kali river basin in Western Ghats, South India, Current Science, 66 (2):128-137.

   Multidate satellite data have been used to quantify the landuse/landcover changes in the Kali river basin for the period 1975-88. An attempt has also been made to predict the changes in landuse/land cover that would be induced in the area to be submerged due to the proposed dume of the Bedtiana the Aghanaghini Hydel projects.

3. Rao, U.R., Rao, D.P., Rao, R.S., Chandrasekhar, M.G., Radhakrishnan, K. (1993), Latur earthquake - Selection of site for rehabilitation of the affected villages in Latur and Osmanabad districts of Maharashtra, India : A Remote Sensing based Study. Current Science, 65(10):772-774.

   Using IRS-1B derived lineament map at 1:50,000 scale, ground truth on affected village and using variative criteria for site selection.

Forthcoming Symposia

1. Symposium on Remote Sensing for Environmental Monitoring and Management with Special Emphasis on Hill Regions and Annual Convention of Indian Society of Remote Sensing, Oct 19-21, 1994, Dehradun.
   - Prof. S.K. Bhan, IIRS, 4 Kalidas Road, P B No. 135, Dehradun 248 001.

2. International Conference on Remote Sensing and GIS, Dec 3-6, 1994, Hyderabad.
   -Prof. I.V. Muralikrishna, ICORG-94, Secretariat, Jawaharlal Nehru Technological University, Mahavir Marg, Hyderabad 500 028.

3. Eighth National Space Science Symposium, SPL, December 19-24, Thiruvananthapuram.
   - Dr. B.V. Krishnamurthy, Director, SPL, VSSC, Thiruvananthapuram 695 022.

4. Fifteenth Asian Conference on Remote Sensing, Nov. 17-23, 1994, Bangalore
   - Shri K Radhakrishnan, ISRO-HQ, New BEL Road, Bangalore 560 094.

5. National Seminar on Conservation and Sustainable Development of Coastal Resources. Dec. 14-17, 1994, Behrampur, Orissa.
   - Dr. R.C. Panigrahy, P.G. Dept of Marine Sciences, Behrampur University, Behrampur 760 007.

ABOUT MEMBERS

ISRS-AC members have continued with their hardwork in various scientific spheres and have earned lot of appreciation of their peers. Some of this also results in awards, election to Scienfific/Professional bodies and climb on hierarchy ladder which we list below. Any omission, is inadvertent. Please communicate such achievements about yourself or your colleagues to Secretary or members of Editorial board.

*

Dr. R. N. Jadhav of SAC shared with Shri S.K. Shivkumar of ISAC the 'Indian National Remote Sensing Award' for the year 1993 given by ISRS. The prize was presented at Annual Convention of Society at Guwahati on November 25, 1993. He wins this award for outstanding contribution to the study of forests using RS data.

*

Shri P S Thakker of SAC received 'Hari Om Ashram Prerit Shri Puranji Paritoshik for year 1992-93 in the field of 'Environment and Social Services' for his services in the field of environment awareness and education and adult education.

*

Shri A Narayana, received ISRS Award-1993 for the best paper published in the Journal of Indian Society of Remote Sensing during the year 1992 for the paper 'Normalisation of Multidate Digital Remote Sensing Data Using Scene Statistics' (Vol. 20, No. 2&3).

*

The award for the best poster presentation at National Symposium on Remote Sensing for Hill Development (Guwahati, November 1993) was shared by Dr. S.K. Pathan, SAC, for his poster "Routing Analysis using GIS Network" with Shri D. Misra of ORSAC.

*

Dr. S.K. Pathan, SAC, was awarded best paper presentation by Computer Society of India for the paper "Potential of Geographic Information System Network for Perspective Planning" during the seminar on "Computers in Public Systems" at Ahmedabad in December 1993.

*

Shri Pramod Kale (President ISRS 1992-1994) took over charge of Director VSSC, Thiruvananthapuram in February 1994.

*

Dr. George Joseph (President ISRS 1994-1996) took over charge of Director, SAC, Ahmedabad, in February 1994. He has been elected unopposed for the post of President ISRS for the term 1994-1996.

*

Dr. Baldev Sahai (President ISRS, 1988-1990 and Chief Editor Photonirvachak) took over charge of Deputy Director (Remote Sensing), SAC in February 1994.

*

Dr. R R Navalgund took over the charge of Group Director, Remote Sensing Applications Group (RSAG), RSA, SAC in February 1994.

*

Dr. Pranav S Desai was appointed as Group Head, Meteorology and Oceanography group (MOG), RSA, SAC in February 1994.

*

Dr. Ajai was appointed as Head of Environmental & Integrated Studies Division of RSAG, SAC in March 1994.

*

Shri J S Parihar was appointed as Head of Agricultural Resources Division of RSAG SAC in March 1994.

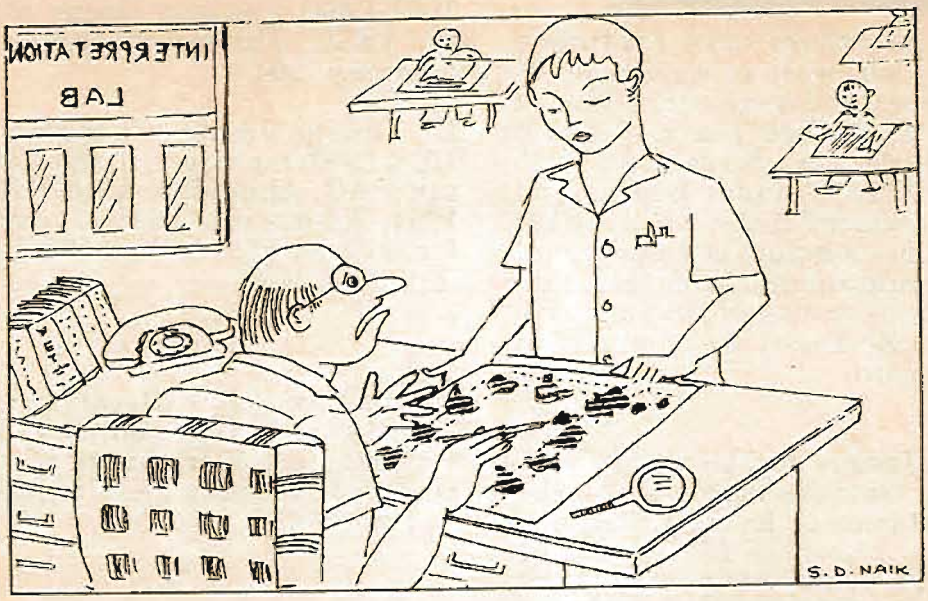
*

Dr. Praful D. Bhavsar and Dr. Baldev Sahai, past presidents of ISRS are among the first four fellows of Indian Society of Remote Sensing. Other two fellows are Dr. L.R.A.Narayan and Prof. B.L.Deekshatulu. They would act as Core Committee to scrutinize the nominations and recommend the names for election as Fellows.

*

Dr. S.R. Nayak was elected to the post of Joint Secretary of the ISRS Executive Council for the term 1994-1996.

- CONGRATULATIONS TO ALL OF THEM



Nonsense ! What do you mean by fracture controlled wetlands ? They are all city roads damaged due to rains

BOOK POST

If undelivered, please return to:

Secretary, ISRS-Ahmedabad Chapter
C/o. Remote Sensing Area
Space Applications Centre
Ahmedabad 380 053

Edited by:

V K Dadhwal, S K Kothari, R M Gairola, N Ravi, Anjali Bahuguna,
K Padmanabhan, Space Applications Centre, Ahmedabad 380 053
A A Ahluwalia, Botany Department, Gujarat University, Ahmedabad

Printed at:

Library, Space Applications Centre, Ahmedabad 380 053

ISRS

SIGNATURES

Vol 9, No 1&2
August 1995

Newsletter of the Ahmedabad Chapter of the Indian Society of Remote Sensing

CONTENTS

Biodiversity and its implications
S.D. Sabnis ... 2
Remote Sensing During the Total Solar Eclipse of October 24, 1995
S. M. Bhandari ... 3
Spectral Vegetation Indices : Recent Advances
S.S. Ray & V. K. Dadhwal ...4
OCEANSAT - N. S. Pillai ...8

Cartoons - S. D. Naik ...10,14
Article update ...11
RS News : International ...11
RS News : National ...11
Forthcoming Symposia ...12
ISRS - Ahmedabad Chapter Activities ...13
About Members ...13

Edited by : V. K. Dadhwal

Dear readers

We are happy to place in your hand the third issue of SIGNATURES by current editorial team which has the same pattern of coverage as was adopted in the previous two issues. Thus again a distinguished guest speaker at ISRS-AC function, Prof. S. D. Sabnis, Ex Pro-Vice Chancellor of MS University, Baroda has tried to communicate the essence of his lecture in his own words. Dr. S. M. Bhandari has drawn the attention of remote sensing community of great opportunity of observing TSE from space. The wonder world of vegetation indices, (new VI are being defined at frantic pace !), is presented in another article by Drs Ray & Dadhwal. The light touch is once again provided by Dr S. D. Naik through his cartoons.

Meanwhile, exciting things are in store for Indian RS community with three Indian-built satellites, INSAT 2C, IRS-1C & IRS-P3 will be placed in orbit by French, Russian and Indian launch vehicles, respectively. The IRS series of satellites will not only change the total scenario of data availability to Indian community but are global leaders as well. While all of you are aware of fast changes in technology, a prime example which can now be added is that 2-band WiFS onboard IRS-1C will be overtaken by 3-band WiFS onboard IRS-P3 before user community will become fully familiar with it. On drawing board, as part of IRS-P series, are a number of unique sensors. One such sensor package is planned on a satellite to be dedicated to ocean applications. The characteristics of sensors on this satellite - OCEANSAT, are described by Shri N. S. Pillai.

The Editorial Committee would welcome your feedback on what you would like to see in SIGNATURES. Our yardstick is to include material which would inform, educate and entertain.

- Editorial Committee.

BIODIVERSITY AND ITS IMPLICATIONS[1]

Prof. S. D. Sabnis
ex- Pro-Vice-Chancellor
The M.S. University of Baroda

Biodiversity now occupies scientific and political centrestage worldwide. It encompasses the variety of World's genes, species, ecosystems, landscapes and habitats.

Plants, animals and various kinds of micro-organisms occupy all conceivable habitats; from ocean depths to mountain tops, from tropical or temperate forests to hot or cold deserts; in rivers, wetlands and even hot springs. Not only that their genetic diversity cannot be correctly quantified, their species diversity varies from the presently known 1.4 million to now estimated 40 or even 100 million. This is due to our poor knowledge about diversity in micro-organisms and poor explorations of the tropical forest and marine ecosystems.

Various human activities have been responsible for adverse changes not only in the landscapes and habitats but also in the ecosystems and the various biotic-plants and animals-components therein. The destruction or shrinkage of these natural habitats has brought about a rapid erosion of the biological resources and their genetic variability. It is very likely that these life forms would disappear from the planet even before their role in the ecosystem or their utility to humans is properly evaluated.

The biodiversity has to be properly assessed not only from a strictly moral/ethical point of view but also from purely practical consideration of present and future human needs for a variety of purposes. It is also necessary to understand the role of biodiversity in the ecosystem structure and function in primary production governing the food chains and webs; and decomposition through micro-organisms for material/nutrient cycling.

Biodiversity losses have been the real crisis facing the humanity. Not only that a large number of species are already extinct or are threatened, there is an imminent danger to the genetic diversity so essential for breeding programmes for improvement of crops and domestic animals. This man-induced process is much faster than the natural process of extinction of species, which has taken place regularly during the past geological eras.

The biodiversity issue, thus touches all human activities. Besides being a scientific, biological issue, it revolves around biological resources and control over their exploitation, through which conmtrol over people and nations could be established and perpetuated. All these socio-economic and political issues like populational and consumptional imbalances, location of germplasm repositories, intellectual property rights, globalization of resources, etc., were also briefly discussed.

[1]Talk delivered under the auspices of ISRS-AC at Vikram Hall, SAC on May 4, 1995.

ISRS-AC Executive Council
1994-96

Dr. P C Pandey ..... *Chairman*
Dr J P Aggarwal..... *Vice-Chairman*
Dr. S K Pathan..... *Secretary*
Shri S V Raghav Rao..... *Joint Secretary*
Ms Beena Kumari..... *Treasurer*
Shri R C Garg..... *Ex-Officio*
Shri I M Bahuguna, Dr. S M Bhandari, Shri S S Manjul, Shri N S Mehta, Shri G B Pandya & Dr. S V C Sastry..... *Members*

REMOTE SENSING DURING THE TOTAL SOLAR ECLIPSE OF OCTOBER 24,1995

Dr. Satyendra M. Bhandari
Meteorology & Oceanography Group
SAC, Ahmedabad

A Total Solar Eclipse is to occur on the morning of Oct. 24, 1995 (Diwali Day) over part of the Earth covering the Indian subcontinent.

A total eclipse of the Sun is an extremely unique and rare event. First of all, in the entire solar system, the sizes and orbits of planets and their satellites are not so optimally designed (!) for such an event to be visible from any planetary surface except of course, the Earth. The Earth-Moon system permits the occurrence of total and partial solar and lunar eclipses. Isn't it unique and astonishing that the great spectacle of a Total Solar Eclipse (TSE) occurs only for the planet which has inhabitants to watch and enjoy it !

The interplay of sizes and distances in the Sun-Earth-Moon system occurs in such a way as to cause a TSE about 2-3 times a year somewhere on the Earth. However, for any given place on Earth, a TSE is as rare as once in 360 years. The last TSE over India took place on Feb. 16, 1980, when the track of totality passed over the peninsular region. A large number of experiments were carried out by the Indian scientists.

The forthcoming TSE on Oct. 24,1995 is the second during this century with the totality path over India. During this event, the track of Moon's shadow would be passing over the highly populated regions of North India. Over India, the TSE would begin in the NW at 0830 IST and the shadow would travel towards E-SE, passing over many cities and would leave the country at around 0850 hrs IST. Fig. 1 shows the coverage of the umbral and penumbral regions of the Moon's shadow over the entire Indian region alongwith the beginning and ending hours, percentage of totality etc. as seen from different places.

During this TSE event, scientists from all over the world have planned a wide variety of experiments to investigate changes that are likely to take place in the state of the Earth's atmosphere and the ionosphere as a result of sudden blocking and unblocking of solar radiation. Astronomers and amateurs would be looking skywards to study the structure and dynamics of the tenuous solar corona, which otherwise is made difficult due to presence of extremely bright solar radiance.

What does a TSE offer to the remote sensing scientists who look at the Earth from space? Certainly, there are many interesting possibilities. As is well known, quite a bit of remote sensing of the Earth even today is being undertaken by measuring and monitoring the reflected solar radiation in the visible band. During the process of a TSE, the incoming solar radiations is blocked by the appearance of dark Moon in the line of sight to the Sun. As a result of this, areas under the shadow would appear dark in any images from space taken during TSE. The response of different types of surfaces on Earth to disappearance and reappearance of the Sun during the TSE can be investigated by remote sensing in the visible and thermal bands.

High resolution imaging from space could thus be used to study the reflected and emitted radiation from various regions of the Earth's surface in the path of the eclipse. These can be supported by ground based monitoring of the incoming and reflected solar radiation, surface and sub-surface temperatures, humidity etc. Resource satellite images may also be useful in imaging any atmospheric gravity waves that the TSE may trigger by the relatively sudden removal and restoration of solar input to the atmosphere/ionosphere system.

While the forthcoming TSE is occurring during the most favorable conditions of weather in terms of cloudiness etc. and in terms of logistics of planning and execution of experiments due to its occurrence over highly populated areas, the time of its occurrence is not suitable in terms of passage of resource satellites over the region. For example, IRS would be collecting images at around 0945 hrs IST, about an hour after the end of TSE.

On the other hand, geostationary meteorological satellite INSAT with VHRR onboard, has the basic flexibility of imaging the entire Indian region at the desired time of the day. Additionally, as India

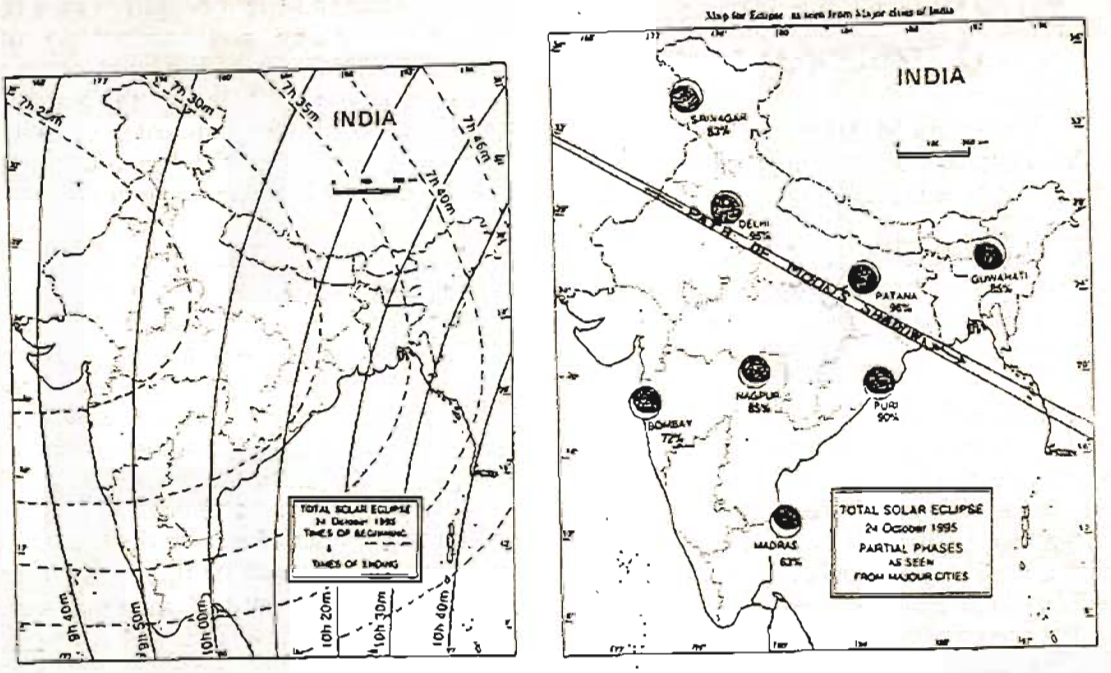


Figure 1. Times of beginning and end of TSE on 24 October 1995 and partial phases as seen from major cities.

simultaneously maintains at least two INSAT-VHRRs in space, these can be used with advantage to get a better coverage of the scan mode to image the shadow 3-4 times in a sequence at different places over the track of the eclipse. INSAT-VHRR images collected in both the visible and IR bands would be analysed to study the size, shape and the dynamics as well as the thermal state of the Moon's shadow during the TSE.

Ground based monitoring of various surface and atmospheric parameters is also planned in collaboration with other colleagues/ agencies to support the remote sensing measurements.

In addition, the occurrence of partial eclipse conditions over the Bay of Bengal would be utilised to study the region of specular reflection of the Sun, called Sunglint, in the INSAT-VHRR visible band images.

The images acquired by the resource satellites like RS, meteorological satellite e.g. NOAA and the oceanic satellites like ERS & TOPEX, which are crossing the region at various hours after the end of the eclipse, would serve to monitor any ong term changes in the behavior of the earth's atmosphere and oceans caused due to the TSE.

While a TSE is normally associated with astronomers undertaking ground based remote sensing of the Sun and its atmosphere, remote sensing of the Earth and its environment from space would add a new dimension to the TSE studies. An image of the Earth from the vantage point of space taken during the TSE, showing the regions actually under the shadow of the Moon, would also have tremendous educational value for the student community excited and eager to learn more about such events.

Remote Sensing community is therefore urged to design and undertake scientific experiments of different types to utilise the

rare opportunity offered by the occurrence of a TSE over the Indian region, to gain better insights into the workings of Nature. It may be noted that the next and the last of the 20th century TSE over India is to occur on 11 Aug. 1999 at a time of the year when sky is likely to be overcast, hampering many an investigations. Hence the forthcoming TSE on Oct. 24,1995 should be viewed and utilised as once-in-a-lifetime opportunity.

(Interested ISRS-AC members are encouraged to contact the author for all the necessary details of the circumstances of the Oct. 24, 1995 total solar eclipse for planning and undertaking any interesting experiment.)

Watching the Spectacle of Total Solar Eclipse Safely

The National Council of Science & Technology Communication (NCSTC) has developed a kit with a handy device with proper filetrs to protect the eyes while viewing the eclipse during all its phases. The kits are available for Rs. 25/- + postage from : Director, NCSTC, Technology Bhawan, New Mehrauli Road, NEW DELHI - 110 016.

ISRS-AC plans to coordinate requirements of these kits from ISRS-AC members for placing the consolidated order. Interested members may give their requirements to the Secretary, ISRS-AC latest by September 30, 1995 so that kits could be obtained in time. A sample kit is available with Dr S. M. Bhandari (Room No 4372, SAC) for the members to examine.

SPECTRAL VEGETATION INDICES: RECENT ADVANCES

S. S. Ray and V. K. Dadhwal
ARD/RSAG/RSA
Space Applications Centre (ISRO)
Ahmedabad 380 053.

The typical reflectance pattern for vegetation shows high absorption due to chlorophyll, at 0.65 µm (red region) and high reflection, due to leaf internal structure, at 0.75 µm (near infra red, NIR, region). This differential vegetation responses at different spectral regions have been used to develop various arithmetic formulae, commonly known as Vegetation Indices (VI). The VIs reduce the multispectral remote sensing data to single numbers for assessing vegetation characteristics, such as, species, leaf area index, biomass, stress etc. VIs are also related to fractions of absorbed total solar and photosynthetically active radiation, canopy photosynthesis, stomatal conductance and land surface albedo. This information is needed in all surface energy balance and climate studies (Sellers et al., 1986), productivity analysis (Prince, 1991) and ecosystem models (Peterson and Running, 1989). Also as result of different arithmetic combinations VIs reduce the additive and multiplicative errors associated with atmospheric effect and sensor characteristics.

This article discusses the modern (post 1980) developments in spectral vegetation indices (VI). As a background the earlier developed and commonly used indices have been summarized in table 1. Most of these VIs suffer from soil brightness and atmospheric influences. So the VIs developed after these are mostly meant to be free from these effects.

1. Broadband Indices

Clevers (1986) proposed a weighted difference VI (WDVI) to correct the IR reflectance for soil background. It is given by,

$$WDVI = R_{nir} - \tau . R_{r} \quad \ldots 1.1$$

where τ is the slope of the soil line.

Huete(1988) developed a transformed VI, called Soil Adjusted VI (SAVI), to minimize

soil brightness influences. Graphically, this transformation involves a shifting of the origin

Table 1. *A summary of the major vegetation indices developed before 1980.*

Name	Formula	References
Ratio	R_r/R_{nir}	Birth & McVey, 1968
Normalized Difference VI	$(R_r+R_{nir})/(R_r- R_{nir})$	Rouse et al.,1973
Transformed VI	$(NDVI+0.5)^{1/2}$	-do-
Orthogonal VI [Greenness(GVI)/Brightness(SBI)]	$a.R_{bl}+b.R_{gr}+c.R_r+d.R_{nir}$	Kauth & Thomas,1976
Perpendicular VI	$[(R_r^s-R_r^p)^2+(R_{nir}^s-R_{nir}^p)^2]^{1/2}$	Richardson & Weigand, 1977
Ashburn VI	$2.0*R_{nir} - R_r$	Ashburn, 1978
GRABS	GVI - a.SBI +b	Hay et al., 1979

$R_{bl}, R_{gr}, R_r, R_{nir}$ are, respectively, the radiance values at blue, green, red and near infra-red wavelength regions. the superscripts s and p stand for soil and plant respectively.

of reflectance spectra plotted in nir-red wavelength feature space to account for first order soil-vegetation interactions and differential red and nir flux extinction through vegetated canopies. Mathematically SAVI is given by,

$$SAVI = [(R_{nir}-R_r)/(R_{nir}+R_r+L)](1+L) \quad .... 1.2$$

where, L is a soil adjustment factor. Although Huete found the optimal adjustment factor to vary with vegetation density, he used a constant L.

Baret et al. (1989) proposed a transformed a transformed SAVI (TSAVI) by taking into account the soil line slope (τ) and intercept (i):

$$TSAVI=[\tau(R_{nir}-R_r-i)]/[\tau R_{nir}+R_r-\tau i+X(1+\tau^2)]3$$

where X is a factor (0.08 in their case)adjusted so as to minimize the soil background effect.

Qi et al.(1994) developed a modified SAVI (MSAVI) that utilized an iterative, continuous L function to optimize the soil adjustment and increase the dynamic range of the SAVI. The L function may be derived by induction or by using the product of the NDVI and WDVI (i.e. $L= 1- 2\tau$ NDVI.WDVI). For inductive L function MSAVI is given by,

$$MSAVI=\{2.R_{nir}+1-[(2.R_{nir}+1)^2-8(R_{nir}-R_r)]^{0.5}\}/2 \quad ... 1.4$$

In addition to minimizing the effect of soil background, top-of-the atmosphere spectral radiance values should be corrected for atmospheric effects to recover the vegetation signal. One such index, the Atmospherically Resistant VI (ARVI) was proposed by Kaufman and Tanre (1992), that incorporated a self correction process for the atmospheric effect at red wavelength by utilizing the radiance difference between blue and red wavelengths. Mathematically it is denoted by,

$$ARVI = (R_{nir} - R_{rb})/(R_{nir} + R_{rb}) \quad .... 1.5$$

where $R_{rb} = R_r - \tau(R_b - R_r)$ 1.6

This index requires prior corrections for molecular scattering and ozone absorption.

ARVI can be coupled with SAVI or MSAVI, the resulting index (SARVI or MSARVI) is expected to correct for both atmospheric and background effects.

$$SARVI = (1+L)[(R_{nir} - R_{rb})/(R_{nir} + R_{rb} + L)1.7$$

$$MSARVI= \{2.R_{nir}+1-[(2.R_{nir}+1)^2-8(R_{nir}- R_{rb})]^{0.5}\}/2 \; ..1.8$$

Xia (1994) found that the VIs based on soil line concept could only reduce soil moisture effect on RS data parallel to the axis, the direction of the soil line, failing when different soil types appeared (in the direction perpendicular to the soil line). Hence he proposed a Two-axis Adjusted Vegetation Index (TWVI) to diminish most soil influences. It is shown to be more suitable as global monitoring VI than other indices.

Many VIs have been computed using thematic mapper data (Thenakbail et al., 1994) One of these is a cubed ratio VI $(TM4/TM5)^3$ which was found to be particularly useful for modelling corn characteristics.

A Global Environmental Monitoring Index

(GEMI) was developed to specifically correct for atmospheric effects in AVHRR data by employing a non-linear combination of red and nir radiances (Pinty and Verstraete, 1992). GEMI exhibits a high atmospheric transmissivity, insensitivity to soil reflectance, with the exception of very bright soils and is empirically representative of vegetation properties in a manner similar to other indices.

$$GEMI=\cap(1-0.25\cap)-(R_r-0.125)/(1-R_r) \quad ....1.9$$

where

$$\cap=\{2(R_{nir}^2-R_r^2)+1.5\,R_{nir}+0.5R_r\}/(R_{nir}+R_r+0.5)$$

Rondeaux and Vanderbilt (1993) proposed modifications in NDVI and SR (simple ratio) by excluding effects of specular light which contains no cellular pigment information. The modified minus specular (ms) indices are given by,

$$SR_{ms} = (R_r-R_s)/(R_{nir}-R_s) \quad .... 1.10$$

$$NDVI_{ms} = (R_r-R_{nir})/(R_r+R_{nir}-2R_s) \quad .... 1.11$$

R_s is the magnitude of the specularly reflected light which can be estimated using Fresnel equations.

2. Narrowband Indices

Spectral VIs in narrow bands can produce better information about the structure and physiology of leaves than NDVI. Hence these indices are also known as physiological indices. Penuelas et al. (1994) have described three such indices. These are, Physiological Reflectance Index (PRI), Normalized Pigment Chlorophyll ratio Index (NPCI) and Water Band Index (WBI).

$$PRI = (R_{550}-R_{530})/(R_{550}+R_{530}) \quad .... 2.1$$

$$NCPI = (R_{680}-R_{430})/(R_{680}+R_{430}) \quad ... 2.2$$

$$WBI = R_{970}/R_{902} \quad ... 2.3$$

PRI shows the changes in the xanthophyll pigments and the photosynthetic rates of leaves. NPCI varies with the total pigments per chlorophyll. The WBI indicates the water status of the leaves.

3. Indices for Temporal Changes

The temporal changes in vegetation can be studied using a Vegetation Change Index (VCI) based on non-corrected radiometric data (Abednego and Collet, 1992).

$$VCI = NPVI_{t1} - NPVI_{t2} \quad .... 3.1$$

where NPVI is Normalized Perpendicular Vegetation Index based on non-corrected radiometric data.

$$NPVI = PVI/\sigma(PVI(bls)) \quad .... 3.2$$

where $\sigma(PVI(bls))$ is the standard deviation of PVI base line (soil line) samples. It has been found that NPVI was not influenced by multiplicative and additive factors due to sensor charateristics, atmospheric and illumination conditions.

To characterize the temporal trends in vegetation indices three derived indices/ parameters have been used. The area-under-the-curve integral index produces a single number that is associated with total dry matter accumulation (Tucker et al., 1981). The skew index (Samson, 1993) reflects the time in the seasonal profile when the highest NDVI values occur. This accomplished by bisecting the time domain of the observations and determining the proportion of the area under the curve in the first half of the season to the total area under the curve. The range index (Samson, 1993) is associated with the range of NDVI values observed over the temporal sequences. This index reflects the relative change in NDVI values observed over the growing season.

4. Thermal Indices

McVicar et al. (1993) developed a temperature based index, called NDTI (Normalized Difference Temperature Index) from AVHRR derived and atmospherically corrected composite surface temperatures T_s.

$$NDTI = (T_- - T_s)/(T_- - T_0) \quad ... 4.1$$

where T_0 and T_- are the energy balance based composite surface temperatures the same area would have at the time of overpass assuming (respectively) fully available moisture (or zero surface resistance) and no available moisture (or infinite surface resistance). NDTI has been found to be very closely related with moisture availability of surface.

Becker and Li (1991) have observed that, as the reflectance contrast between optical bands is very low for soils, indices based on optical bands do not properly characterize soil properties. So a combination of optical data with thermal data will be suitable for this purpose. However, the thermal ir data is a combined effect of surface emissivity(which represents soil properties) and surface temperature. In order to solve this problem they have defined Temperature Independent thermal ir Spectral Indices (TISI). In general, TISI is defined as:

$$TISI = \prod_{k=1}^{N} \epsilon \qquad ...4.1$$

if atmospheric reflected radiance is neglected,

$$TISI = C.\prod_{k=1}^{N} \epsilon \qquad ...4.2$$

if it is not neglected ,with $C \approx 1$, N is the number of channels and ϵ is the emissivity.

5. Microwave Indices

VIs have also been defined in microwave region, which are used for crop discrimination. Paloscia and Pampaloni (1992) a microwave VI, called Normalized Temperature Difference, which is the difference between the normalized temperature T_r at 36 GHz and 10 GHz, where T_r is the ratio between the microwave 'brightness' and infrared 'radiance' temperatures. This index was foun to depend upon plant biomass and could be related to some crop parameters such as plant water content and leaf area index.

The Microwave Polarization Difference Index (MPDI), developed by Becker and Choudhury (1992) is the normalized difference of brightness temperatures in horizontal and vertical polarization measured at 37 GHz.

$$MPDI = (T')/(T_H + T_V) \qquad ....5.1$$

$$\text{where} \quad T' = (1-C)\,T_s + C.\,T \qquad ....5.2$$

T - brightness temperature difference, C - fraction cover and T_H and T_V are brightness temperature in horizontal and vertical polarization. The subscript s is for soil. MPDI has been found sensitive to water content of plant.

Conclusions

Because of the large amount of information provided by the VIs, these form the core of an evolving branch of remote sensing technology with a significant role in the forthcoming Earth Observation System (EOS) era. However it must not be forgotten that the information content of a VI depend only on the constituent radiances (or reflectances) and that an empirical relationship does not necessarily imply a causal relationship. Though the recently developed broadband VIs try to correct for soil and atmospheric influences, still they are not able to completely be free of those influences. For example, ARVI corrects well for atmospheric effects resulting from sun angle changes and moderate variations in aerosol optical depth. However it does not correct for net negative atmospheric effect at near infra red wavelength, which is large under turbid atmosphere. For critical discussions on different VIs, readers are referred to Hall et al. (1992) and Myneni and Asrar (1994).

REFERENCES

Abednego BSP, Collet C (1992) A theoretical approach for vegetation change index based on non-corrected radiometric data. *IJRS*. **13**:699.

Ashburn P (1978) The vegetation index number and crop identification. *Proc. LACIE Symp.* Johnson Space Centre, Houston, USA. pp. 843.

Baret, F. Guyot, G. and Major, D. (1989) TSAVI: a VI which minimizes soil brightness effects on LAI or APAR estimation. *12th Canadian Symp. on Rem. Sens. and IGARSS'90*, Vancouver, Canada, 10-14 July.

Becker F, Choudhury BJ (1988) Relative sensitivity of NDVI and MPDI for vegetation and desertification monitoring. *RSE* **24**:297.

Becker F, Li ZL (1991) Complementarity of temperature independent thermal ir spectral indices (TISI) and NDVI : Compared properties and combined use for soil and vegetation discrimination. *Proc 5th Int. Collquium - Physical Measurements and Signatures in Rem. Sens.*, Courchevel, France. pp. 475-480.

Birth GS, McVey G (1968) Measuring the colour of growing turf with a reflectance spectrophotometer. *Agron J* **60**:640.

Clevers JGPW (1986) The application of a VI in correcting the IR reflectance for soil background. *Proc. Symp. on RS for Res. Dev. & Environ. Mgt.*, Enschede, 25-29 Aug, 1986.

Hall FG et al. (1992) Satellite Remote Sensing of surface energy balance: successes, failures, and unresolved issues. *J. Geophy. Res.* **97**, D17:19,061

Hay L et al. (1979) Development of AI procedures for dealing with the effect of episodal events on crop temporal response. Agristars Rep. SR-B9-00434. Johnson Space Centre, Houston, USA.

Huete, A.R. (1988) A soil adjusted vegetation index (SAVI). *RSE* **25**: 295

Kaufman YJ, Tanre D (1992) Atmospherically resistant vegetation index for EOS_MODIS. *IEEE Trans. Geosci. Rem. Sens.* **30**: 261-270.

Kauth, R.J. and Thomas, G.S. (1976) The Tasseled Cap - a graphic description of the spectral-temporal development of agrl. crops as seen by Landsat. *Proc. Symp. Machine Processing of RS data.* Purdue University. pp. 44-51.

McVicar TR et al. (1993) Soil moisture and drought monitoring using remote sensing. *Proc 14th ACRS.* Tehran.

Myneni, R.B. and Asrar, G. (1994) Atmospheric effects and spectral vegetation indices. *RSE.* **47**:390-402.

Paloscia S, Pampaloni P (1992) Microwave vegetation indexes for detecting biomass and water conditions of agricultural crops. *RSE* **40**:15

Penuelas, J et al. (1994) Reflectance indices associated with physiological changes in nitrogen and water limited sunflower leaves. *RSE* **48**:135-146.

Pinty, B. and Verstraete, M.M. (1992) GEMI : a non-linear index to monitor global vegetation from satellites. *Vegetatio*, **101**:15-20.

Peterson, D.L. and Running, S.T. (1989) Application in forest science and management, in 'Theory and Application of Optical Remote Sensing' (G. Asrar, Ed.) Wiley, New York, pp. 429-473.

Prince, S.D. (1991) A model of regional primary production for use with coarse resolution data. *IJRS* **12**:1313.

Qi J et al. (1994) A modified soil adjusted vegetation index. *RSE* . **48**: 119.

Richardson, A.J. and Weigand, C.L. (1977) Distinguishing vegetation from soil background information. *PERS* **43** : 1541

Rondeaux G, Vanderbilt VC (1993) Specularly modified VIs to estimate photosynthetic activity. *IJRS* **14**: 1815.

Rouse, J.W et al. (1974) Monitoring earth vegetation system in great plains with ERTS. Proc. 3rd ERTS-1 Symp., GSFC, NASA, SP-351. pp. 309-317.

Samson, S.A. (1993) Two indices to characterize temporal patterns in the spectral response of vegetation.*PERS* **59** : 511

Sellers, P.J., Mintz, Y., Sud, Y.C. and Dalcher, A. (1986) A simple biosphere model (SiB) for use with general circulation models. *J. Atmos. Sci.* **43**:505-531.

Tucker, C.J., Brent,N.H., James, H.E.Jr. and James, E.M. (1981) Remote sensing of total dry-matter accumulation in winter wheat. *RSE* **11**:171-189.

Thenkabail, P.S., Ward, A.D., Lyon J.G. and Merry, C.J. (1994) Thematic mapper VIs for determining soybean and corn growth parameters. *PERS* **60**: 437-442.

Xia, Li (1994) A two-axis adjusted vegetation index (TWVI). *IJRS* **15**:1447-1458.

(IJRS : Internat. J. Remote Sensing;
PERS : Photogramm. Engg. & Remote Sens.,
RSE : Remote Sensing of Environment)

Obituary Notice

Indian born Astrophysicist and Nobel Laureate S. Chandrashekar passed away in USA in August 1995.

ESPECIALLY ON HOLIDAYS , WHAT I DO IS , I PROFUSELY PRAISE HIS REMOTE SENSING WORK AT THE TIME OF MORNING TEA AND RELAX REST OF THE DAY

OCEANSAT

N S Pillai
Space Applications Centre (ISRO)
Ahmedabad- 380 053

Following the successful development and operationalisation of IRS 1A and 1B satellites and the planned launch of IRS 1C and 1D to cater largely to the needs of land related applications, it has now been proposed to develop and launch OCEANSAT, catering largely to oceanographic applications. The data from this satellite will also provide valuable inputs for the meteorological and climatological studies.

OCEANSAT is expected to carry a Ku-band scaterrometer, a Ku-band altimeter, a three frequency radiometer and a ocean colour monitor. Scatterometer will provide data on ocean surface wind speed and direction, altimeter will provide data on significant wave height, ocean surface topography and wind speed and the ocean colour monitor would provide data related to ocean biological parameters. The microwave radiometer data will be primarily used for computing the atmospheric parameters for correcting the altimeter data. The major specifications of these sensors are given below:

Sensor 1. Ku-band scatterometer

Frequency	13.995 GHz
Polarisation	vertical
Antenna	3 fan beam antennas (45, 115 & 135 deg wrt flight vector)
Swath	500 Km
Resolution	50 x 50 Km
Wind Direction *(a) Range* *(b) Accuracy*	 0 - 360 deg 20 deg

Wind Speed *(a) Range* *(b) Accuracy*	 4-24 m/s 2 m/3 or 10%

Sensor 2. Ku-band Altimeter

Frequency	13.6 GHz
Antenna	1.2 m dia parabola
Altitude measurement accuracy	10 cm
Significant Wave Height Measurement *(a) Range* *(b) Accuracy*	 1-20 m 0.5m or 10 %
Scattering Coeff. Measurement *(a) Dynamic Range* *(b) Accuracy*	 48 dB 1 dB

Sensor 3. Radiometers

Frequency	18, 21 & 37 GHz
Antenna	800 mm dia. parabola
Resolution	54x58 km, 44x29 km & 28x18 km
Temp. Measurement Accuracy	1 deg K

Sensor 4. Ocean Colour Monitor

No. of Channels	9 (402 - 1700 nm)
IFOV (a) VNIR *(b) SWIR*	250 m 500 m
Swath	1500 km

The altitude of the spacecraft will be around 743 km in the polar sun synchronous orbit. The repetivity will be 2 days for the 500 km swath. The data will be downlinked in both S and X bands during the visibility period and there will be provision for on board data recording and storage also.

RS-NEWS : INTERNATIONAL

Landsat 7 program is making progress and current plans indicate a launch in 1997/98.

High Resolution Eyeglass (see Signature 8(1/2)p13) is being considered as a two satellite configuration to increase viewing frequency.

RADARSAT, the Canadian microwave satellite is expected to be launcehed in September, 1995 from USA. The launch services are being provided at no cost by USA for having access to data over USA.

RS-NEWS : NATIONAL

IRS-1A was retired from service on March 17, 1995.

INSAT-2C is scheduled for launch on Nov 30, 1995 by Arianne. It does not carry the AVHRR as already 3 AVHRR are currently deployed in space.

IRS-P3 is scheduled for launch in January, 1995 by PSLV from Sriharikota. The sensor package onboard IRS-P3 includes DLR payload of MOS-A, MOS-B and MOS-C and SAC-built 3-band WiFS.

Antrix Corporation has signed an agreement with EOSAT that provides latter with exclusive world rights for data generated by IRS series of satellites. EOSAT is already acquiring and distributing data from IRS-1B and IRS-P2 satellites.

ARTICLE UPDATE

The contributions of ISRS-AC members in the ISRS 25 Silver Jubilee Symposium on Remote Sensing for Environmental Monitoring and Management with Special Emphasis on Hill Regions, held at Dehradun (22-24 Feb, 1995) are given here for the benefit of those who did not participate in the symposium.

Oral Presentations

Palria S, TS Singh, M Chakraborty, V Tamilrasan, MA Kawosa, Mapping of turbidity levels and aquatic vegetation in Wular Lake using IRS-1A data. pp 1-9.

B Sahai, MM Kimothi, Resources survey of Nanda Devi biosphere reserve. pp 26-33.

TT Medhavy, C Patnaik, NK Patel, An evaluation of

speckle removal filters for ERS-1 SAR data. pp 91-97

N Padmanabhan, KP Rao, KL Majumdar, A method for correcting terrain related distortions in remote sensing data. pp 98-105.

HS Bhatt, IC Matieda, CVS Prakash, Light transfer analysis and radiometric normalization of IRS-1B payloads. pp 121-131.

HS Bhatt, PB Shah, CVS Prakash, Near real time monitoring of IRS LISS payload performance. pp 132-138.

G Arun, S Kothari, TP Singh, Application of remote sensing in mapping and management of land degradation : A case study of Sagwada Tehsil, Dungarpur, Rajasthan. pp 203-209.

R Krishnamoorthy, R Ramesh, S Ramachandran, S Sundarmoorthy, B Sahai, SR Nayak, P Chauhan, Study on sediment concentration in coastal waters of Tamil Nadu. pp 222-229.

MM Kimothi, RN Jadhav, AK Kandya, MB Mankare, PB Bhalekar, SC Chavan, Catchment area treatment plan for directly draining subwatersheds of Sardar Sarovar catchment (Maharashtra) using remotely sensed data. pp 273-281.

PH Vaidya, KF Patel, UD Datir, TP Singh, V Tamilarasan, RR Navalgund, Application of remote sensing in monitoring of water logging - A case study of Dharoi command area, Gujarat. pp 295-303.

MP Oza, VK Srivastava, PK Devaiah, Predicting mean crown diameter in tropical dry deciduous forest from characteristics. pp 312-317.

RN Jadhav, PS Thakker, MM Kimothi, YS Vanikar, JP Aggarwal, A GIS-based approach for forest working plan revision : A case study in Santrampur Taluka, Panchmahals District, Gujarat. pp 318-326.

IM Bahuguna, AS Rajawat, NS Mehta, DS Mehta, P Bhatnagar, AK Srimal, Synergistic use of ERS-1 SAR and IRS LISS-II data for mineral exploration : A case study covering Pur-Banera region (Bhilwara district, Rajasthan). pp 375-381.

Posters & Abstracts

RM Gairola, S Basu, PC Pandey, Rainfall estimation using integrated satellite visible, infrared and microwave observations. p 393.

HS Bhatt, RN Acharya, SS Palsule, CVS Prakash, Light transfer characteristics analysis and radiometric normalization of MEOSS payload. p 396.

S Mohan, NS Mehta, RL Mehta, P Patel, DR Rajak, HS Srivstava, ERS-1 SAR for the identification of forest cover - A case study covering parts of Agra. p 397.

B Kartikeyan, PS Dhinwa, M Jethakumar, KL Majumdar, Development of an expert system for land cover classification using spectral knowledge and ancillary information. p 401.

Shri Lakshmi Narayan Calla Memorial Lecture Series Revived

With delivery of sixth lecture by Prof. V. K. Gaur, the above series, which was started in 1987 has been revived. The funds for this series are provided by Shri O.P.N. Calla, Deputy Director, SAC and first Chairman of ISRS-AC. The distinguished list of past speaker is provided below :

I. **Prof. P. R. Pisharoty** : Remote sensing of ocean floor topography (Dec 30, 1987).

II. **Shri P. A. Raj** : Sardar Sarovar Project - A lifeline of Gujarat (Dec 30, 1988).

III. **Prof. S. S. Merh** : Sea-level changes along Gujarat coast (Dec 11, 1989).

IV. **Prof. B. L. Deekshatulu** : Remote Sensing for national development (Jan 11, 1991).

V. **Dr. K. Kasturirangan** :Bio-Astronomy - A test for anthropomorphic principle (Jan 9, 1992).

FORTHCOMING SYMPOSIA

National Symposium on Remote Sensing of Environment with special emphasis on green revolution and Annual Convention of Indian Society of Remote Sensing. - Ludhiana, Nov. 22-24, 1995

- Dr. P. K. Sharma, Organising Secretary, ISRS Symposium-1995, Punjab Remote Sensing Centre, PAU Campus, Ludhiana - 141004.

Workshop on Application of Remote Sensing and Geographical Information System in Urban and Regional Planning. October 17-20, 1995 at Dehra Dun.

- Prof. N. D. Sharma, Head, Human Settlement Analysis Group, IIRS, 4 Kalidas Road, P.B. No. 135, Dehra Dun 248 001.

Fifteenth INCA International Congress : Cartography - Emerging Technologies and Alliances; 5 - 8 december 1995, Indore

- Prof. H.S. Mehta, Organising Secretary, Deptt of Civil Engineering, GSITS, Indore - 452 003 (MP).

National Workshop on Soil Resource Inventory for Perspective land Use Planning (SRILUP 95), September 26 - 29, 1995, Nagpur.

- Dr. J. P. Sharma, Organising Secretary SRILUP95, National Bureau of Soil Survey and land Use Planning, amravati Road, Shankar Nagar P.O., Nagpur - 440 010

TROPMET-96 : National Symposium on Meteorology and Natural Disasters, Feb 14-17, 1996, Andhra University, Visakhapatnam.

-Prof. J. K. Patnaik, Chairman LOC-TROPMET-96, Dept. of Meteorology & Oceanography, ANdhra University, Visakhapatnam - 530 003 (A.P.).

ISRS-AC ACTIVITIES

The Annual General Body Meeting of ISRS-AC was held on April 28, 1995 at Vikram Hall, SAC. About 100 members participated in deliberations which were rounded off with a high tea.

A lecture on biodiversity was delivered by Prof. S. D. Sabnis, ex Pro-Vice Chancellor, MS University, Baroda, on May 4, 1995 at Vikram Hall, SAC.

Sixth Shri Lakshmi Narayan Calla Memorial lecture was delivered by Prof. V. K. Gaur, Distinguished Scientist, CMMACS, Bangalore on May 24, 1995 at Vikram Hall, SAC who spoke on ' International decade of natural disaster reduction : An Indian Experience' before an appreciative audience.

Van Mahotsav was celebrated on August 5, 1995 by distributing about 600 saplings to the ISRS-AC members. We hope the members will take good care of their new 'wards'.

Members may get ready for the following activities, planned for near future :

* A painting competition for the children of ISRS-AC Members is planned for October, 1995
* A quiz program for college students will be held in November 1995.
* Seventh Shri Lakshmi Narayan Calla Memorial Lecture is tentatively scheduled for Nov/dec 1995.
* One day seminar on remote sensing for development of Gujarat state is planned in March 1996.

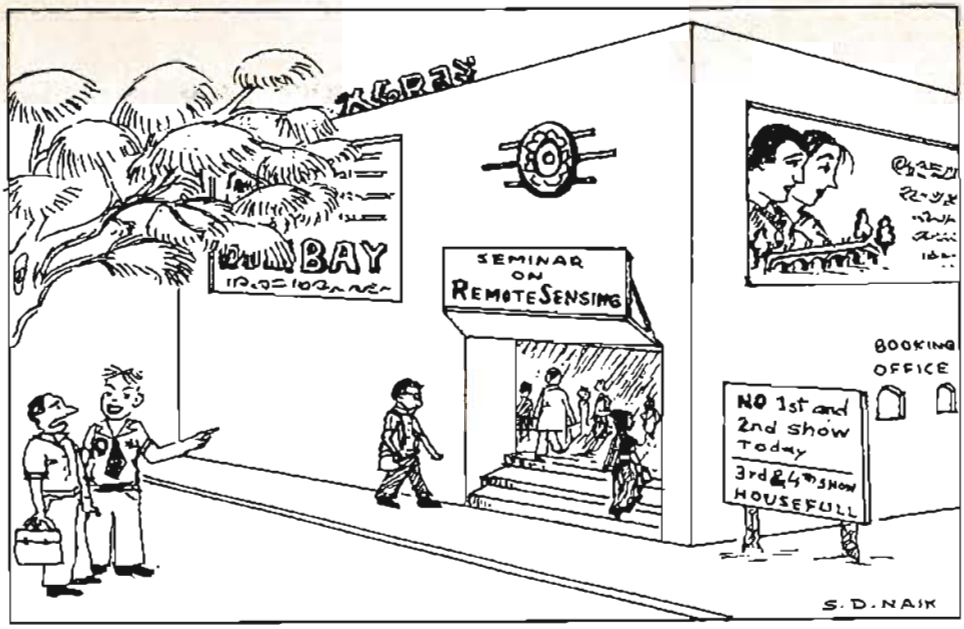
ABOUT ISRS-AC MEMBERS

The **Indian National Remote Sensing Award** for the year 1994 was conferred jointly on Dr. Shailesh Nayak and Shri A.S. Kiran Kumar for their contribtions in 'application and operationalisation of remote sensing technology in coastal mapping and management', and ' design, development and fructification of remote sensor technology'. This marks hat trick for ISRS-AC in winning this award, with previous winners being Dr R. R. Navalgund (1992) and Dr. R. N. Jadhav (1993).

Shri R. C. Garg, past Chairman. ISRS-AC, joined as director ADRIN, Hyderabad.

Indian Meteorological Society (IMS) has awarded **J. Das Gupta Award** to Shri S. Ilanthiryan, Shri A. K. Mathur and Dr. V. K. Agarwal for their article 'Cloud height determination using satellite stereoscopy from along track scanning radiometer on board ERS satellite', published in Photonirvachak - J. Indian Society of Remote Sensing, Vol 20, 1992. (*We would like to compliment them for publishing a valuable contribution in field of meteorology in the ISRS journal.*)

IMS has awarded **Dr. B. N. Desai Award** to Dr. P. K. Pal for his article on 'Cyclone track prediction over the North Indian Ocean' published in Monthly Weather Review, Vol 119, 1991.



Almost every delegate requested for best projection system and total darkness during presentation. This is the only hall in our town which has both.

BOOK POST

If undelivered, please return to :
Secretary, ISRS-Ahmedabad Chapter
c/o Remote Sensing Area
Space Applications Centre (ISRO)
Ahmedabad - 380 053

Edited by :
V. K. Dadhwal, S.K. Kothari, R. M. Gairola, N. Ravi , Anjali Bahuguna, N. Padmanabhan, Space Applications Centre, Ahmedabad
A. A. Ahluwalia, Botany Department, Ahmedabad
Printed at :
Library, Space Applications Centre, Ahmedabad

1990

MEHTA N.S.
SCIENTIST, ARD-RSAG
SAC
AHMEDABAD-380053

SIGNATURES

Vol 10, No 1&2
November 1996

Newsletter of the Ahmedabad Chapter of the Indian Society of Remote Sensing

CONTENTS

Improving the quality of life- The Space Option **K. Kasturirangan** ... 2
Retrospective and Prospective of Remote Sensing in India **George Joseph** ...2
High spatial resolution commercial satellites4
INSAT-VHRR Imaging of earth during total solar eclipse **S. M. Bhandari** ... 6
RS News : International ...7
RS News : National ...7
ISRS - Ahmedabad Chapter Activities ...9
Forthcoming Symposia ...10
About Members ...10
Science Ranking of India declines ...11
Cartoon - S. D. Naik ...12

Edited by : V. K. Dadhwal

Dear readers

We are happy to place in your hand another issue of SIGNATURES, albeit belatedly, which has the same pattern of coverage as has been followed in the previous two years.

During the period covered in this issue, ISRS-AC members had the privilege of playing host to and listening to some very distinguished guests and speakers. Dr. K. Kasturirangan spoke on 'Improving the quality of life - The space option'. Prof. R. Pisharoty was the guest at the inuagral lecture of a series instituted in his honour. The first lecture of this series was delivered by Dr. George Joseph, then President ISRS. Eighth Shri Lakshmi Narain Calla Memorial Lecture was delivered by Shri Pramod Kale also a past President of ISRS.

1997 will see the launch of 25th Indian satellite (we provide you a list of previous 24 satellites) and international RS 'scene' will hot up with arrival of new kids in the block with shining bikes (Commercial high spatial resolution satellites), which are covered in an excerpt from PERS.

Dr. S. M. Bhandari had drawn the attention of RS community of opportunity of observing total solar eclipse from space in last issue and he provides results of his observations in this issue.

Although Indian remote sensing programme ranks very high globally, our ranking in overall science continues to decline. We present one such view and analysis.

The light touch is once again provided by Dr S. D. Naik through his cartoon.

The Editorial Committee would welcome your feedback on what you would like to see in SIGNATURES. Our yardstick is to include material which would inform, educate and entertain.

- Editorial Committee.

IMPROVING THE QUALITY OF LIFE - THE SPACE OPTION

K. Kasturirangan
Secretary, Dept. of Space & Chairman ISRO

In the continuing quest for knowledge man has embarked on scientific explorations of one kind or the other for the betterment of mankind and for improving the quality of life. Among the scientific developments of the 20th century, the development of space technology and applications, stand out as one of the most revolutionary and comprehensive achievement. It has enriched scientific knowledge, provided connectivity on a planetary scale and has touched every aspect of human life. Today life on earth is unthinkable without vital inputs from space technology.

From the primitive man to present, the quality of life has undergone dramatic changes. Space technology has provided a quantum leap in improving the quality of life by providing vital inputs in economic development, nature conservation, health care, sanitation, food-security, etc. The direct benefits of space technology have been in the area of telecommunication, meteorology, resource inventory, disaster management and exploring higher and higher frontiers in the solar system and beyond.

The capability of satellite based remote sensing to provide an unbiased synoptic view of the natural resources of the earth in a timely and cost effective manner offers a valuable solution to the problem of improving environmental integrity to developmental processes at all levels.

In the area of disaster management, for example, weather forecasting and communication of advance warning of severe weather is made possible through space technology. This minimizes loss of life and damage, and facilitates timely rescue and rehabilitation of affected population. INSAT based DWS (Disaster Warning System) has proved its efficacy in the successive cyclone seasons during the last one decade. This has helped in saving thousands of lives and livestock in the country. With continuous monitoring of a vast region arounfd India, through indegenously developed INSAT-VHRR system, no cyclonic storm can go undetected.

Based on popular lecture delivered on August 12, 1996 at PRL auditorium under auspices of ISRS-AC for celebrating the National Remote Sensing Day.

—««OO »»—

RETROSPECTIVE AND PROSPECTIVE OF REMOTE SENSING IN INDIA

George Joseph
Director, Space Application Centre
Ahmedabad

" As President of the Indian Society of Remote Sensing, I would like to compliment the office bearers of the Ahmedabad Chapter for organizing such an approprite function to honour the invaluable contributions made by Prof. Pisharoty, to the field of earth observation. I consider it a great privilege and honour to speak on this occasion as Prof. Pisharoty has influenced me personally and professionally.

" Use of aerial photography is not new to the Indian community. Aerial photography was first used in India in th eyear 1920 in a survey experiment. However, in the context of modern remote sensing where one uses multispectral information for feature

identification, it started with the famous experiment on the detection of cocnut wilt disease pioneered by Prof. Pisharoty. The seed sown by Prof. Pisharoty has grown into a big banyan tree, very huge one and stands higehr and taller than many other similar programmes in the international arena.

" After having said all nice things, let me be a little critical. As members of the Remote Sensing Society, I think, we shoul look critically at our achievement. I am quite unhappy with the contibution what we have made in the area of basic sciences of remote sensing. .. . We have not gone into fundamental research inspite of having so much intellectual talent. We are still talking about MXL classifier; what prevented us to develop operationally working software to use texture ? We talk about expert systems but have not come out with anything which can be used operationally. Again look at modelling. For many of the parameter retrieval we use regression fitting. I would like some physics being used to retrieve the parameters of interest. ... Some of the other importnat areas which need attention are : atmospheric correction, parameter retrieval algorithm, data integration,....

" I would like to do some loud thinking about what could be vision for the future. We need to tackle five broad areas. Continuity of service, ... Explore newer areas of applications, ... Strengthen Infrastructure,... International Participation,... Capture remote sensing market.

" I think as an optimal constellation to meet out national and global needs... three type of satellite systems [needed are] : (i) an operational system which provides continuity of services, and with time provides newer and additional services; (ii) satellite systems designed for specific task where repetitive observation may not be required frequently, for example, a satellite system for deriving digital elevation model; and (iii) satellites which can test new concepts of sensors and applications.

" Before I conclude I would like to remind that do not consider remote sensing as a 'broad spectrum antibiotic' which can take care of all problems, the remote sensing data has to be integrated with other conventional data, socio-economic information etc. ...Lastly of the often quoted statement of Dr. Vikram Sarabhai, the operating message (according to me) is ... "We must be second to none in the application of advanced technologies to the real problems of man and society". So Ladies and Gentleman the central driving force of all our efforts should be the 'people'. Let us join together to make their life a little better.

Excerpts from booklet on inaugral lecture of Prof Pisharoty Lecture Series, delivered by Dr. George Joseph on February 23, 1996.

——««OO »»——

ISRS-Ahmedabad Chapter

Executive 1996-1998

Chairman	:	Shri A. K. S. Gopalan
Vice-Chairman		-
Secretary	:	Shri R. M. Pandya
Jt. Secreatry	:	Shri A. K. Murdia
Treasurer	:	Shri N. S. Mehta
Members	:	Shri P. S. Thakker
		Shri I. M. Bahuguna
		Dr. M. M. Kimothi
		Dr. S. M. Bhandari
		Shri P. K. Tiwari

The elections to the new executive of ISRS-AC took place on March 23, 1996 with Dr. S. D. Naik acting as Returning Officer and the new executive took charge in April 1996. There was no nomination for the post of Vice Chairman.

——««OO »»——

PROF P R PISHAROTY - THUMBNAIL SKETCH

Pishorath Rama Pisharoty was born in Kollengode (Palaghat District, Kerala) on February 10, 1909 and aftre his early education in village school, graduated in Physics from University of Madras in 1931. During the period 1931 to 1942, while working as a lecturer, he spent his vacation period carrying out research under the guidance of Prof. C.V. Raman. He joined India Meteorological Department in 1942. He also worked on deputation at University of California (Los Angeles) and obtained his PhD. Among the positions held by him are Director Colaba and Alibaug Magnetic Observatories, Bomabay, Director Institute of Tropical Meteorology Pune, Senior Professor and later Professor Emeritus Physical Research Laboratory, Ahmedabad, and Head Remoet Sensing and Meteorology Division, SPeace applications Centre, Ahmedabad. He is Fellow of INSA. He was honoured with Padamshri (1970), Raman Centenary Medal (1988), International Meteorological Prize of WMO (1989).

——««OO »»——

Remote Sensing and keen observation

EOSAT Notes (Vol. 11 No. 1, Spring/Summer 1996) carried a picture of Washington DC from IRS-1C PAN data. While the picture is good to look at and carries an accompanying text, keen observations and interpretation by ***Dr. S. M. Bhandari****(MOG/SAC), missed by the authors of the text are reproduced here:*

"While the description describes capture of an aeroplane approaching the airport, ... it misses the shadow of the aeroplane on waters of Potomac river. ... From the shadow of the Washington Monument which has a height of 169.3 m (555 ft.) ... it is possible to translate the aircraft shadow displacement into aircraft cruising height, which comes out as ca. 420 ft. ... More accurate estimates can be derived by analysing actual digital image data and after considering the topographic slopes, etc. "

——««OO »»——

HIGH SPATIAL RESOLUTION COMMERCIAL SATELLITES

(Source : L. W. Fritz, Photogramm. Engg. & Remote Sensing, January 1996)

By the end of 1997 we are going to enter into another era of space remote sensing, with commercial satellites being built to produce panchromatic images with spatial resolutions of 1-3m and mutlispectral resolutions of 4-15m. The new systems are characterized by their flexible pointing ability, high geometric fidelity and very rapid image-collection to customer delivery. Upto now most of the earth observing systems were built with gevernment funding. These satellites will try to satisfy the growing user need for fast and accurate geo-spatial information and bring space observation in direct competition with some form of aerial photography market.

All of the proposed systems are in smallsat/lightsat category and are not a single satellite but a constellation to increase imaging opportunities for repetitive coverage, stereo coverage and timely monitoring of events. The orbits are circular low-earth optimising revisits. The sensors are pushbroom type (exceot for two-dimensional pixel staring arrays of Early Bird) and provide 8-bit or 11-bit data. The multispectral capabilities are in red, green, blue and near-infrared. Each of the system will rely on a store-and-forward operation with capabilities for on-board storage and perhaps some pre-processing (such as data compression). To achieve precision pointing the systems use on-orbit GPS positioning. They also have ability to point to

multiple areas of interest in a very short time interval.

Summary of Satellite, communication/processing and sensor information of some of the proposed commercial earth observation satellites.

Corporation	EarthWatch				Orbital Science		Space Imaging	
System	Early Bird		Quick Bird		OrbView-1			
On-orbit date	April 1996 !!!		July 1997		Dec 1997		Dec 1997	
Payload (kg.)	< 100		ca. 150		150		225-275	
Altitude (km)	470		470		460		680	
Repeat Cycle - max	20 days		20 days		16 days		14 days	
Revisits Cycle - max	1.5 - 2.5 days		1.5 - 2.5 days		< 3 days		1-3 days	
Period (revisit/day)	15.3		15.3		15.5		14.6	
Scenes (max)	500/orbit		100/orbit		535/day		600/day	
On-board recording	500 scenes		100 scenes		250 scenes		120 Gb	
Delivery time *	15 min - 48 hr		15 min - 48 hr		15 min - 24 hr		24 hr - 48 hr	
Mode	Pan	MS	Pan	MS	Pan	MS	Pan	MS
Resolution nadir (m)	3	15	1/2	4	1/2	8	1	4
Spectral bandwidths (μm)	.45-.80	.50-.59 .61-.68 .79-.89	.45-.90	.45-.52 .53-.59 .63-.69 .77-.90	.45-.90	.45-.52 .52-.60 .63-.69 .76-.90	.45-.90	.45-.52 .52-.60 .63-.69 .76-.90
Pixel bits	8	8	11	11	8	8	11	11
Swath width (km)	6	30	36	36	8	8	11	11
Data Size	4MB	12MB	3.5GB	14.2 GB	128 MB	128 MB	-	.76- .90-
Stereo	In track		In track		In track		In & cross track	
Pointing (deg)	30/30#		30/30		45/45		45/45	
Sensor attitude	No		Star trackers		Star trackers		3 star trackers	

* : from acquisition to user; # : (in/cross) track

INSAT-VHRR IMAGING OF THE EARTH DURING THE TOTAL SOLAR ECLIPSE OF OCT. 24,1995

Dr. Satyendra M. Bhandari
MOG/RSA/SAC

The Oct. 24,1995 Total Solar Eclipse (TSE) over the Asia- Pacific region was an event of great scientific significance. Exploiting the unique circumstances offered by the TSE, a large variety of experiments were conducted by Indian and foreign scientists to study the solar corona and the Earth's atmosphere and the ionosphere. Prominent among the Indian efforts were serious attempts to detect the presence of possible dust ring around the Sun under relatively favorable conditions of low/minimum sun-spot activity. Another unique attempt was to image the Moon's shadow on the Earth's surface during the TSE from the vantage point of geostationary orbit in space.

As proposed (see SIGNATURES August 1995) the author in association with his interested colleagues, successfully planned and realised the "INSAT-VHRR Campaign" to image the Earth in a quasi-continuous manner almost from the beginning to the end of the Oct. 24,1995 solar eclipse. As per the plan, the three INSAT-VHRRs onboard INSAT-1D, 2A and 2B were operated in desired sector or full-disc modes and data were acquired at AES-SAC (Ahmedabad), MCF (Hassan) and SATMET-IMD (New Delhi). INSAT-2B VHRR image data collected at SAC were analysed in near-real-time mode and the feeble visible and IR band signatures of the Moon's shadow were extracted using specialised image processing techniques. The entire sequence of images, taken at intervals of ~8 minutes, showing the gradual movement of Moon's shadow over the Indian land mass, the adjoining Bay of Bengal, the South East Asian region and finally over the Pacific, was analysed within an hour of the end of the eclipse.

The geometrical and the dynamical characteristics of the Moon's shadow were close to the simulated behavior based on the predicted circumstances of the eclipse. The intensity distribution over the shadow region was however, observed to be quite interesting; regions with different albedo values showed different types of signatures. The low albedo oceanic regions revealed the presence of the shadow much earlier than the high albedo desert or land regions. Contrary to expectation, the shadow signatures were observed to be much smoother over land than over the oceans. In fact, the highly fractured nature of the shadow over Oceania is quite intriguing and needs careful study.

The thermal-IR band VHRR images reveal clear signatures of the cooling effect over land surfaces associated with the short-duration removal of the solar radiation, especially over the central regions near totality. The cooling is however observed to begin with substantial delay and to persist much longer after the shadow has passed over the region. Further quantitative analysis is in progress.

The existing INSAT-VHRR capability in space over the Indian region in terms of vast geographical coverage, bi-spectral high space-time resolution imaging, flexibility of operational modes, multiplicity of VHRRs etc. -proved to be of the "made-for-each-other" kind for the Oct. 24,1995 TSE. As a result the above Campaign produced the most comprehensive and unprecedented quasi-continuous set of images ever taken of the Earth during a solar eclipse from the vantage point of space.

As per the established scientific

method, the above observations were undertaken on the Eclipse day as well as on the previous day i.e. Oct. 23,1995 in order to record the non-eclipse day behavior for comparison.

The INSAT-VHRR TSE Campaign could be successfully realised due to operational nature of the INSAT system and with support and cooperation from a number of groups and colleagues. The team consisted of Dr. S.M. Bhandari, Dr. W.J. Prakash, Shri S. Ilanthirayan, Shri H.I. Andharia and Dr. A. Narain, all scientists at RSA/SAC.

——««OO »»——

RS NEWS - INTERNATIONAL

Radarsat 1 was launched on November 4, 1995 on a Delta rocket from Vandenberg Air Force Base, California. It went through a four month commissioning and testing phase and began commercial service from March 1, 1996. The Canadian Space Agency (CSA) is talking to a consortium of private companies for owning and operating its successor Radarsat 2.

ADEOS (ADvanced Earth Observation Satellite) is developed by NASDA (Japan) and flies an impressive range of scientific sensors of unique capabilities contributed by international collaborative effort. It includes :

Advanced Visible and Near Infrared Radiometer-AVNIR (NASDA)
Ocean Colour and Temperature Scanner - OCTS (NASDA)
Improved Limb Atmospheric Scanner (Environment Agency of Japan, JEA)
Interferometric Monitor for Greenhouse Gases (MITI, Japan)
NASA Scatterometer -NSCAT (NASA)
POLarization and Directionality of Earth's Reflectances - POLDER (CNES, France)
Total Ozone Mapping Scatterometer - TOMS (NASA)
Retroflector in Space - (JEA)

ADEOS was launched on August 17, 1996 by H2 launch vehicle of Japan. The satellite separated 16 minutes after takeoff and during maneuvering to exact orbit one of the main thrusters failed to fire and a backup thruster was used. This delayed satellite movement to its final orbit which occurred on September 8. The scatterometer from JPL (USA) which measures speed and direction of winds over ocean was switched on September 9. The scanning mirror on Interferometer Monitor for Greenhouse Gases became stuck on September 20, but the problem was resolved by September 24.

Two French Objects Meet in Space : Cerise, a 50 kg French military research microsatellite designed to eavesdrop on weak high frequency cummunications, which was launced on July 7, 1995 by Ariane launcher as a secondary payload with Helios-1A (military surveillance satellite), met a piece of Ariane rocket left in space from November 1986 launch of SPOT-1 satellite. The Ariane booster upper stage had broken into many pieces. This meeting led to cutting of 6m long boom that stabilized Cerise into half and the satellite tumbled. This is the first time that two objects previously catalogued by ground radars have collided.

——««OO »»——

RS NEWS - NATIONAL

PSLV-D3 Launch : The third development flight of Polar Satellite Launch Vehicle was a complete success. The launch of 44 m tall and 283 tonne vehicle took place from Sriharikota on march 21, 1996 at 10.23 am. The vehicle placed 930 kg Indian Remote Sensing Satellite IRS-P3 in precise orbit. The IRS-P3 carries German built MOS Payload and 3 band WiFS (MOS details were covered in previous issue).

The Indian Space community eagerly waits for launch of 25th Indian satellite this year. The two favourite contenders for this honour are INSAT-2D and IRS-1D. We provide below the launch summary of previous 24 Indian Satellites.

Sl No	Name	R/C *	Date of launch	Weight (kg)	Launch Vehicle	Country	S/F#
1	ARYABHATA	S	19-04-1974	358	Inter Cosmos	USSR	S
2	BHASKARA-1	R	07-06-1979	444	Inter Cosmos	USSR	S
3	RS-1	R	18-07-1980	35	SLV-3	India	S
4	RS-D1	R	31-05-1981	38	SLV-3	India	S
5	APPLE	C	19-06-1981	670	ARIANE	France	S
6	BHASKARA-2	R	20-11-1981	436	Inter Cosmos	USSR	S
7	INSAT-1A	RC	10-04-1982	1150	US DELTA	USA	F
8	RS-D2	R	17-04-1983	41.5	SLV-3	India	S
9	INSAT-1B	RC	30-08-1983	1194	Space Shuttle	USA	S
10	SROSS-1	S	24-03-1987	150	ASLV-D1	India	F
11	IRS-1A	R	17-03-1988	980	VOSTOK	USSR	S
12	SROSS-2	S	13-07-1988	150	ASLV-D2	India	F
13	INSAT-1C	RC	22-07-1988	1190	ARIANE	France	F
14	INSAT-1D	RC	12-06-1990	1293	US DELTA	USA	S
15	IRS-1B	R	29-08-1991	990	VOSTOK	USSR	S
16	SROSS-C	R	20-05-1992	106	ASLV-D3	India	S
17	INSAT-2A	RC	10-07-1992	1906	ARIANE	France	S
18	INSAT-2B	RC	23-07-1993	1932	ARIANE	France	F
19	IRS-1E	R	20-09-1993	845	PSLV-D1	India	F
20	SROSS-C2	R	04-05-1994	113	ASLV-D4	India	S
21	IRS-P2	R	15-10-1994	904	PSLV-D2	India	S
22	INSAT-2C	C	07-12-1995	2050	ARIANE	France	S
23	IRS-1C	R	28-12-1995	1250	MOLNIYA	USSR	S
24	IRS-P3	RS	21-03-1996	920	PSLV-D3	India	S

**: R(Remote Sensing), C(Communication), S(Scientific); #: S(Success), F(Failure)*

IRS-1C - LAUNCH & COMMISSIONING EVENTS

- IRS-1C airlifted from Bangalore on November 18, 1995.
- Satellite mated with rocket and fuel filling operations completed on December 24, 1995 at Baikonur Cosmodrome, Kazakhastan.
- IRS-1C launched by Russian Molniya Rocket at 1215 hours IST on December 28, 1995.
- IRS-1C was injected into orbit 15 minutes after launch around 21 N and 56 E.
- About 93 seconds after injection the two solar panels were automatically deployed by an on-board sequencer.
- During the 14th orbit on December 29, 1995 the star-sensor which provides attitude information was switched on. During the same orbit at 1038 hours IST, the camera hold down mechanism of PAN was released.
- The three cameras onboard IRS-1C were swithced on January 5, 1996. PAN was swithched on at 9.25 am (IST) during the 113th orbit while LISS-III and WiFS were switched

on during subsequent orbit.

- In addition to NRSA station at Hyderabad, the IRS-1C data is also being received and processed at EOSAT ground station at Norman, Oklahoma, USA and German Aeropsace Research Establishment ground station at Neustralitz.

——«OO»——

Shri Lakshmi Narayan Calla Memorial Lecture Series

This lecture series was started in 1987 and is named after Late Shri L. N. Calla, father of Shri O.P.N. Calla, first Chairman of ISRS-AC who has provided funds for this series. The distinguished list of past speakers is provided below :

I. **Prof. P. R. Pisharoty** : Remote sensing of ocean floor topography (Dec 30, 1987).

II. **Shri P. A. Raj** : Sardar Sarovar Project - A lifeline of Gujarat (Dec 30, 1988).

III. **Prof. S. S. Merh** : Sea-level changes along Gujarat coast (Dec 11, 1989).

IV. **Prof. B. L. Deekshatulu** : Remote Sensing for national development (Jan 11, 1991).

V. **Dr. K. Kasturirangan** :Bio-Astronomy - A test for anthropomorphic principle (Jan 9, 1992).

VI. **Prof. V. K. Gaur** : International decade of natural disaster reduction : An Indian experience (May 24, 1995).

VII. **Prof. P. D. Bhavsar** : Global Climatic Changes (Oct. 19, 1995)

VIII. **Prof. Pramod Kale** : Educational Prospects in Remote Sensing and GIS (Jan. 30, 1996).

IX Shri Chandi Prasad Bhatt

X. Prof. K. S. Valdiya.

ISRS-AC ACTIVITIES

♂ A new lecture series, "Prof P R Pisharoty Lecture Series" was initiated this year. The first lecture was delivered by Dr George Joseph, President ISRS. Details of the series and lecture are reported elsewhere in this issue.

♂ Two lectures were arranged under Shri Laxmi Narain Calla Memorial Lecture Series. They were delivered by Prof P Bhavsar and Prof Pramod Kale. Prof. Kale spoke on 'Educational Prospects in Remote Sensing and GIS' on Jan 30, 1996 at Vikram Hall, SAC.

♂ The World Environment Day was celebrated with an invited lecture by Dr. S. A. Chavan, Chief Conservator of Forests, Gujarat Forest Department on June 5, 1996 at Vikram Hall (SAC) who spoke on 'Environment and biodiversity of Gujarat'..

♂ The National Remote Sensing Day (1996) was celebrated by ISR-AC. On this occasion Dr. K Kasturirangan, Chairman ISRO gave a popular lecture on 'Improving the quality of life - The space option' on August 12, 1996 at PRL Auditorium.

♂ A painting competition was organised for school children on the theme '**Space and National Development**' at Central School, Vastrapur on October 20, 1996. The school children surprised us by their knowledge as well as artistic skills.

♂ The IX Shri Laxmi Narain Calla Memorial Lecture will be delivered by noted environmentalist Shri Chandi Prasad Bhatt on December 2, 1996 at ATIRA Auditorium.

——«OO»——

FORTHCOMING SYMPOSIA

ICORG-97 (International Conference on Remote Sensing and GIS/GPS) -March 16-19, 1997, Hyderabad
-Prof. I.V. Muralikrishna, Centre for Remote Sensing, JNTU, Mahavir Marg, Hyderabad-500028.

National Workshop on Remote Sensing & GIS Application for Watershed Management - Jan 21 & 22, 1997, Bhopal.
-Dr. N. K. Tiwari, remote Sensing Applications Cemtre, MP Council of S&T., 26 Kisan Bhawan, Jail Road, Arera Hills, Bhopal - 462004.

National Symposium on GIS and Geological Remote Sensing, Feb 5-7, 1997, Tiruchirapalli.
-Prof. S. M. Ramasamy, Centre for Remote Sensing, School of Earth Sciences, Bharathidasan University, Tiruchirapalli - 620 023.

TROPMET' 97 : Monsoon, Climate and Agriculture, Feb 10-14, 1997, Bangalore.
-Prof. B. N. Goswami, CAOS, Indian Institute of Science, Bangalore - 560 012.

——««OO »»——

ABOUT ISRS-AC MEMBERS

***Signatures** joins all ISRS-AC family in congratulating out illustrious members. We are sure that this list is incomplete at best, we request you to bring to our notice all such recent accomplishemnts which will be covered in the next issue.*

Dr. Shiv Mohan (SAC) shared *Indian National Remote Sensing Award (1995)* with Dr. R. S. Dwivedi of NRSA. With this, the total awardees from ISRS-AC rises to five (Dr. R. R. Navalgund - 1992, Dr. R. N. Jadhav -1993, Dr. S. R. Nayak and Shri A. S. Kirankumar - 1994) and for four continuous years.

ISRS award for *best paper in Photonirvachak - 1994* was given to **Ms T. Sharma** and **Shri T.T. Medhavy** for their paper 'Procedures for computation of Saturation radiances: A case study for proposed sensors onboard Indian Remote Sensing Satellite - 1C'.

The *SPECK Award -1994* for best paper presentation at ISRS Symposium at Ludhiana was jointly awarded to **Ms. T. Sharma** (SAC) and Dr. D. Dutta (RRSSC, Jodhpur).

Shri S. K. Pathan (SAC) received *ESRI-NIIT Best Paper Presentation Award* at First ESRI/ERDAS User Conference (Nov., 15-16, 1996, N. Delhi) for their paper on 'The potential of GIS network techniques in utilities planning and management' authored by S.K. Pathan, R.J. Bhanderi (SAC) and B.M. Patel, B.S. Shah (GSRTC, Govt. of Gujarat).

Shri Ram Rattan (SAC) received the *Astronautical Society of India - Annual Award* for the year 1994 for Spacecraft and related Technology at their recent meeting in Bangalore.

Dr. S. S. Pokharna (SAC) was honoured with a *Shiromani award of The Indian Board of Alternative Medicines* for proposing interdisciplinary approach for better understanding of human system in context of problems of environment and sustainable development. *(This shows how multidisciplinary practitioners of remote sensing are !!!).*

SCIENCE RANKING OF INDIA DECLINES

In a letter to ***Nature*** published in Oct 17, 1996 issue of the journal, N. Raghuram of CSE (N. Delhi) and Y. Madhavi of NISTADS (N. Delhi) have brought to attention a decline in scientific output from India as measured by number of publications in journals covered by the **Science Citation Index (SCI)** between the period 1981 and 1995 of order of 32 %. No other country in the world has suffered such a decline except Commonwealth of Independent States. This contrasts with significant increase in contribution by China and other South East Asian countries. While the number of Indian publications has stagnated since 1984, the world output continues to grow. The decline is not totally due to reduced number of Indian Journals covered by SCI since in earlier years Indian journals contributed only 35% of the total Indian output even when SCI coverage was at its best. This drop could not be attributed to publishing bias against Indian articles or reduced preference for submission of Indian manuscripts in SCI journals. The decline is also accompanied with fall in India's rank by citation impact from 57 in 1985 to 81 in 1989. The authors believe that manuscripts by Indian authors are facing more rejections now than before. They attribute the decline to brain drain, decline in growth rate of funding for science, ageing of scientific institutions, lack of motivation, a feudal work culture and absence of dynamic and inspiring leadership.

(Before seeing their name in print, the authors submit manuscripts to editors who get them refereed by anonymous peers. We bring to you here a sample of one such author-referee interaction which is taken from IEEE Trans. Professional Communication)

Mice have four feet. *Elaborate ! Mt*

Mice have five appendages, and four of them are feet.

No discussion of the 5th appendage ! HSP

Mice have five appendages: four of them are feet; one is a tail.

What ? / Feet and no legs ? / RGN

Mice have four legs, four feet, and one tail per unit-mouse.

Confusing – is that a total of 9 appendages ? TAM

Mice have four leg-foot assemblies and one tail assembly per body.

DOES NOT FULLY DISCUSS THE ISSUE ! W.M.

Each mouse comes equipped with four legs and a tail. Each leg is equipped with a foot at the end opposite the body; the tail is not equipped with a foot.

Descriptive, but not forceful. WA.

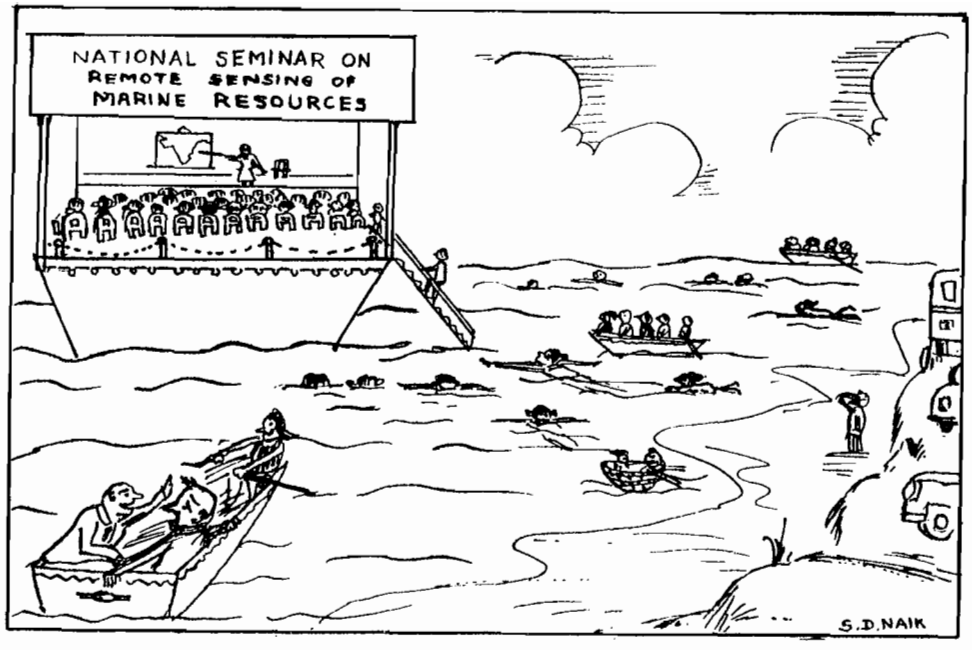
Allotment of appendages for mice will be: four foot-leg assembalies, one tail. Deviation from this policy is not permitted as it would constitute misappropriation of scarce appendage assets.

Too authoritarian; stifled creativity / gp

Mice have four feet; each foot is attached to a small leg joined integrally with the overall mouse structural subsystem. Also attached to the mouse structural subsystem is a thin tail, nonfunctional and ornamental in nature.

Too verbose/scientific. Answer the question ! LP.

Mice have four feet.



Perhaps this is the first time we could perfectly match the venue with seminar theme

BOOK POST

If undelivered, please return to :
Secretary, ISRS-Ahmedabad Chapter
c/o Remote Sensing Area
Space Applications Centre (ISRO)
Ahmedabad - 380 053

Edited by :
V. K. Dadhwal, S.K. Kothari, R. M. Gairola, N. Ravi , Anjali Bahuguna, N. Padmanabhan, Space Applications Centre, Ahmedabad
A. A. Ahluwalia, Botany Department, Ahmedabad
Printed at :
Library, Space Applications Centre, Ahmedabad

SIGNATURES

Vol. 11, No 1
August 1998

Newsletter of the Ahmedabad Chapter of the Indian Society of Remote Sensing

ISRS
Ahmedabad Chapter

Executive 1998-2000

Chairman: Dr. R.R. Navalgund
Vice-Chairman: Dr. S.A. Chauhan
Secretary: Shri R. M. Pandya
Jt. Secretary: Shri Bharat Patel
Treasurer: Shri N. S. Mehta
Members:
Shri I. M. Bahuguna
Dr. M. M. Kimothi
Shri A.S. Rajawat
Shri G.J. Kantharia
Prof. R.D. Shah

Editorial Board

Editor: Shri J. K. Garg

Members:

Shri A. S. Rajawat
Prof. R. D. Shah
Dr. S. S. Ray
Shri R. S. Rao

Address for Correspondence

Secretary,
ISRS-Ahmedabad Chapter,
C/o Remote Sensing Area,
Space Applications Centre
Ahmedabad – 380 053.

Dear readers

We are happy to place in your hand another issue of SIGNATURES though belatedly. The New Editorial Committee places on record its appreciation of the work done by the earlier editorial committee for providing the material for the current issue of ***Signatures.***

Since the last issue of Signatures, as you are aware, IRS-ID has been launched, further proving the capabilities of Indian scientists in orbiting world class remote sensing satellites.

The cyclone of 9th August 1998 that hit many parts of Gujarat has caused colossal loss of life, caused large-scale devastation and brought untold miseries to the life of the people. I, on behalf of all of you, express deep sense of grief and sorrow and request to contribute in whatever way you can to minimise the sufferings of the people.

I take this opportunity to request all members to co-operate in improving the quality and content of the Newsletter by providing their valuable inputs. I assure you on behalf of the Editorial Committee that we would try to bring out issues of the ***Signatures*** *in time and provide latest update on the developments in the broad area of Remote sensing, GIS and other related aspects. I once again seek your co-operation in this regard.*

- *Editor*

CONTENTS

Mitigation of calamities and restoration of Himalayan ecosystem – **C. P. Bhatt** ...2
High resolution spectroscopy from space **J. N. Desai** ...3
Space News ...5
ISRS - Ahmedabad Chapter Activities ...6
Forthcoming Symposia ...7
About Members ...7

MITIGATION OF CALAMITIES AND RESTORATION OF HIMALAYAN ECOSYSTEM

Chandi Prasad Bhatt
Dasholi Gram Swarajya Parishad, Chamoli, U.P.

I am delighted to be invited by Indian Society of Remote Sensing-Ahmedabad Chapter (ISRS-AC) to deliver the 9th Laxmi Narayan Calla Memorial Lecture. Over the past few year's I have been watching with keen interest the work done by ISRO scientists and application of space technology for the development of the country. I would not hesitate to say that the contribution made by the satellite technology in the field of natural resource management and environmental studies is remarkable. Satellite technology has been effectively helping in forecasting not only the weather but also providing timely warning of various calamities, such as, cyclone, torrential rain etc.

In the mountainous region such as the Himalayas where I am working for past 4 decades for the restoration of ecological balance, the calamities like landslides, soil erosion, flash floods etc., have become the recurrent phenomena in recent times. One of the major causative factors for these calamities is the large-scale exploitation of forests. This has not only adversely affected the terrain but also the rich biodiversity which is at the verge of extinction. Between the late 50's and early 70's large-scale commercial exploitation of forest was witnessed in the central Himalaya. Silviculturists claimed that the forest exploitation is a scientific process and done according to the guidelines suggested in the working plan. We for the first time challenged the authenticity of the forest working plan in early 70's, through "CHIPKO MOVEMENT" (hugging the trees), as during July 1970 a devastating flood not only swept the Alaknanda basin but also caused large-scale damage in western Utter Pradesh. We could see the relationship of the forest with the flood as the watersheds from where the flood originated were the sites in which 6477 ha of forest was felled between 1959-1969. Never in the historical past the fury of flood was so devastating as seen during 1970. Unfortunately our knowledge gained through experience could not convince the forestry experts. This compelled us to launch the non-violent protest of hugging the trees. Finally the government realised our points and came with the blanket ban on tree felling in the Upper Alaknanda basin which continues till today. Having achieved the protection of forest we realised that it is equally important to re-green the barren slopes through a massive campaign involving the local people. Today after 20 years of our conservation work we have at least been able to rejuvenate the forest in various watersheds. Recent studies conducted by Space Applications Centre, Ahmedabad have shown that there is an overall improvement in the landscape and natural resources status. I would like to emphasise here that for the wellbeing of the nation, the Himalayan ecosystem should be protected with utmost care. The Himalaya, which is not only the storehouse of our natural resources, source of many rivers and abode of spiritual and cultival heritage, gives us identity in the world as a nation with Himalayan pride.

With the advent of satellite technology, I feel that we can definitely provide a new direction in the conservation and eco-restoration strategies. SAC has already done much work in other parts of the country, but Himalayan region is still untouched. I earnestly request the scientist of ISRO and SAC to come forward and provide direction for various conservation and developmental programmes in this region. Calamities are inherent in the Himalayas, but at least we can bring down the fury of such events to a manageable extent, provided we have all the necessary information about the Himalayan ecosystem. Viewing the ruggedness and inaccessibility of the terrain, satellite technology has shown a lot of promise. I hope that very soon we will have the complete blue print for this ecologically fragile region.

Once again I am thankful to ISRS-AC for giving me this opportunity to speak at this occasion. I wish all of you very prosperous future in scientific advancement for the benefit of the nation.

About the speaker: Shri C. P. Bhatt was born on June 23, 1934 in a small village in Chamoli (UP) and has participated in Sarvodaya movement (1960), working of Dasholi Gram Swarajya Mandal (since 1964) and Chipko Movement (1973). He is recipient of many awards including Padma Shri (1986), Ramon Magasaysay Award (1982), UNEP Global 500 Award (1987) and a number of other awards for the activities of his organisation, the Dasholi Gram Swarajya Mandal.

——««OO »»——

Based on the 9th Laxmi Narain Calla Memorial Lecture delivered at ATIRA on December 2, 1996.

HIGH RESOLUTION SPECTROSCOPY FROM SPACE

Prof. J. N. Desai
Physical Research Laboratory, Ahmedabad

I indeed feel highly privileged to have been invited to give this lecture in a series organised in honour of Prof. Pisharoty, the Pioneer of Indian Remote Sensing Programme. We all have always held Prof. Pisharoty in great esteem, not only for his scientific achievements, but also for his wisdom, and humanitarian approach. I regret my inability to quote anything appropriate from Sanskrit at this occasion, and I am extremely thankful to Shri R.M. Pandya to have taken care of that part. I also feel a sense of diffidence, because I myself have not been actively associated with spaceborne programmes. As a consequence, my lecture may be lacking in some aspects. What is lacking in "Specifics", I will try to make up in "Basics".

Title of my talk for today is "High Resolution Spectroscopy from Space". Most of you in the audience have greater interest in "high angular resolution", i.e. sharper imaging, so let me begin by bringing the two on a common platform through basic optical theory. The link connecting the two "high resolutions" is provided by consideration of the "coherence" aspect of the wavefield associated with the radiation received from an object.

Coherence is a measure of average correlation between fluctuations of (complex) field amplitudes (V (x_1t) measured at two different points in space or time. Taking normalised field amplitudes, coherence is then,

$r_{12}(J) = < V_1(t)V^*_2(t+J)>$
Where J is time delay and 1 & 2 signify two points in space.
With J = 0, $r_{12}(o) = < V_1(t)V_2^*(t)>$
measures spatial coherence

$r_{11}(J) = (V_1(t)V^*_1(t+J)>$:measures temporal coherence at point 1

Physical measurements of coherence are carried out by observing the interference effects. In the classical Young's double slit experiment, the fringe contrast is a measure of spatial coherence between points in space sampled by location of slits. In Michelson interferometer (division of amplitude by a beam splitter) the fringe contrast measures temporal coherence for a time delay J given by 2D/C where D is the difference in the length of the two interferometric arms.
Now according to the Van Cittert - Zernike theorem, the Spatial Coherence $r_{12}(o)$ gives two-dimensional Fourier transform of intensity distribution across the source. Achieving high angular resolution, i.e., getting sharper image means measuring power in the higher frequency Fourier components, i.e. capacity to measure spatial coherence with the largest possible spatial separation "S". It is now clear why the sharpness of an image is determined by the size of aperture of the image forming system, viz. Resolution $\delta \approx$ S/ . But this also tells us something more. At least in principle, it is the aperture size, and not the optics quality that decides the maximum attainable resolution. This fact has been make use of in achieving diffraction-limited resolution with large telescopes in presence of degradation produced by the atmosphere, through spectral infertorometry and also forms the basics for interferometric imaging methods.

The complementary theorem in temporal domain is the Weigner theorem according to which "Autocorrelation, or temporal Coherence r (J) is the Fourier transform of the source spectrum"
Just as Van Cittert_Zernike theorem provides us basis for high angular resolution, the Weigner theorem provides the basis for high spectral resolution, through what is known as the "Fourier Transform spectroscopy". In past thirty years, this new method of spectroscopy has emerged as a powerful tool and played a crucial role in form of spectrometers flown aboard a number of spacecrafts, both for the earth's atmosphere as well as planetary atmospheres.
It is to be noted that both these developments, high angular resolution and high spectral resolution through measurement of coherence are intimately connected with the great stalwart - A.A. Michelson. First high angular resolution in astronomy was achieved when Michelson measured stellar diameter - that of the star Betalgeise, using fringes obtained with his stellar interferometer in which spatial coherence was measured with a mirror separation of 7 meters. He was also aware of the spectrometric capability of his other device, the Michelson interferometer, but could not use it as a complete Fourier transform spectrometer, due to technological limitations.

Fourier Transform Spectroscopy
Fourier transform spectroscopy being not so familiar, a brief outline is given here. Output

(Based on 2nd Prof. P.R. Pisharoty Lecture delivered on March 26,1997 at PRL Auditorium)

Intensity of a two beam interferometer like Michelson interferometer, for an ideally monochromatic line at wavenumber σ [$\sigma=1/\lambda$] of intensity I_o is given by

$I(\Delta) = 1/2\ I_o [1 + \text{Cos}\ (2\pi\sigma\ \Delta)]$; Δ being the path difference introduced interferometor arms.

For a broadband source with spectral distribution characterized by B (σ), this takes the forms

$I(\Delta) = 1/2 \int_0^\infty B(\sigma) [1 + \cos(2\pi\sigma\Delta)]\, d\sigma$

$I(\Delta)$ has a constant part $1/2 \int B(\sigma)\, d\sigma$ and variable part $1/2 \int B(\sigma)\cos(2\pi\sigma\ \Delta)\, d\sigma$

The variable part is called the interferogram and is the cosine transform of the spectrum B (σ). So the inverse transform of the interferogram gives the spectrum. This in short is the method of Fourier transform spectroscopy. The technological difficulties faced earlier were associated with i) Computations and ii) Sampling interferogram [i.e. $I(\Delta)$] at accurately determined Δ. Width of the resolved spectral element "$d\sigma$" in Fourier transform spectroscopy is $\approx 1/\Delta_{max}$; where Δ_{max} is the maximum path difference at which the interferogram is sampled. This corresponds to a temporal delay $J = \Delta_{max}/c$. Again we see that it is the maximum time delay with which one can measure temporal coherence, that decides the resolution achieved. [The same principle can be seen to apply in other spectrometers like grating and prism spectrometers].

Advantages

One may wonder why one should take recourse to such an indirect way of recovering spectrum when one can directly obtain it with devices like grating spectrometers. The answer lies in the so-called "Multiplex Advantage". Different spectrum elements (energy densities at different wave numbers) are modulated through cosine function and a single detector receives the combined intensity. Inverse transforms demodulate the information stored in form of interferogram, to give back the spectrum. So in detector noise limited situations one gains in S/N ratio by a factor $\approx\sqrt{N}$ when N is the number of spectral elements simultaneously recorded. Planetary atmospheres radiate mostly in the thermal infrared and it is in this regime that the vibration rotation spectra of the constituent gases carry information about composition and physical conditions. It is also in this region that one encounters detector noise limited situations. This is why Fourier transform spectrometers have played a pivotal vole in high resolution spectroscopy with space borne instrumentation for planetary spectra.

Throughput

Another qualifying parameter for a spectrometer is the field of view over which it can collect radiation when operating at a given resolution. In general higher the resolution, smaller is this angle. (e.g. slits of a grating spectrometer have to be narrow if higher resolution is desired). Around 50's, Jacquinot carried out pioneering investigations in this direction, comparing various spectrometer systems and concluded that interferometric spectrometers as the most efficient in this respect, followed by grating spectrometers. Prism spectrometers are the least efficient of the three. This large "throughput" or the "light grasp" of interformetric spectrometers, quantified as $R\Omega=2\pi$ is referred to as the "Jacquinot advantage" of interferometric spectrometers. Here R is the resolving power "$\sigma/d\sigma$" and Ω is the corresponding field of view "seen" by the spectrometers. Basically, we have two types of interformetric spectrometers. i) Fabry-Perot based systems which directly give spectrum, and ii) Michelson based systems which work as Fourier transform spectrometers.

Both types of spectrometers have played an important role in space borne high-resolution spectroscopy. Fabry-Perot systems found earlier applications because of their simplicity and capability to directly give spectra, but because of their free spectral range limitations (free spectral range is the range of wavelengths that can be covered by a spectrometer without an overlap of orders) they have found use essentially for high resolution line profile studies. These give valuable kinematic information about atmosphere sounded by the spectral line; viz. temperature and winds, pertaining to the heights from where the radiation is emitted One of the earliest high resolution spectrometer on a space vehicle was a Fabry-Perot spectrometer aboard OGO-6 flown during 69-70. This was designed to give thermospheric night time temperatures through line-widths of oxygen red night airglow at 6300A° which comes from a height of 250-300 km. Subsequently, Fabry-Perot technology has undergone great evolution in terms of servocontrol of parallelism between the Fabry-Perot plates and Piezo electrical scanning; together with efficient 2D detectors like CCD to make full use of capability of Fabry-Parot systems to give imaging spectra. A much more sophisticated Fabry-Perot spectrometer was flown aboard the satellite Dynamics Explorer (early 80s) to observe several emission lines from different layers of the atmosphere. This instrument measured

Doppler shifts to infer winds, in addition to the temperatures inferred from Doppler line widths.

Although a Fabry-Perot has a high luminosity, for faint emission one may need to increase it further. This means we must have $R\,\Omega > 2\pi$. The field of view Ω, as dictated by the relation $R\,\Omega = 2\pi$ can be further increased by a large factor, particularly for Michelson type interferometers by using principle of "field widening". [In field widened michelson, essentially the geometrical image of reflecting mirror in one interferometer arm is made to superpose on the mirror in the other arm by using a dispersive element in one arm. Optical path difference remains finite. This permits much wider field of view at a given resolution].

A device of this type designed by G.Shepherd and his colleagues has been flown recently aboard Upper Atmosphere Research Satellite (UARS). Here it is the visibility of the fringes for an observed emission line that gives Doppler widths and hence the temperature; the winds are obtained through Doppler shifts observed as "phase of the fringes". Capacity to obtain high S/N ratio for weak emission lines is the special advantage of this type of field widened spectrometers.

As earlier mentioned, Fabry-Perot based systems, although comparatively simpler, have the limitation of use for line-profile measurements of isolated emission lines. When it is desired to observe complete rotation - vibration spectra over large spectral range (as for example in the study of planetary atmospheres, both for constituents and physical conditions) Fabry-Perot systems are grossly inadequate. It is here that Fourier transform spectrometers - named IRIS (infrared interferometric spectrometers) flown aboard several space vehicles have proved very useful. IRIS spectrometers aboard Nimbus Satellite have proved very valuable in obtaining temperature - height profiles for earth's atmosphere through the high resolution CO_2 spectra. IRIS spectrometers have also been flown aboard Mariner and Voyager satellite for obtaining high resolution spectra in the thermal infrared for studying the atmospheres of outer planets and their satellites. These spectra have revealed a number of minor constituents like methane, ethane, ethylene, benzene, phosphene, germane and several others in these atmospheres.

Towards the end of my talk let me return to the high angular resolution. One knows that a large aperture telescope on ground cannot directly produce image sharper than $\approx$ 1" of an arc. However, as already mentioned earlier, images taken with large apertures do contain information at Fourier frequencies $\approx$ Aperture diameter/λ. In mid 70^s a way was discovered to retrieve images upto these frequencies - which were the method of speckle interferometry developed by Labeyric. Within a short time, the technique of adoptive optics was also developed which corrects the image forming wavefront by a flexible mirror. A Hartmann-Shack Screen senses distortions produced by atmospheric turbulence and this information is used to appropriately distort a correcting mirror in a servo mode to get back a sharp image. However, nothing so good as direct pictures from beyond the atmosphere. These have been provided by Hubble space telescope with an aperture of 2.4 meters. As everybody knows Hubble landed in a trouble. One of the most exciting space activity was to remove the spherical aberration of Hubble by a device known as COSTAR (Corrective Optics for Space Telescope Axial Replacement). However, even prior to that, the images produced by Hubble could be deconvolved with its (aborted) point spread function, which was 1", and images could be considerably improved. It is interesting to compare, i) Hubble pictures prior to COSTAR, ii) Processed pictures prior to COSTAR, iii) Pictures after COSTAR, iv) Ground based pictures of same objects obtained with adoptive optics with ESO's new technology telescope at Chile.

Since size of aperture on a space borne telescope has a limitation, final answer in achieving highest angular resolution may be from an interferometric array on moon!

BIO-DATA OF Prof. J.N. DESAI: Prof. J.N. Desai, who recently retired as a senior-Professor from Physical Research Laboratory, is internationally known for his work on Solar Corona using Febry-Perot methods. He has about 80 research publications in reputed journals. He is a fellow of National Academy of Sciences, Allahabad and also Gujarat Science Academy and a life member of number of learned societies.

——««OO »»——

STUDIES ON GUJARAT CYCLONE

The damage caused by the Gujarat Cyclone of 9th June 1998 was assessed using satellite data of LISS-III, PAN, WiFS on-board IRS-1C and IRS-1D. Both visual and digital data of pre and post cyclone were used to assess the area and extent of

inundation, effects on salt pans, flora and fauna along the coast, agricultural and horticultural crops and structural damages etc. Details of the study are available with Dr S. R. Nayak, Head, MWRD, RESA, Space Applications Centre, Ahmedabad.

SPACE NEWS

* NASA proposes a New Generation Space Telescope (NGST), a follow-on programme to the Hubble Space Telescope. NGST (with an aperture greater than 4 m) will have observing capabilities far better than the existing ground and space-based telescopes, providing the opportunity for the first time to look back through eons of time to the very first stars and galaxies in the Universe.

* In a rare celestial spectacle, two comets have been observed plunging into the Sun's atmosphere in close succession, on June 1 and 2. The observations of the comets were made by the LASCO coronagraph on ESA's Solar and Helioscopic Observatory (SOHO) spacecraft.

* Higher resolution of 3 meters is planned for the third and fourth China-Brazil Earth Resources Satellites.

——««OO »»——

ISRS-AC ACTIVITIES

Presented below is the ISRS-AC Secretary's **Annual report (April '97 - March '98)**.

MEMBERSHIP

The membership of the Chapter as on 31/3/97 is –

Life –237; Annual – 27; Sustaining – 8; Patron –3.

As many as 10 life members, 5 annual members and one sustaining member were added during the year. The Ahmedabad Chapter continues to be the largest chapter.

WORLD ENVIRONMENT DAY CELEBRATION

To observe world environment day on June 5, 1997, two popular lectures were organised jointly with IMS - Ahmedabad Chapter. First lecture was delivered on "Impact of environmental activism in pollution control" by Prof. P.P. Oza, member APPELLATE authority to pollution acts and second lecture was given by Dr. P.C. Pandey, Advisor, ASC, Goa on "Monitoring environment through space". The lectures were well attended by members of both the societies. In addition on the occasion of Van-Mahotsava, about 2000 sapling, provided by Forests Dept. Gujarat, were distributed to the members of ISRS-AC.

NATIONAL REMOTE SENSING DAY CELEBRATION

A popular lecture on "Launch Vehicles for Remote Sensing Satellites" by Shri E. Janardhana, Group Director, Launch Vehicle Design Group, VSSC, was delivered on 12th August (Dr. Vikram Sarabhai's birthday) at Vikram Hall, SAC. Enthusiastic response was received from the audience from the various sections at SAC and society members.

SHRI L.N. CALLA MEMORIAL LECTURE

10th lecture in this series was delivered by Prof. K.S. Valdiya, Prof. Emeritus, JLN Centre for Advanced Scientific Research, Bangalore on "Impact of neotectonics on Himalayan Environment" on December 10, 1997 at Vikram Hall, SAC.

EDUCATIONAL EXCURSION

ISRS-AC organised one day educational excursion to "Sardar Sarovar Narmada Dam Site" on September 27, 1997. More than 150 members with their families participated in the programme and made it a memorable one. This scientific field excursion helped all of us to understand and appreciate the importance of such large scale gigantic project, which is considered to be a life line of Gujarat state

NATIONAL SCIENCE DAY CELEBRATION

ISRS-AC in collaboration with other three societies of SAC i.e. IMSA, SSME and ISG, celebrated the National Science Day on March 1, 1998 at Vikram Hall, SAC. Essay competition, Cartoon competition and a popular lecture by Dr. Sitaram, Director, CSC were the highlights of the day. Members and their families of above mentioned societies participated in the programme.

——««• • »»——

FORTHCOMING SYMPOSIA

INTERNATIONAL SYMPOSIA

1. 35th Annual Symposium and Map Curators Group Workshop,10-13, September, 1998 University of Keele, UK.

Contact: David Fairbairn, BCS Programme Committee Chairman, Dept. of Geometrics, University of Newcastle, Newcastle, NEI 7 RU, UK

2.Fifth International Conference on Remote Sensing for Marine and coastal Environments.5-7, October, 1998 San Diego Princess Convention Centre, San Diego, California.

Contact: Nancy Wallman, ERIM, Box 134001, Ann Arbor MI 48113-4001 USA.

3. International Symposium on Information Technology in Oceanography, 12-16, October 1998. National Institute of Occanography, Dona Paula, Goa - 403 004, India

Contact : Organising Secretary, ITO-98, National Institute of Oceanography, Dona Paula, Goa - 403 004, India.

4. XIXth congress of the International Society for Photogrammetry and Remote Sensing (ISPRS) – Geoinformation for All, Amsterdam, The Netherlands, 16-23 July, 2000. Important Dates : Call for Papers – Jan,1999; Deadline for Abstracts – Sep,1999, Deadline for manuscripts – Mar,2000.

Contact: Saskia Tempolman, Secretary, Local Organising Committee, ITC, P.O.Box 6, 7500 AA ENSCHEDE, The Netherlands, E-mail: ISPRS@ITC.NL, WWW: http://www.itc.nl/~isprs

NATIONAL SEMINAR / SYMPOSIA

1. National seminar on Frontiers of Research and its Application in Coastal Agriculture at Navsari September 1998. Organised by Indian Society of Coastal Agricultural Research, CSSRI, Regional Research Station Canning Town, and Gujarat Society of Agronomy and Soil Science, GAU - Navsari Campus.

Contact: Sect., Indian Society of Coastal Agricultural Research, Central Soil Salinity Research Institute., P.O. Canning Town, 24 – Praganas, West Bengal, 743329.

2. Regional Workshop on Inputs from Remote Sensing for Natural Hazard Mitigation, October 24-26, 1998, at Aligarh Muslim University, Aligarh.

Contact: The Indian Geological Congress, Department of Earth Sciences, University of Roorkee, Roorkee-247 667, India.

3. GEOINFORMATICS'98 : National Seminar on Geoinformatics, at Indian Institute of Remote Sensing, Dehra Dun, India on 26-27, October, 1998, Organised by Indian Institute of Remote Sensing (NRSA), Dehradun and International Institute for Aerospace Survey and Earth Sciences (ITC), Enschede, The Netherlands.

Contact: Prof. M. D. Shedha, Organising Secretary, GEOINFORMATICS'98 Seminar, Indian Institute of Remote Sensing (NRSA), Dehra Dun – 248 001, India. E-mail: dean@del2.vsnl.net.in

——««OO »»——

ABOUT ISRS-AC MEMBERS

***Signatures** joins all ISRS-AC family in congratulating our illustrious members. We request you to bring to our notice all such recent accomplishments, which will be covered in the next issue.*

Dr. P. C. Pandey has been elected fellow of the Indian Academy of Sciences. He has joined DOD as advisor and will be Executive Director for Centre of Antarctic Research being set up at Goa.

JOINED

Dr. Shiv Mohan, SAC - as Chief Scientist Haryana Remote Sensing Applications Centre, Hisar.

Dr. A. Narain - as Director Remote Sensing Applications Centre, Uttar Pradesh, Lucknow

Shri T.P.Singh, SAC - as Director Remote Sensing and Communication Centre (RESECO), Gandhinagar, Gujarat.

Shri R.L. Mehta and Shri Sandeep Oza, Scientists SAC joined RESECO, Gandhinagar, Gujarat as senior scientists.

AWARDED

Dr. Ajai, Group Director FLPG, Space Applications Centre (ISRO), Ahmedabad has been bestowed Indian National Remote Sensing Award for 1997, for his pioneering contribution in the field of remote sensing applications to crop stress detection, condition assessment, evapotranspiration and yield estimation.

A REQUEST

Readers are requested to send articles/anecdotes and other useful information they wish to share with other ISRS-AC members for making the NewsLetter regular. Articles should not exceed 2-3 typed pages, preferably in MS Word, supported by 1 or 2 good quality line diagrams, if necessary, in Indian Black ink.

A DECADE OF IRS SATELLITES

IRS 1A	**17-03-1988**
IRS 1B	**29-08-1991**
IRS 1E	**20-09-1993**
IRS P2	**15-10-1994**
IRS 1C	**28-12-1995**
IRS P3	**21-03-1996**
IRS 1D	**29-09-1997**

Maiden Bhaskara Award instituted by the Indian Society of Remote Sensing will be conferred on Dr. George Joseph, Director Space Applications Centre (ISRO), Ahmedabad in recognition of his lifetime and outstanding contribution in the field of electro-optical sensors conceptualisation, design and development. These sensors have been flown successfully on-board IRS series of satellites. Indian Society of Remote Sensing – Ahmedabad Chapter congratulates Dr. George Joseph for this achievement. ISRS - AC also wishes a very long, active and happy life to Dr. George Joseph, Director SAC and Ex-President ISRS, on his sixtieth birthday, which falls on August 4, 1998.

BOOK POST

If undelivered please return to :

Secretary, ISRS-Ahmedabad Chapter,
C/o Remote Sensing Applications Area (RESA),
Space Applications Centre (ISRO),
Ahmedabad 380 053.

SIGNATURES

Vol. 12, No 1&2
March 2000

Newsletter of the Ahmedabad Chapter of the Indian Society of Remote Sensing

ISRS
Ahmedabad Chapter

Executive 1998-2000

Chairman:	Dr. R.R. Navalgund
Vice-Chairman:	Dr. S.A. Chauhan
Secretary:	Shri R. M. Pandya
Jt. Secretary:	Shri Bharat Patel
Treasurer:	Shri N. S. Mehta
Members:	Shri I. M. Bahuguna
	Dr. M. M. Kimothi
	Shri A.S. Rajawat
	Shri G.J. Kantharia
	Prof. R.D. Shah

Editorial Board

Editor:	Shri J. K. Garg
Members:	Shri A. S. Rajawat
	Prof. R. D. Shah
	Dr. S. S. Ray
	Shri R. S. Rao

Address for Correspondence

Secretary,
ISRS-Ahmedabad Chapter,
C/o Remote Sensing Area,
Space Applications Centre
Ahmedabad – 380 015.

Dear readers

Editorial Board feels happy in placing in your hands the first issue of SIGNATURES in the new millennium and wishes a happy, prosperous and active 2000.

Cyclone of October 16, 1999 and Super Cyclone of October 29, 1999 in Orissa have wreaked havoc and resulted in widespread devastation in the coastal belt of Orissa. Through 'Signatures' on behalf of all ISRS-AC members, I share the grief of our brethren. As a goodwill gesture, some of our colleagues collected relief material and helped in providing succour to the cyclone-affected people. I hope that in future also ISRS-AC members will rise to the occasion and extend a helping hand to the victims of natural calamities.

During 1999 Landsat 7, IKONOS and EOS-PM1 (carrying MODIS sensor) satellites providing very high-resolution data were launched. Japan also plans to launch Ricesat for meeting the needs of Asian countries. Hopefully, in the new millennium, remote sensing applications will mature into newer areas and achieve astounding heights.

- *Editor*

CONTENTS

Photogrammety: Evolution and basic concepts	2
Rice crop loss due to Super cyclone of Orissa	4
Coral reefs	4
Popularisation and commercialisation of remote sensing	6
ISRS-AC Activities	7

PHOTOGRAMMETRY: EVOLUTION AND BASIC CONCEPTS

B. Narender and P. Jayaprasad
Space Applications Centre, Ahmedabad

Photogrammetry may be defined as the art, science and technology of obtaining reliable information about physical objects and environment through the process of recording, measuring and interpreting photographic and satellite images, and patterns of recorded radiant electromagnetic energy and other phenomena. The term photogrammetry is derived from three Greek words, *photos* meaning "light", *gramma* meaning "something drawn or written" and *metron* meaning, "to measure". Photogrammetry can be broadly divided into *metric photogrammetry*, which involves precise measurement and computations to determine size and shapes of objects, and *interpretative photogrammetry*, which deals with the recognition and identification of objects.

The inputs required for satellite photogrammetry are two overlapping images of the same area viewed at different angles. Images then can be observed and measured or interpreted using stereoscopic viewing devices which give a three dimensional view and create an illusion for a relief model of the terrain. In digital photogrammetry mechanical measurements can be replaced by analytical mathematical formulations and using suitable models Digital Elevation Model (DEM) of the terrain can be generated

Historically, photogrammetry started with the era of a great Italian genius Leonardo Da Vinci. His intuition graphically demonstrated in 1492, the principles of aerodynamics and optical projections. In the early 19th century, Brook Taylor published his treatise on linear perspective and soon thereafter, J.H. Lambert suggested that principles of perspective viewing could be used in preparing maps.

In 1849, 'Colonel Aime' Laussedat of French Army Corps of Engineers had used the photogrammetric principles in topographic mapping for which he is known as the father of photogrammetry. The invention of aircraft in 1902 provided the further impetus for the emergence of modern aerial photogrammetry.

The beginning of space programme in 1958 opened the era of satellite photogrammetry. Satellite images were used for mapping of moon's surface and planetary mapping. The Lunar Orbiters mission, the most successful of the pre-Apollo NASA Lunar satellites (1966), provided a great thrust stimulus to satellite photogrammetry. Using the data obtained from these missions, the sites for landing of Apollo on moon were selected. This also provided experience in satellite triangulation. This was the first time a triangulation project had utilised a computer programme with orbital constraints to establish control for mapping.

New Remote sensing satellites

Landsat 7 having ETM+ (Enhanced Thematic Mapper plus) earth viewing sensors was launched on April 15, 1999. New features on Landsat 7 include better spatial resolution a panchromatic band (0.52-0.90 µm) with 15 m spatial resolution, and a thermal IR channel (10.40 to 12.5 µm) with 60 m spatial resolution. The satellite has started transmitting valuable data that will be of immense use to the remote sensing community throughout the world.

IKONOS, world's highest civilian/known spatial resolution satellite, was orbited on September 24, 1999 from Vandenberg Air Force Base, California into a sun-synchronous, near polar, circular low earth orbit (680 km). The satellite simultaneously collects one-meter resolution B&W (panchromatic) images and four meter resolution (multispectral) images.

EOS PM1 satellite (carrying onboard MODIS sensor) was orbited on December 19, 1999 into space. The satellite data will be very useful for studying various constituents of biosphere.

Fig.1.DEM of a part of Alwar district

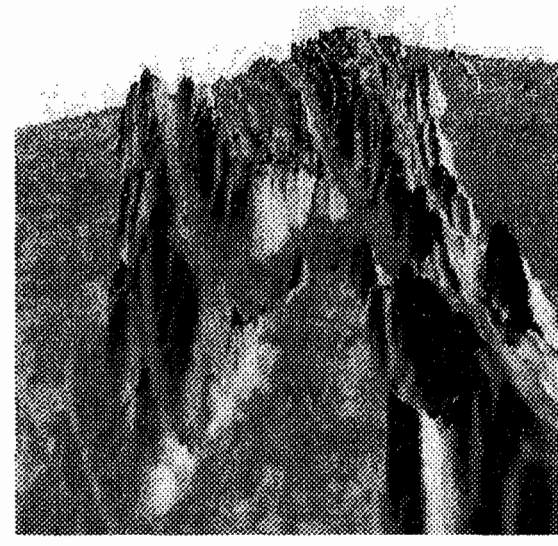


Fig. 2: Perspective view of Alwar area

Imagine we have only one eye. In such a situation we will not able to perceive an object with its three dimensions. With binocular vision, when the eyes are focused on a certain point, the optical axes of the two eyes converge on that point and intersect at an angle called parallactic angle. The nearer the object, greater the parallactic angle and *vice versa*. A distance called 'eye base' separates the optical axes of the two eyes. The depth between the different points is perceived as the difference in this parallactic angle. The shortest distance of clear stereoscopic depth perception for the average adult is about 25 cm and the eye base varies between 63 and 69 mm. The maximum parallactic angle is 15°.

The three dimensions or stereoscopic impression of objects can be achieved photographically by viewing identical images of the objects. If a pair of photographs or images is taken from two exposure stations separated by 'base' the same object will appear on both images at different positions. If the object is having a height then its top and bottom will appear on the image separated by a distance called *relief displacement*. If the two images are viewed in such a way that left eye sees only left photo and right eye the right photo, a three dimensional impressions of the object is obtained. The brain judges the height of the object according to the parallactic angle. When eyes gaze over the entire overlap area, the brain receives a continuous three dimensional impression of the terrain. The 3-D image thus formed is called a *stereoscopic model* or simply a *stereo model* and overlapping pair of photograph is called a *stereo pair*. A stereo pair is the basic input to all the photogrammetric analysis. IRS-1C and IRS-1D PAN sensors have the capability of acquiring stereo pair by tilting the camera.

The basic steps involved in satellite photogrammetry are space resection, image matching, space intersection and interpolation. In space resection the position of camera is determined from the known ground control points. Hierarchical matching technique is used to identify the conjugate point in the overlap area of the stereo pair. Space intersection provides three dimensional ground co-ordinates for all identified conjugate points (irregular digital Elevation Model). Interpolation technique generates a regular Digital Elevation Model (DEM) from irregular DEM. DEM (Fig. 1) can be used as a basic input for generating slope maps, drainage patterns, orthoimages and various other applications. By draping DEM over IRS-1C /1D LISS-III images perspective view of the terrain can be generated (Fig. 2).

ASSESSMENT OF RICE CROP LOSS DUE TO INUNDATION BY ORISSA SUPER-CYCLONE

M. Chakraborty,
Space Applications Centre, Ahmedabad

1999-2000 season with prospect of above normal production of Kharif Rice, was promising to be good one for Orissa, particularly the coastal districts. However, cyclones of October 16, 1999 (over Ganjam district) and the Super Cyclone of October 29, 1999 devastated the coastal districts of Balasore, Bhadrak, Cuttack, Jagatsinghpur, Jajpur, Kendrapara, Puri and Khurda in the state.

Analysis has been carried out using RADARSAT ScanSAR data of November 2 and 4, 1999 to assess the inundated areas and total loss in rice area and production in these districts. The results were presented to Secretary, DAC, Min. of Agriculture, Govt. of India and other concerned on November 08, 1999. These data were the first available Satellite data over the affected areas.

Data Used

Pre-cyclone Rice Crop Estimation
RADARSATT ScanSAR Narrow B: July 7, July 31 and August 24, 1999; Pixel Size = 25m, Incidence angle : 30-46 deg., Descending : 0530 hrs.

Post-cyclone Rice Crop Loss Assessment
RADARSAR ScanSAR Narrow A: November 2, 1999; Pixel size = 25m, Incidence angle : 22-31 deg., Ascending : 1730 hrs.
RADARSAT ScanSAR Wide : November 4, 1999; Pixel size = 50m, incidence angle :22-46 deg., Descending : 0530 hrs.

Results

Inundation areas were demarcated (digital data) using the upper limit of SAR backscatter for water. The upper threshold was determined by the analysis of SAR data for Rice Crop Monitoring. Post-cyclone data of November 2 and 4 were co-registered with the base data of July 7, July 31 and August 24, 1999 and were used for Kharif Rice Crop assessment for the current year.

Permanent water bodies or waterlogged areas (as seen on August 24 data) were excluded from the inundation areas. District boundaries digitized from 1:250,000 SOI maps have been used for district level loss assessment. In the 8 districts of Orissa, 20.8% of the geographical area has been inundated and 316.4 thousand ha of kharif rice area lost (28.6% of the rice area). This corresponds to a loss of 426.9 thousand tonnes of rice. Loss in rice production can be more as many other areas have suffered due to wind damage and partial inundation.

Jagatsinghpur, Kendrapara and Bhadrak are the worst cyclone affected districts.

Inundated areas (dark areas on land) of Jagatsinghpur district in Orissa on Nov., 02, 1999

CORAL REEFS

R.S. Rao
Space Applications Centre, Ahmedabad

Most of us must surely have seen a coral. We may like to ask what exactly is a coral? A coral is a coelenterate animal (also called a polyp) which is no more than a few mm in size. Two traits make a coral different from other animals. Firstly they secrete calcium carbonate skeleton outside their body, somewhat like a cup within which the coral lives. Secondly, most of them carry algal cells within their own cells. If we put together a number of coral cups of a single species we get a coral colony and if we put together a number of coral colonies (of assorted species) together then we get a reef.

Corals are highly specific in their requirements of temperature, salinity and water clarity for their growth. For a reef to develop certain conditions have to be met: a hard substratum on which the corals can settle, a water temperature above 20°C, good light penetration and uniform salinity. Because of these constraints coral reefs are found only in tropical seas and along the coastlines.

What makes the coral reefs unique? They sustain very high rates of biological productivity, which increases fish and mineral yield. Coral reefs can supply up to 10% of all the fish catch in the world. Moreover, the present-day trade in ornamental reef fish is also in tens of millions of dollars. The potential yield of calcium carbonate from the coral reefs is 600 million tonnes per year. Coral reefs are also the sites of highest biodiversity in the marine environment. They are also the sites of great aesthetic value and are the destination for a large segment of tourism industry, be it for diving sport, fishing or simple reef walking.

Structurally coral reefs can be described as fringing, barrier, atoll, patch and a variety of other reefs. The *fringing reef* develops practically right on the shore, with no large water body (lagoon) between the emerged shore and the submerged reef. A *barrier reef* is the one that has moved away from the shore and in the process has created a lagoon between the reef and the shore. An *atoll reef* is generally ring shaped with a central lagoon and land mass (es) on the merged portions of the reef. *Patchy reef* is a collection of a number of coral species near the shore that is yet to graduate to the state of a fringing reef. The minor reef types are faros, microatolls, table reefs, ridge reefs etc.

Some of the major Indian coral reefs are as follows:

(a) Palk Bay: The reef here is of the fringing type. This is one of the few Indian reefs where detailed studies on coral and associated fauna and flora, and productivity have been carried out. The total area under coral reef and its associated features for Palk Bay and Gulf of Mannar is 94 sq. km.

(b) Gulf of Mannar: Fringing reefs occur around a chain of 20 islands from Tuticorin to Shingle island.

(c) Gulf of Kachchh: Reef formations are fringing or patchy around a chain of islands from Okha to Jodhya. Coral diversity is lowest among all Indian reef areas. The reefs are in degraded condition. The total area under reef is 150 sq. km in the Gulf of Kachchh.

(d) Lakshadweep islands: Reef formations are mainly atolls with a low lying island on the east, a broad well developed reef on the west with a lagoon in between connected to the open ocean by one or several channels. The area occupied by the reef flats is 136.5 km².

(e) Andaman and Nicobar Islands: Reef formations are mainly of the fringing type. Exploited resources are principally molluscan shells for use in handicrafts and corals for souvenir collections. Total area occupied by reef and associated features is 960 km².

AWARDS

Dr. Rangnath Navalgund, Dy. Director, Remote Sensing Applications Area, Space Applications Centre, Ahmedabad has been bestowed the 1999 Astronautical Society of India award for the year 1996 in recognition of his contributions to 'Space Science and Space Applications'. Award was given by Hon'ble Minister of State, Dept. of Space, Smt. Vasundhara Raje at a function held at SAC, Ahmedabad on February 4, 2000.

Dr. Vinay Kumar Dadhwal, Head, CMD/ARG, SAC has been conferred the Indian National Remote Sensing award by the Indian Society of Remote Sensing, for 1999, for his contribution to the development of crop forecasting methods. The award was given during the society's Annual Convention at Bhubaneswar on March 22, 2000.

***Signatures* congratulates them for their achievements.**

Popularisation and commercialisation of remote sensing - some suggestions

S S Pokharna
Space Applications Centre, Ahmedabad

Remote sensing in India has reached a level where it requires popularisation at grassroot level. This in turn is linked with the technology and cost of data products. When one talks of popularisation and commercialisation, one should look at the areas/issues that will require RS data. Natural resources are the major areas that directly come into picture. A rough measure of the seriousness of the problem faced in the country is given in Table 1.

Table 1: Natural resources and Magnitude of the problem in India

Issue/Problem	Magnitude of problem
Food requirement (2010)	300 m tonnes
Fodder requirement (2010)	900 m tonnes
Forest area desirable (2010)	110 mha
Grassland area desirable (2010)	25 mha
Fuelwood requirement (2010)	225 m cum.
Wasteland to be developed	135 mha
Unirrigated area to irrigated	100 mha
Area where productivity has to be increased	40 mha
Area under threat of drought	100 mha
Area affected by flood	20 mha
Problematic wetlands	8 mha
Problem of ground water	40 mha
Loss of fertile soil per year to sea	6000 m tonnes
Loss due to various disasters	Several crores
Development of infrastructure	About 6 lakh villages

To tackle the above problems a sound long term planning is required. It is a herculean task and requires a scientific approach taking cognisance of various interrelated issues and their interdependence into account. This necessitates a strong collaboration between institutions like ISRO, other Government organisations, private entrepreneurs, educational institutions and industries etc. However, until now the involvement of Indian industries in the field of natural resources related business has been insignificant. An active Institutes-Industries Interaction (I cube) is very much desirable. However, for this concept to develop, a vigorous compaign is required to take these technologies to the relevant people even living in villages and working in Panchayats. Although considerable efforts have been made in this direction, nevertheless, the high cost and lack of trained manpower *cum* entrepreneurs has hampered the penetration of the technology on a large scale.

To take the RS technology to the grassroot level, there is a need to look at the issue of pricing of satellite data products. Cheap photographic prints of various data types to initiate first impact should be generated. Cost of such popular products should not be more than Rs.100-2000 depending on the type of product and the type of user (an individual or an institution). This requires generation of FCC's of India (WiFS based), States (LISS-I or WiFS based), District (LISS-I or LISS-II) and Taluka (LISS-II or LISS-III). Table 2 gives a rough estimate of data products and the cost involved based on this approach.

In order to further enhance the usage of RS data use of Information Display Technology for displaying the FCC and Classified images of various, districts and talukas and their colour prints on a large scale through mass media. A number of places can be identified where data products of different types can be displayed like district and taluka headquarters, aerodromes, railway stations, taluka and district units of various ministries like agriculture, forest, environment, district rural development authorities, tourism, water resources, railway, road transport, mines and geology etc. Other probable candidates are universities, colleges, corporate houses, hotels and resorts etc.

Table 2: A rough estimate of FCC's and cost

Level	Number (approx.)	Scale	Estimated copies	Sensor	Unit cost (Rs.)	Total sales (Rs. crores)
Country	1	1:5 million	100 000	WiFS	100-200	1-2
State	25	1:1 million	10000	LISS I	200-250	5-12.5
Districts	500	1: 250 000	1000	LISS II	200-500	10-25
Talukas	5000	1:50 000	100	LISS III	500-2000	25-100

Industries and Companies which may be benefited from RS technology

Some of the important areas in which remote sensing will have a real use are agriculture, water resources, mines and geology, wasteland development, sites for horticultural, medicinal and herbal plants, forest produce and many others. There are several industries and companies who will be linked with the above disciplines. An attempt has been made to identify a probable list of industries and companies, which may have some use of remote sensing technology. This has been taken from the Capital Market (April 1998, a monthly journal listing all the major companies whose shares are listed in the share market). A list of around 45 industries out of total 323 has been prepared which have around nine hundred companies. Their details are given below:

Acquaculture (12), Banks (23), Cement (38), Ceramics (11), Chemicals (60), Computer (10), Education (10), Construction (48), Cotton Textiles (113), Drip Irrigation (5), Dye & Pigments (29), Fertilisers (25), Housing Finance (11), Floriculture (5), Food Processing (35), Granite & Marbles (14), Horticulture (6), Hotels & Resorts (47), Metals (23), Mining & Minerals (7), Oil drilling & exploration (13), Paper (47) Pesticides & Agrochemicals (23), Petrochemicals (24), Plastic Pipes (8), power (8), Pumps (5), Recreation/ Amusement (4), Refineries (9), Solvent Extraction (53), Sugar (42), Tractors (5), Tea (40), Transmission (4), Road Transport (10)

In addition to the foregoing RS data can also be used to assess the locations for better input and prices, future expansion, better marketing and distribution network with optimal cost, taking timely measures for environmental issues, more accurate information for financing, display for better information and education etc.

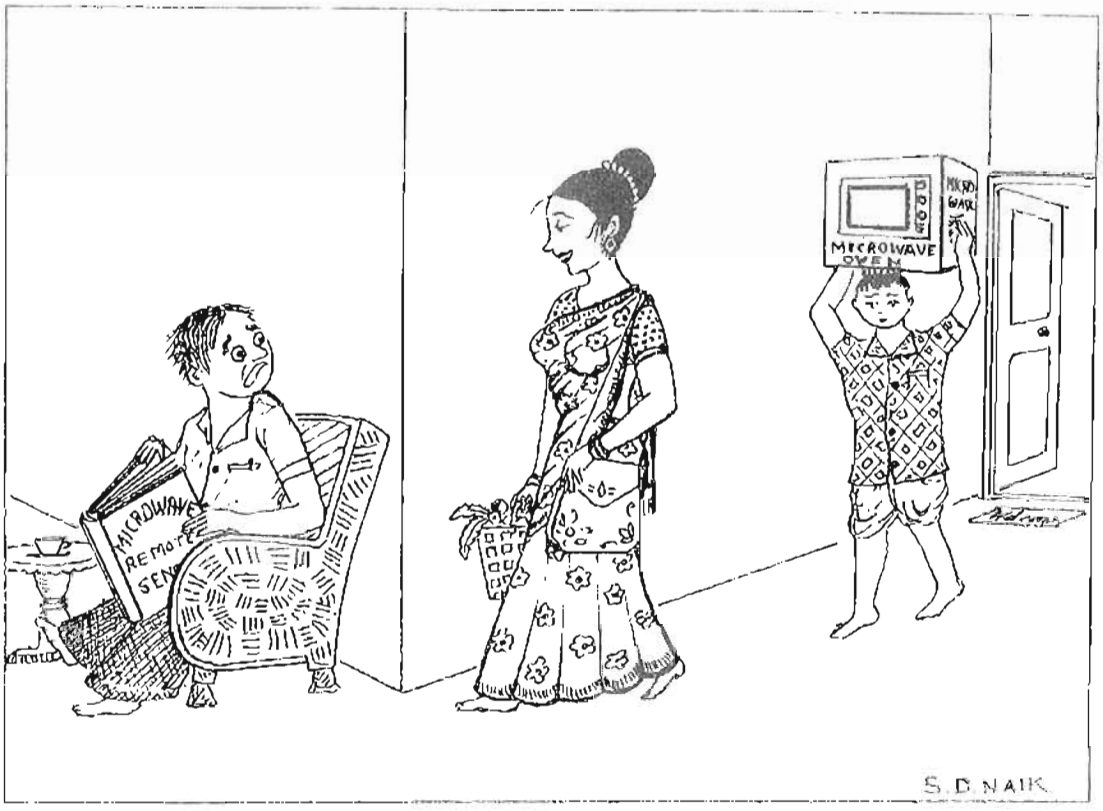
ISRS-AC ACTIVITIES

1. National Remote Sensing Day Celebration:
   Like earlier years birth anniversary of Dr. Vikram Sarabhai (August 12) was celebrated as National Remote Sensing Day. On this occasion a science quiz competition for the schools of Ahmedabad and exhibition on 'Remote sensing & Communication Technology for National Development' were organised at Kendriya Vidyalaya, SAC. 14 higher secondary schools participated in the Quiz. Asstt. Commissioner, Kendriya Vidyalayas (AR) distributed the prizes and delivered a lecture exhorting the children to imbibe the scientific spirit. Response to the exhibition was overwhelming and about 10,000 school children, college students besides the general public visited the exhibition.

2. Shri L.N. Calla Memorial Lecture:
   Prof. P.K. Kaw, Director, Institute of Plasma Research, Ahmedabad delivered the lecture on 'Global Energy, Research, Resources consumption and Alternative' on June 25, 1999 at Vikram Hall, SAC, and Ahmedabad.

3. A popular lecture on 'Climate and Agriculture' was jointly organised by ISRS-AC and IMSA on February 22, 2000. at Space Applications Centre, Ahmedabad. Dr. U.S. Dey, Additional Director General of Meteorology, delivered the lecture.

4. Prof. P.R. Pishroty Lecture Series:
   Shri A.K.S. Gopalan, Director, Space Applications Centre, Ahmedabad delivered the 5th lecture in the series on 'Meteorological and Oceanographic Application Potential of MSMR onboard Oceansat-1' at SAC, Ahmedabad on March 21, 2000.



I HAVE ALSO DECIDED TO WORK ON 'MICROWAVE' !

BOOK POST

If undelivered please return to:

Secretary, ISRS-Ahmedabad Chapter,
C/o Remote Sensing Applications Area (RESA)
Space Applications Centre
Ahmedabad 380 015.

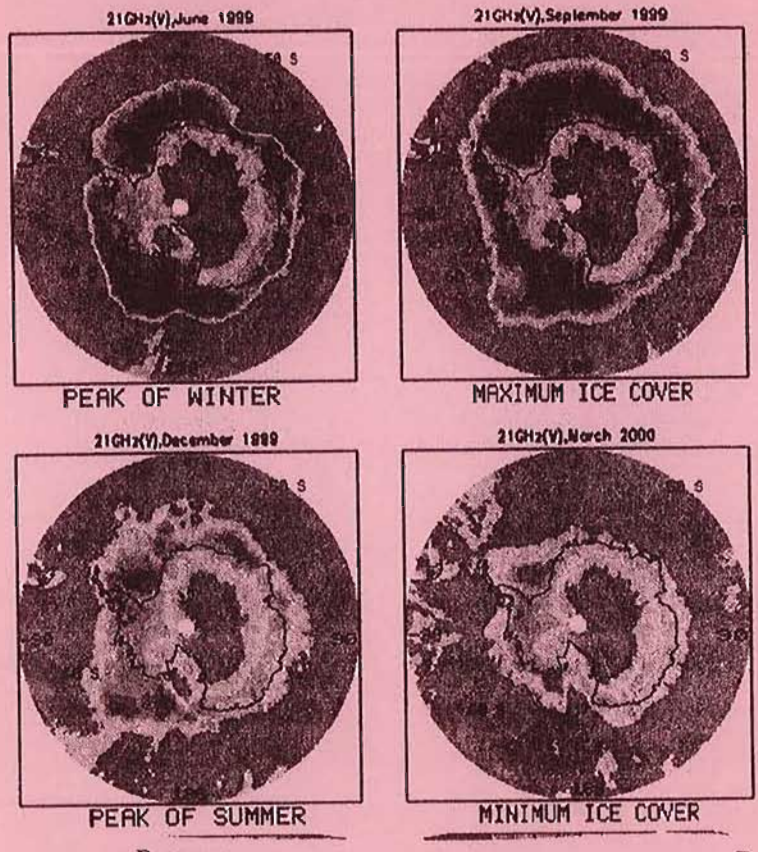
SIGNATURES

Newsletter of Indian Society of Remote Sensing – Ahmedabad Chapter

Volume- 13 *No. 1* *Month- July* *Year- 2000*

Monitoring Antarctica using IRS P4 MSMR

(Article in page 16)



In this Issue

Page no.

Articles

Chapter Update	3
Message from Chairman, ISRS-AC	5
Earth Observation Programme of India in the new Millennium	6
High resolution images	7
Monsoon-2000	8

Page no.

Regular features

Basket search	11
Special section on environment	15
Monitoring Antarctica ice cover..	16
Environmental news clips	17
Silver linings	19
Leisure corner	21

EDITORS COLUMN

Dear readers

Amidst the hype and cacophony of excitement, expectations, celebrations, the world has entered the 21st century, so is our Signature. It is high time to take action to make our Signature a symbol of progress keeping pace with the rapid changes in Information Technology. As a first step to achieve this, we are making serious efforts to make it a regular quarterly issue. A new outlook also has been worked out with an objective of making it an information source and reading delight for members and their family. It will feature few articles addressing current trends, scenario in remote sensing, GIS, IT and other noteworthy topics. The regular features will be:

Basket search: A collage of information on current scenario of sensors, techniques in image processing, GIS, related products, interesting web sites for learning, job opportunities in RS and GIS etc.

Silver linings: This section highlights the achievements of members as well *as their family members.* All members are requested to provide necessary information to make this section complete and up-to-date. In this issue we also bring to you an article on a device for low vision people designed by one of our chapter member.

Leisure corner: Crossword, puzzle, quiz related to RS, GIS, IT. Some issues will feature special quiz contest for children of members (like this one). Kindly encourage them to participate and send the answers. Their talents will be brought to notice and we plan for surprise rewards, depending upon the response.

Special Section: Each issue will feature a topic (either invited or contributed) of specific theme. We will try to link it with certain UN theme day. In this issue, the special theme is 'Environment' as World Environment Day was celebrated on 5th June.

Message to members from organisations other than SAC:
We sincerely wish to represent the remote sensing work being carried out in organisations other than SAC, particularly the current trends and future directions. We request the members from each organisation to take initiative to realize this.

We are confident that we can achieve the targeted goal and much more with the co-operation of and contribution from all of you. Hope you will enjoy reading this issue with its new look and flood us with contribution for the sections of your choice.

-editor-

Front cover

Brightness temperature maps over Antarctica derived using IRS P4 MSMR data at quarterly interval. For further details please refer the article by Vyas and Dash.

Published by	***Printed by***
ISRS-AC C/o RESA Space Applications Centre Ahmedabad 380015	Library SAC

Indian Society of Remote Sensing-Ahmedabad Chapter Update

Founded on	1983
Life members	277
Annual members	06
Sustaining members	08
Patron members	04

ISRS-AC have members from the following Organisations:

Ahmedabad

Space Applications Center
CEPT
Ahmedabad Urban Development Authority
Survey of India
M G Science Institute
St. Xaviers College
PAM consultants
GEOTECH Bharat Ltd
Indian Institute of Management
All India Soils and Landuse Survey
Gujarat University, Dept. of Botany
Central Ground Water Board

Gandhinagar

Department of Mines and Geology, Town Planning Department, Govt. of Gujarat
Forest Department, Govt. of Gujarat
GEER Foundation
RESECO

Naroda

Technocad Engineers and Consultants Pvt. Ltd.

Anand

IRMA

Vadodara

M.S.University, Dept. of Geology,

Succession of the Chapter Chairmen

Shri O.P.N.Calla (1983-87)
Dr T. A. Hariharan (87-90)
Dr. George Joseph (90-92)
Shri R. C. Garg (92-94)
Dr P. C. Pandey (94-96)
Shri A.K.S.Gopalan (96-98)
Dr R.R.Navalgund (98-2000)
Dr S.R.Nayak (Current)

Milestones:

Initiation of Calla Memorial lecture- 1987

Initiation of Prof Pisharoty memorial lecture- 1996

Activities- 2000

World environment day Celebration	June 5
National Remote Sensing Day Celebration	August 12
Shri L. N. Calla Memorial Lecture	September
Regional workshop on Monitoring coastal Environment	October
Educational Excursion	Nov.-Dec
Prof. P. R. Pisharoty Lecture	February, 2001

Executives

Current	*Immediate past*
Chairman	
Dr. S R Nayak	*Dr R R Navalgund*
Vice-Chairman	
Shri A B Vora	*Dr S A Chauhan*
Secretary	
Shri N S Mehta	*Shri R M Pandya*
Jt. Secretary	
Shri Girish Baluni	*Shri Bharat Patel*
Treasurer	
Dri M M Kimothi	*Shri N S Mehta*
Members	
Shri P.J.Shah	Dr. I M Bahuguna
Shri J. V. Bhatt	Dr M M Kimothi
Shri V. Ravichandran	Shri A S Rajawat
Ms Abha Chhabra	Shri G J Kantharia
Shri S A Sharma	Prof. R D Shah

Editorial Board

Current	*Immediate past*
Editor	
Dr S Panigrahy	Shri J.K.Garg
Members	
Dr S S Ray	Shri A. S. Rajawat
Shri K K Mohanty	Prof. R.D. Shah
Prof. R.D. Shah	Dr S. S. Ray
	Shri R. S. Rao

New members during 1999-2000

Life

1. Ms Madhura Niphadkar, SAC
2. Shri Sushil Kumar Singh, SAC
3. Shri V. E. Netajimariappan, SAC
4. Shri Yaswant Pradhan, SAC

Annual

5. Ms Indrani Chaudhary, SAC
6. Jaya Vipat, SAC
7. Shri S. Prakash, SAC
8. Shri Santosh K. Singh, SAC

Indian Space Budget Growth

(Space news)

(million of rupees)

Item	98-99	99-2K	2K-01
1	5670	5548	7744
2	6473	6898	7244
3	2008	1873	2658
4	1055	1404	1453
5	297	398	391
Other	521	1138	702
Total	16024	17259	20,192

1. Rocket development
2. Insat operations
3. Satellite development
4. Space applications
5. Space science

Major Indian Space Missions during Ixth Plan

(DOS Annual Report)

Missions	98-99	99-2K	2K-01	2K-02
IRS		P4		P5
INSAT	2E	3B	3A	3C
Expt./Tech payload			GSAT -1	GSAT -2, GSAT
PSLV		C2	C3	C4, C5
GSLV			D1	D2

Message from Chairman, ISRS Ahmedabad Chapter

Dear Members,

First of all, I am grateful to you for unanimously electing the executive council and me for the new millennium term 2000-2002. The Ahmedabad Chapter has been in the forefront in conducting various programs for dissemination of knowledge of remote sensing in the Gujarat State. We are confident that with your active support, we will able to keep this tempo and strive for newer heights. We have already drawn up schedule of activities for the entire year. The activities have been planned in such a way that all sections of the society, industries, academia, government as well as non-governmental organizations (NGOs), can be reached. Special programs for students of school and collages have been formulated. The World Environment Day function was organized at the Naroda Industrial Estate and the program was a great success.

Through our NEWSLETTER, we will provide latest information about remote sensing technology and applications to you. It will also provide a medium to interact with members.

It is heartening to note that the government and industries are now using remote sensing data as a baseline data for formulating plans and in some cases for implementation. We need to identify accuracy standards, both classification and planimetric, and implement them. I invite all members to convey their suggestions and comments in this regard to the Editor.

You all will be glad to know that former Chairman of the Chapter, Dr R. R. Navalgund has been elected as the President of ISPRS Commission VII for 2000-2004 term. Another member from SAC, Dr V. K. Dadhwal has been selected for the Hari Om Prerit Dr Vikram Sarabhai Award' in the field of Space Applications. This speaks for itself about the Chapter achievements.

In the end, I assure you that we will strive our level best to fulfill objectives of the ISRS.

Shailelsh Nayak

Dr R. R. Navalgund, Former Chairman of ISRS-AC and Dy Director, RESA, SAC has been elected as the President of ISPRS Commission VII on - "Resource and Environmental Monitoring" for 2000-2004 term.

Chapter extends its heartiest congratulations and best wishes to him

Due recognition

. To quote Vasundhara Raje, Honorable Minister of State, on March 1, 2000, to Parliament *"The use of remote sensing data so far has saved the country more than 5 billion rupees in the total cost of developmental projects, even though the cost of remote sensing data usage in each project was about 3 to 5 per cent of the overall project cost". -Space news*

Earth Observation Programme of India in the new Millennium

Use of space-borne remotely sensed data for inventory and monitoring of natural resources over land has reached a level of maturity in the country with the launch of a series of Indian Remote Sensing satellites (IRS-1A/1B/P2, IRS-1C/1D, IRS-P3/P4) during the last two decades. While there is need to improve upon spatial, spectral and temporal resolution of data to enhance their utility for some of the land resources applications, there is a greater need to address observation needs of other components of the earth system. Observations of physical and biological phenomenon of the oceans from space through a series of active and passive sensors - both in the optical and microwave regions are likely to gain momentum in this millennium. An integrated system of observations wherein the networking of in-situ measurements coupled with space borne observations would need to be established to facilitate greater understanding and modeling of phenomena and applications. Many measurements related to atmospheric parameters as well as their profiles will also gain attention. Another direction of progress will be in the area of cartographic satellites providing data at very high spatial resolution of the order of a meter or its fraction. Providing stereo data at this high resolution from space platforms is likely to be an important aspect for carrying out detailed terrain evaluation, and also for preparing/updating topographic maps at large scales. While many of the missions mentioned above would cater to the needs of oceans, land and atmosphere, there is also a possibility of many small missions specifically meant for scientific investigations being flown. They can be carrying high resolution spectrometers, microwave sounders, sensors for astronomical observations etc. Use of geo-stationary platforms for providing constant surveillance of the earth to aid in disaster management is another likely dimension to emerge in earth observation scenario.

In the context of the overall worldwide scenario as mentioned above, India is embarking upon ambitious space programme in the next millennium. Some of the space missions already approved for realisation in the early part of the first decade of the millennium include Cartosat(1) providing high spatial resolution data, Resourcesat providing data at three levels of resolutions (60, 23 & 6 in multi-spectral mode) and Meghatropique, for observations of the sea and atmosphere.

Dr R R Navalgund
Deputy Director. RESA, Space Applications Centre and Former Chairman, ISRS-AC

India's proposed budget for space activities in 2000-2001 was submitted to parliament on Feb.29, 2000 to the tune of 20 billion rupees. It is a 17 per cent increase over the current budget and represents a nearly 92 per cent increase since 1997-98. The allocation for space applications item is around 1.453 million against the 1.404 of 1999-2000. Noteworthy features are-1.16 billion for the proposed Cartosat-1 and Resourcesat. 150 million to begin work on three more advanced imaging satellites dubbed as Cartosat 2A, 2B, 2C.

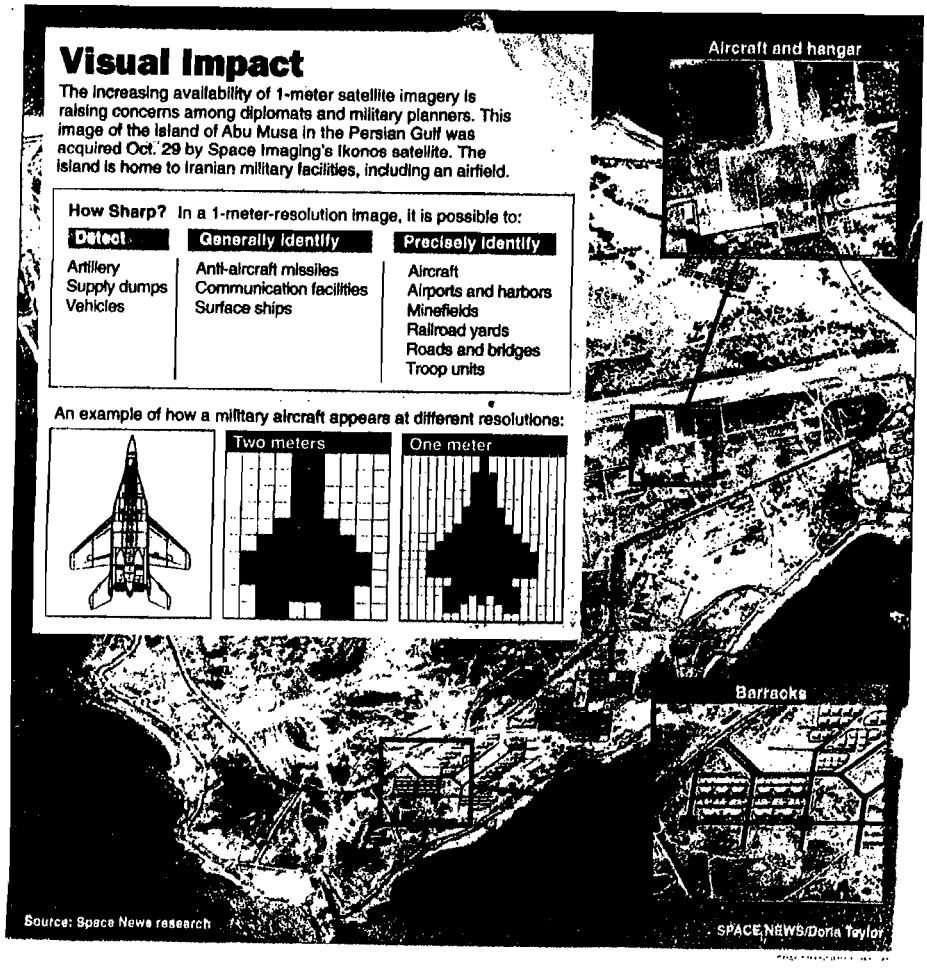
Space News

High-resolution images-User's delight and policy maker's nightmare!

Public policy always has difficulty keeping up with advances in technology. Earth observation technology is no exception to this. New markets and applications are developing in the field of urban planning and management, real estate, insurance etc. as a result of the high resolution images. However, it poses a significant challenge for military planners around the world who will find it difficult to keep some information from enemies. The most capable of this new generation of commercial satellites are producing images in which objects as small as 1 meter across can be positively identified. Space Imaging's Ikonos satellite with 1 meter spatial resolution image has already created a palpable buzz at government and defense circle. Apart from Ikonos, 1-meter resolution optical imagery soon be available from a variety of non-US sources including Israel, South Korea, Russia, India .

In an operational environment it means that nations beyond the first tier of military power will for the first time possess a strategic reconnaissance capability. It can be mentioned that so far both USA and Russia allowed commercial sale of data upto 2 meter spatial resolution, the highest spatial resolution available was 2 meter data from the Russian government's Spin-2 satellite. So what difference it makes between 2 to 1 meter imagery to stir a hornet's nest? The picture shown below (source- space news) highlights one such difference from military point of view.
The remote sensing policy of USA, Russia which restricts finer than 2 meter data to be sold commercially is poised for reform. India also is taking steps in this direction. Till then, these images are delight to the users and nightmare for policy makers.

Compiled by Editor



Monsoon - 2000

P C Joshi, P K Pal and B Simon,
MOG, RESA,
Space Applications Centre

The monsoon season (June - September) is one of the spectacular transition system in weather. This is more so for the Indian subcontinent where approximately 75% of the annual rainfall occurs during this period. Some pockets in the country get more than 90% of the annual rainfall in this season. The prediction of onset of monsoon and the total seasonal rainfall are the two long-awaited features of the monsoon season. Towards end of May both these predictions are made by India Meteorological Department (IMD).

Predictions using Operational Models:

Since 1988, IMD has been issuing long range forecast for the monsoon rainfall over the country as a whole, using the,'16 parameter power regression model' which was revised by replacing the 4 predictors (North India Temperature, 10 hPa zonal wind at Balboa, 500 hPa Ridge position and Darwin pressure (Spring), whose relationship with monsoon rainfall has declined in recent years) with 4 new predictors (Arabian Sea SST, South Indian Ocean SST, Europe pressure gradient and Darwin Pressure Tendency which have shown significant relationship with the monsoon). It has been found that the performance of the new 16 Parameter power Regression Model is better than the old model. Therefore, this year, official long range forecast for the country as a whole is issued based on this new 16 parameter (12 old + 4 new) Power regression and Parametric model.

The long range forecasts as given by IMD for the 2000 Southwest Monsoon over the country as a whole and the three broad homogeneous regions of India, viz., NW India, Peninsula and NE India are given below.

a) In 2000, the rainfall over the country as a whole for the entire southwest monsoon season (June to September) is likely to be normal thus making the year 2000 twelfth normal monsoon year in succession. The normal is defined as rainfall with ± 10% of its long period average.

Quantitatively, the rainfall over the country as a whole for the entire southwest monsoon season is likely to be 99% of its long period average with an estimated model error of ±4%.

b) Over the broad homogeneous regions of India, the rainfall for the entire southwest monsoon season of 2000 is likely to be **102% of its long period average over NW India, 98% of the LPA over Peninsula and 100% over NE India** with an estimated model error of ± 8%.

The performance of the IMD's operational prediction model in the present decade is shown as below:

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Forecasted Rainfall	94%	92%	103%	92%	97%	96%	92%	99%	108%	99%
Actual Rainfall	91%	93%	100%	110%	100%	103%	102%	105%	96%	?

The table shows that in the years of extreme rainfall there is large variation in the forecasted rainfall from the actual rainfall.

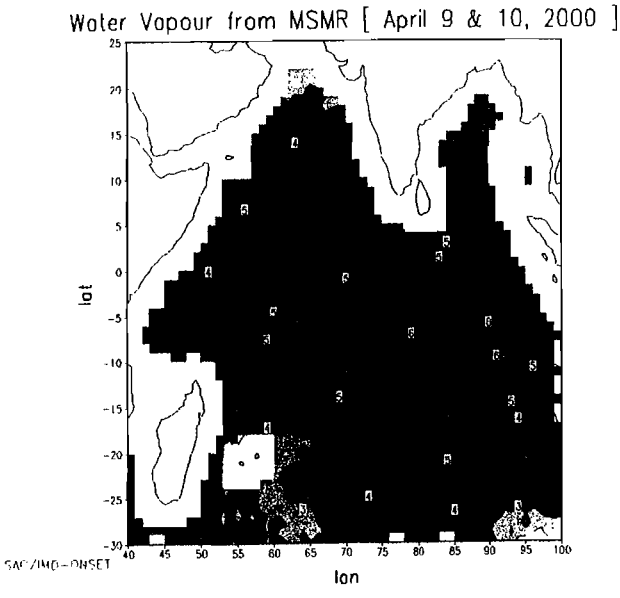
Results from Experimental Dynamical Model

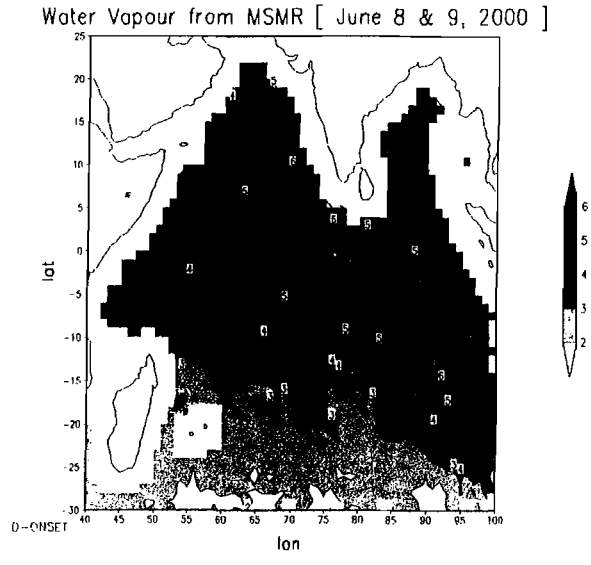
Besides above operational forecasts based on statistical methods, attempts are also being made to predict the seasonal / monthly rainfall using numerical weather prediction models. These models are based on fundamental basic dynamical equations for the atmosphere taking into account various physical processes. One such effort is going on at Space Applications Centre, Ahmedabad under the experimental project Extended Range Monsoon Prediction (ERMP). ERMP aims at predicting monthly average rainfall over various zones of the country. **The June averaged rainfall for monsoon 2000 is predicted to be excess over Peninsular India, deficient over NE regions and normal over rest of the Country**. The normal, excess and deficient are with respect to the long term average rainfall for that particular zone.

Onset of Monsoon:

Precise prediction of onset of monsoon is important for a number of operational applications in different sectors of national economy. Spatial distribution of atmospheric water vapor over vast oceanic areas and ocean surface wind speed are the two important parameters, which determine the progress of the monsoon circulation. Multi-frequency Scanning Microwave Radiometer (MSMR) onboard IRS - P4 launched on 26 May 1999 provides data for derivation of these two products. The onset of monsoon in the year 2000 occurred on 1st June the average mean date. Its advancement to some parts of the country was subsequently faster than expected but the monsoon circulation has not yet covered the whole country (as on 27/6/2000)

A special study was undertaken jointly by IMD and SAC to monitor the onset of Monsoon - 2000 utilizing data received at IMD & SAC from NRSA, Hyderabad. Maps for these parameters were prepared covering a geographical domain of 40° E - 100° E and 25° N to 30° S. A critical study of this data set along-with other conventional data, available over a period of 2 months, has shown that prior to onset of monsoon there is a general increase of water-vapor over the Arabian Sea. As the monsoon progresses towards Indian sub-continent, the area of maximum moisture content moves northwards as revealed by charts seen on a weekly basis. Along with the onset of monsoon over Kerala Coast on 1st June, 2000, an increase in moisture was observed over Bay of Bengal and Arabian Sea for a considerable period of time during which there was good rainfall activity over peninsular India. The total water vapour content before and after onset of monsoon is shown in following diagram.





Ocean Surface wind speed available from MSMR also shows increased values over Arabian Sea during the advancement of monsoon. A time series plot of wind speed at two specific locations in Arabian Sea i.e., 9° N, 67° E, 7° N, 69° E has shown that two distinct surges of high wind speed have come on 15 May and 1st June after which there was increase in rainfall activity, particularly over West Coast of India.

The first surge was of a short duration since high wind speeds were not sustained for long time after that. However, the second surge on 1st June, 2000 was of a prolonged duration and high wind speeds were sustained for considerable duration. The application potential of these data for prediction of onset of monsoon is being attempted.

BASKET SEARCH

News briefs

The Information Data Corporation's World Times Information Society Index, stated as the world's first effort to benchmark where nations stand in their capability to access, absorb and effectively take advantage of information and information technology. It has employed proprietary data, based on 23 variables related to four categories- information, computer, internet and social infrastructure. Based on the variables, it classifies all countries in four categories as Skaters – above 3500, Striders – above 2000, Sprinters- above 1000, Strollers- below 1000. *Strollers are those wandering towards the revolution without great haste, deterred by infrastructure costs, limited consumer demand and cultural fears. India is rated as a stroller along with China, Pakistan, Indonesia, Peru, Egypt.* Its ranking was 54 among the 55 countries surveyed, just above Pakistan. Sweden tops the scale of skaters followed by USA. - *Statesman news service, Calcutta, May 9, 2K*

NASA has more employees over the age of 60 than under the age of 30 as young, post-doctorate job seekers go to internet companies. It is suggested to explore the possibilities of paying for a student's tuition fee in exchange for three years of service in NASA.
Space news

Ministry of Agriculture, China showed keen interest in the methodology adopted by India to monitor rice crop using RADARSAT ScanSAR data, due to its financial feasibility for the vast regions of rice area in the country.
Reflections

India-Brazil sign cooperation pact on March 15 in Brasilia. Potential areas of cooperation are satellite applications, training in remote sensing, mutual use of space science facilities etc
Space news

NOAA marks 40th anniversary of weather satellites. April 1, 2k marked 40th anniversary pf the world's first weather satellite TIROS (Television Infrared Observation satellite)was launched from Cape Canaveral, Spa.
-*Space news*

RADARSAT international (RSI) has entered into a Memorandum of Understanding with Malaysia based Padiberas National Berhad to participate in a commercial study on the feasibility of developing a commercial intelligence system for global rice production monitoring using satellite data.

Japan's Hokkaido Chizu Co offers a customized electronic map making service that combines information supplied by user with data from company's GIS. A customized prefactual map at 1:250,000 scale starts at 3 million yen.

Space Imaging, Thornton, operates the Ikonos images and sells images of Landsat, IRS etc. has acquired Pacific Meridian Resources, California who does value added services in the field of land cover mapping, change detection, toxic waste dump site selection, environmental assessment etc. to become a full visual information company to expand into value added portion of the RS industry.

Glimpses into International sensors

The 1-Metre Outlook

By 2003, 14 satelites capable of producing 1-metre resolution images are expected to be operational (*space news*)

Operator	1999	2000	2001	2002	2003
Space Imaging (U.S.)	1				
EarthWatch (U.S.)		2			
OrbView (U.S.)		1	1		
West Indian Space (U.S. – Israel)		1	1	3	1
Russia		1			
India					1
South Korea					1

Ikonos - the first commercial, high resolution satellite Ikonos-II was launched successfully on 24 September 1999 from Vanderberg Air Force Base, California. The 720 kg Ikonos is launched into a sun-synchronous, near polar, circular low earth (400 miles) orbit at 11.21 am Pacific Stanard Time by Lockheed Martin-build Athena II rocket. Readers may note that Ikonos I

of similar configuration was lost on 27 April, 1999 when the rocket's payload fairing failed. It collects 600 images of an 11 sq km area per day as well as revisit any location every 1.5 to 3 days. It collects simultaneously 1 meter panchromatic image and 4 meter multi-spectral images.
For details visit-
http:www.spaceimaging.com

NASA has successfully launched on December 18, 1999, Terra-the first major component of Earth Observation Syatem. ASTER (Advanced Spaceborne Thermal Emission and Reflection Radiometer) aboard Terra has the multispectral capability to determine soil and ground composition. To know more about ASTER and see an image visit the Weekly Links section under Resources at www.spacenews.com

NASA has also flown the Shuttle Radar Topography Mission which will provide the first uniform set of detailed topographic data about the globe. Scientists will utilize these data in following natural and human induced changes on Earth's surface.

RADARSAT-II scheduled for launch in 2002 will be the most advanced SAR satellite. Carrying a C band radar with ground resolution ranging from 3-100 meters and swath of 20-500 km. Will offer multi-polarisation SAR data. Alenia Aerospazio of Italy which specializes in constructing microwave sensors (including altimeter, radiometer etc.) bagged the contract in December 1999 to build the satellite bus.

ENVISAT weighing 8500 kg and measuring 10.5 meters in stowed position will be launched by mid 2001 as the sole payload on an Arian-5 rocket. However, operational data will be ready by early 2002. To provide continuity of data to users of ERS-1 and 2, efforts are on keeping ERS-2 healthy until ENVISAT takes over. It can be mentioned that the mission is delayed almost two years.

Ricesat – exclusively to meet the monitoring of rice lands of Asia, Japan floated the concept of using a dual frequency radar with 10-20 meter resolution that could detect submerged rice to be realised by 2005. It will carry a price tag of $100-200 a scene compared to $4000 of Radarsat..

Products, offerings and bargains

ERDAS-IMAGINE 8.4 is now available which includes the IMAGINE Expert Classifier and a Batch Wizard that combines multiple files into a single process chain

ESRI offers PC ARC/INFO 4. It includes 32 bit Windows executables which improves processing speed on Windows 95, 98 and NT operating systems.

US Based Synoptics Geo Applications Ltd (SGA) have unveiled a capability for generation of medium resolution ortho-images and DEM without the use of GCPa using the satellite ephemerals and timing of data for location. To see a sample data product visit http:www.synopticsga.freeserve.co.uk

PCI Geomatics has released PAMAP GIS 5.2b, a fully integrated raster and vector GIS software package. The software is available for use on Windows 95/98/NT platforms.

ERS SAR Toolbox (STBX) is a collection of executable software tools which facilitates use of ERS SAR data and complements the existing commercial softwares. It has minimum human-machine interface. It carries out extraction, data conversion, statistical anslysis, resampling, co-registration, Gamma MAP filtering, and calibration. The Toolbox can be found at http:/earth1.esrin.esa.it/STBX/

RADARSAT International (RSI) has a package offer. Buy one new RADRASAT scene (any beam mode) and get an archive data of the same scene for $600.

Job prospects in Remote sensing and GIS

(compiled by Shri K. K. Mohanty, SAC)

Internet Site	*Brief Overview*
http://www.geosearch.com	Recruiters in Geographic Information Systems (GIS), Global Positioning Systems (GPS), Photogrammetry, Remote Sensing, Image Processing, Computer Science and Related Technologies and Sciences.
http://www.gjc.org	GIS Jobs Clearinghouse. Started in 1992, the GJC has helped thousands of GIS/RS professionals find positions. With hundreds of positions and resumes in its databases, the GJC has resources for both employers and those seeking jobs. Initially, started as a free-site for posting resume, currently charges nominally for resume posting.
http://www.the-rss.org	Opportunity pages on this site regularly posts on some of the current opportunities available in the Earth Observation sector, including employment, funding, academics and research.
http://ourworld.compuserve.com/homepages/eworks/	EARTHWORKS: **Job opportunities for remote sensing/GIS** professionals, geoscientists, climate/atmospheric scientists, oceanographers, environmental scientists and hydrographers in the academic, upstream oil

	and gas, civil and mining sectors with particular focus on the UK, North America, Europe, Africa and Pacific Rim.
http://www.star.ait.ac.th	**Scholarship for European and Asian Students:** The Asian Institute of Technology (AIT), in partnership with the European Union has established the Postgraduate technological Studies (PTS) Programme that will run between 1998 - 2001. During this period a number of scholarships will be available for Asian students to undertake part of their studies at European academic institutions, and for European students to take a full masters degree course at the AIT in Bangkok, Thailand
http://www.uni-mainz.de/FB/Geo/Geologie/jobs/index.html	**Geoscience Jobs:** Job opportunities for remote sensing/GIS professionals, geoscientists, climate/atmospheric scientists, oceanographers, environmental scientists and hydrographers in the academic, upstream oil and gas, civil and mining sectors with particular focus on the UK, North America, Europe, Africa and Pacific Rim.

SPECIAL SECTION ON ENVIRONMENT

To bring awareness on environment related issues, June 5th is celebrated as World Environment Day. It was established by the United Nations General Assembly in 1972. It is a people's event with governments, individuals and community groups organizing activities to improve the environment.

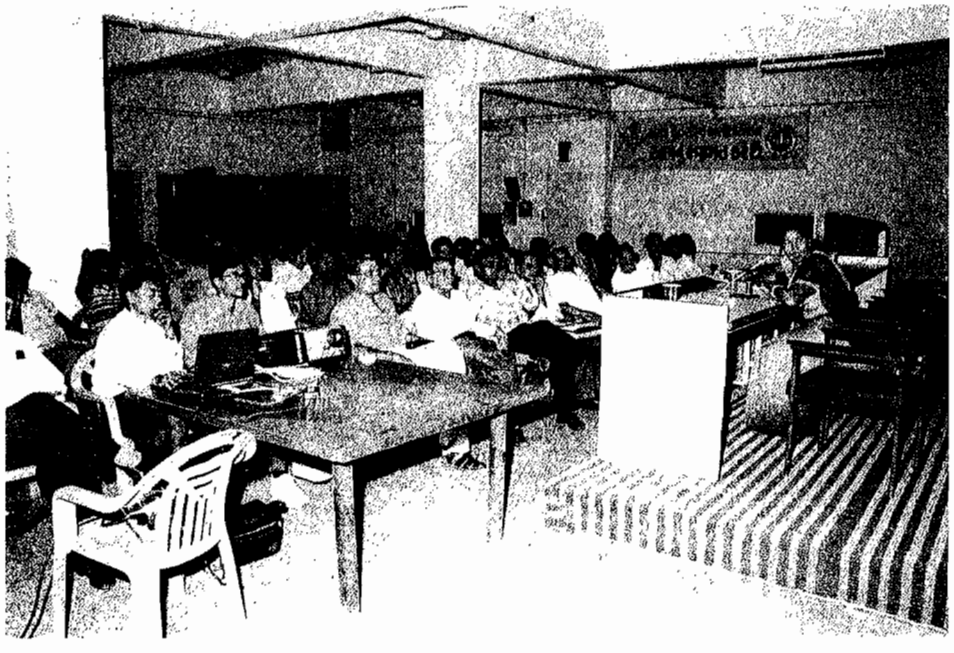
Celebration of World Environment Day- ISRS-AC style

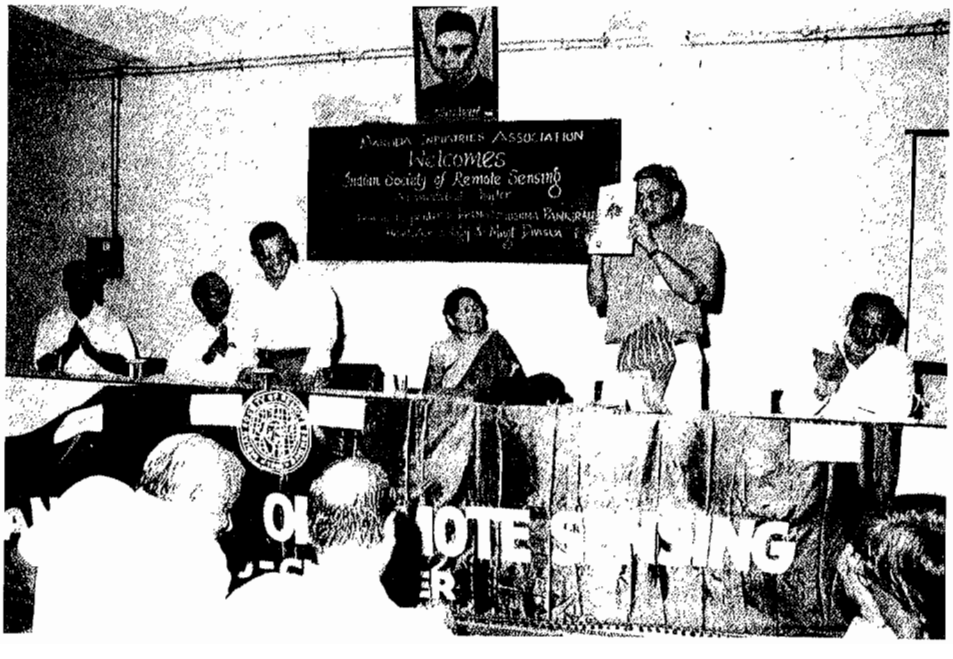
When most of the organizations were busy celebrating the world environment day on June 5, in the premises of posh hotels, auditoriums, educational institutes, ISRS-AC decided to go to the people and celebrate at their site. ISRS-AC in an innovative way celebrated the day jointly with Naroda Industrial Association (NIA) at the NIA's hall at Naroda, with an objective of creating awareness about the capability of remote sensing in the field of environment among the members of

NIA, who are mainly promoters of small scale industries.

A lecture on "Remote sensing applications for environmental monitoring" was arranged. *Dr Sushma Panigrahy,* a senior scientist of SAC, heading the Agro-ecology and Management Division, Remote Sensing Applications Area delivered the lecture. Shri G.B.Shah, President, NIA welcomed all the members. Dr S.R.Nayak, Chairman, ISRS-AC briefed about the objective of this celebration and about the speaker. Shri G.C.Baluni, Jt.Secretary, ISRS-AC, outlined the expectation of the industries from the technology. Liberal use of visuals, examples and *Hinglish* medium of the lecture created inquisitiveness, interest and desired impact among the audience.

The function ended by vote of thanks by Shri Shailesh Patwani. NIA.ISRS-AC arranged transport facility from SAC to the venue and back for the participants Few moments of the function as captured by Shri R.K. Dave are shown below:



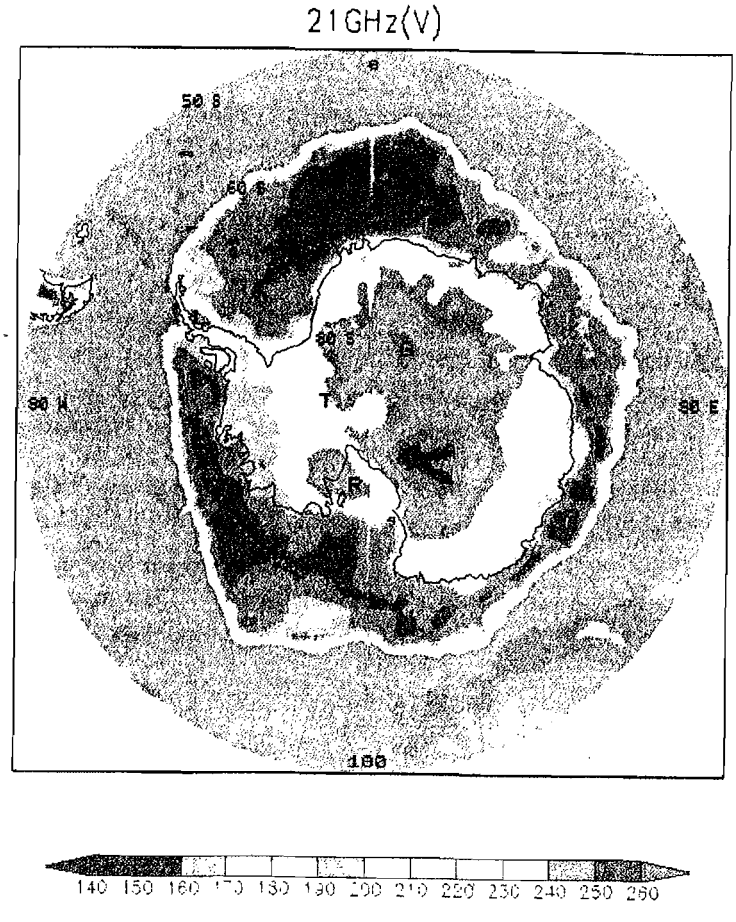


Monitoring Antarctica ice Cover using IRS P4 MSMR data

N. K. Vyas andi M. K. Dash
MOG, Space Applications Centre

Ice and snow cover are sensitive indicators of climate variation. So Antarctica is in the focus of attention as it will provide the validation of various global warming theories and models. First systematic study of the Antarctica ice cover was carried out using NIMBUS-5 ESMR data during 1973-76 followed by NIMBUS-7 SMMR data in 1978-87. At present a lot of work is being done using SAR data from ERS and RADARSAT sensors. With the launch of IRS P4, MSMR data is available, which has a great potential to map and monitor ice features and processes

Studies are being conducted to map and monitor Antarctic ice cover using this data, validate the accuracy of various algorithms using sea truth data. The first results obtained from these studies are quite encouraging. The MSMR derived sea ice emissivities are in good agreement with those obtained from sea truth as well as SMRR data. We could observe various features/ processes on land in Antarctica like Ross ice shelf, Larsen ice shelf, Wilkins sound, Fisher-Lambert glacier, etc. (location of these features is shown in the figure given below).



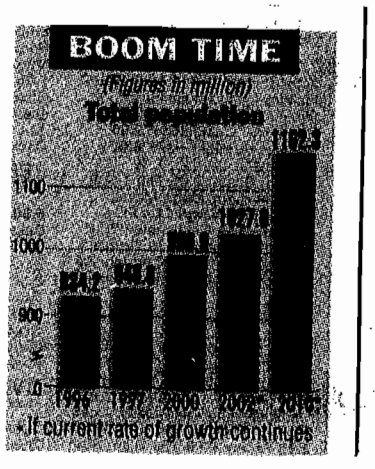
L : Larsen Ice Shelf
G: Gamburtsev Sub-glacial Mountain
R: Ross Ice Shelf
T: Trance -Antarctic Mountain Ranges
W: Wilkes Sub-glacial Basin
A: Aurora Sub-glacial Basin

Similarly, the seasonal variation of ice extent and concentration on sea was also derived. The ice cover during peak of winter (June) and summer (December) were mapped. The maximum ice cover was in September and minimum in March as shown in the figure given on the cover page.

The possibility of carrying out many meaningful research studies in the field of environment and global warming brightens up using this data.

Environmental News Clips

In 2025, India is expected to overtake China to become the most populous country in the world (see inserted figure.). Environment-monitoring and managing is the greatest need of the hour to prevent the rapid degradation of environment and sustain the growing need of the population. However, the issue of environment is not confined only to India but the whole world. Whole world is concerned with the expected effects of climate change on food security, very existence of certain landforms, human health etc.



Why earth is not warming as quickly as greenhouse warming models have suggested- Study using data from US-Japanese Tropical Rainfall Measuring Mission Satellite suggests aerosols over land surface as the reason behind this which can modify clouds, suppress precipitation and reflect light. Credit of this finding goes to Daniel Rosenfield, Hebrew University of Jerusalem.
Space news

NOAA-12, 14 and 15 are used to track the iceberg of 11,000 sq.km in area that broke free of Antartica's Ross ice shelf and may drift into the Ross sea.
Space news

Two islands in Pacific- Tebua Tarawa and Abanuea in Kiribati have sunk as a result of global warming and sea level rising. The latter ironically is locally known as the island which is long lasting.
Down to Earth

Ozone layer over UK and northern Europe has thinned to half of its normal concentration as observed by meteorological measurements taken in stratosphere.
Down to Earth.

Global warming is accelerating faster than what climatologists have predicted. According to Thomas Kaul, Director of National Climate Data Centre, NOAA, of warming is already 3 degree *C per* the rate century.
Down to Earth

Findings from INDOEX (Indian Ocean Experiment) indicates that a brown haze of pollutants caused by high concentration of aerosols at an altitude

of 3 km. Above sea level looms large covering northern parts of Indian Ocean, Arabian sea, Bay of Bengal/ It is expected to cause acid rain affecting terrestrial and marine life.
Down to Earth.

Unique to the Antarctica, Ice shelves are believed to be particularly sensitive to changes in climate. Recently some have experienced rapid retreat. Large cracks have formed in the Ronne ice shelf where shearing stresses exceeded the strength of the ice. One such crack in 1999 caused a slab of ice roughly the size of the U.S. state of Delaware to separate from the ice shelf
Annual Review Report 1999-2000 of RADARSAT

Ice crystals known as Methane hydrates found inside the sea floor have trendous energy potential, but it is yet to be tapped.
Down to Earth

In collaboration with the New York based Institute for transportation and Development policy, a Delhi based NGO –Asian Institute of Transport Development has introduced a new user friendly zero emission Rickshaw on roads of Taj City-Agra.
Down to Earth

Researchers studying biological diversity are learning to make better use of remote sensing data. However, their opinion is that in order to make a significant long term impact in this field, the data must be more affordable, there must be a systematically collected archive of global space products
Space spectrum

The accumulation of spent rocket stages and abandoned satellites is a growing problem in space. However, the good news is that despite the thickening cloud of debris there has been only one confirmed case of damage to a satellite. That was collision of a spent Arian rocket upper stage with the French Defense Ministry's Cerise microsatellite.
– Space spectrum

Few relevant web sites for those interested in environment-

United States global change research programme
http://www.gedis.userp.gov

The greenhouse effect-an overview
http://www.geocities.com/Athens/Parthenon/5173/greenhouse_effect.html

Global environmental information center- *http://www.geic.or.jp*

Information Centre for Environment
http://ice.ucdavis.edu/echo/remote_sensing.html

Remote sensing and forest monitoring
http://rouge.engr.wisc.edu/cee/courses/cee352.html

Remote sensing of the atmosphere, environment and space
http://www.spie.org/info/ae/

(Contributions from Ms Abha Chhabra, ARG, Space Applications Centre.)

Silver Linings

Achievements of members

Scientist honoured

Dr V K Dadhwal of Space Applications Centre, Ahmedabad, has been selected for the 'Hari Om Prerit Dr Vikram Sarabhai Award' in the field of Space Applications for his work in crop monitoring and production forecasting by remote sensing. The award is given bienneialy by PRL. It will be awarded during the celebration of Dr Sarabhai's birthday on August 12. Dr Dadhwal is a life member of ISRS-AC.
Congratulations and best wishes to Dr V.K.Dadhwal for his scientific achievement

Bringing smile to thousands of people with low vision

Scientists who apply their scientific bent of mind to do something for the cause of society are always remembered. Shri Bhagirathi Mankad, our member from SAC and a senior scientist has just done that. His sensitive feelings, scientific aptitude and innovative temperament has motivated him to do something for the less fortunate people and really done all scientists proud. Thanks to his simple device, people with low vision can read their text books, solve advanced mathematics and write answers as efficiently as a normal vision person and are free from using Braille medium. Blind People's Association has named the device as *Dhairya Low Vision Device* and decided to mass manufacture it at their workshop. There is a detailed article in page no.20.

Our heartiest congratulations to Shri Bhagirath Mankad for his contribution to the society.

For the cause of ISRS-AC

ISRS-AC thankfully acknowledges the efforts of Ms Abha Chhabra towards enriching the members of the chapter. She has the distinction of enrolling highest number of members during first quarter of 2000. She is a junior research fellow, of CMD, ARG, Space Applications Centre.
Heartiest congratulations and best wishes to Ms Abha.

Establishment of a North-Eastern Space Applications Centre (NE-SAC) has been initiated. The center will have facilities for remote sensing, satellite communication and space science research and will aim towards overall development of the north-east region including Sikkim. One of our esteemed Chapter member-Shri J S Parihar, a senior scientist from SAC is appointed as Director designate of the Centre.

The Chapter extends heartiest congratulations and wishes him all the best.

Achievements of family members

Kargil remembered

Ms Supriya Pokharna stood first in the drawing competition in the age group of 16 years and above for her theme on Kargil war, held by Ellisbridge Gymkhana on June 11. She is a B. Sc, III

year student in Industrial Chemistry in St. Xaviers College, Ahmedabad and daughter of Dr S. S. Pokharna, one of the senior member of the Chapter, from SAC.

Heartiest congratulations and best wishes to Supriya for her painting talent

Ganguli bowled

Master Sunny K. Mallik's poem in Hindi written to Sourav Ganguli on his birth day touched the soft cords of the player by its simplicity and loving emotion laden words. The busy player took his time off to reply to this talented young poet with his autograph. Sunny is son of Shri K. D. Mallik, a senior member of the Chapter from SAC.

Heartiest congratulations and best wishes to Sunny for his poetic talent

Dhairya Low Vision Device

Bhagirath Mankad
SAC, Ahmedabad

It has been documented that over 70 per cent (around 45 million) of the visually impaired people in India have either partial or some degree of functional vision. These category of people need high illumination condition and/or high contrast for writing or reading. Since, high illumination conditions are not always available, they are forced to use devices like Braille slate designed for persons without vision.

Dhairya Low Vision Device (DLVD) is a simple gadget but very useful and effective for such people with low vision to write and read. The device consists of a wooden box with fluorescent tube mounted inside to form a light source. The front face of the box is fitted with white translucent acrylic sheet. A fiber tipped sketch pen or a white board marker pen can be used to write any thing, draw sketch etc. The device is particularly useful for students of higher grades for study and preparation of mathematics and science as the currently used Mathematical Slate for blind has limitations because of non-availability of many symbols.

Blind People's Association has named the device as *Dhairya Low Vision Device* (named after his daughter for whom he has designed the device) and decided to mass manufacture it at their workshop.

Crossword Solution

Across. 1. Forestry, 5. Salut, 9. Root Mean Square, 11. Range, 12. Retina, 13. Lossy, 16. Kinetic, 17. RRSSC, 21. Noise, 22. Explorer, 23. Scattering, 24. IRS

Down. 1. Fourier, 2. Resolution, 3. Seam, 4. RADAR, 6. Accuracy, 7. Telemetry, 8. LISS, 10. INSAT, 13. LACIE, 14. Strap On, 15. IKONOS, 17. EOSAT, 19. SARVI, 20. ERTS

LEISURE CORNER

QUIZ

1. How many flights for ASLV and PSLV have been carried out by ISRO so far, including the initial failures?

a) 3 and 4 b) 4 and 4
c) 4 and 5 d) 5 and 6

2.. What is the volume of data that can be stored in a CD-ROM without any compression?

a) 450 KB b) 550 MB
c) 650 MB d) 1GB

3. What is the number of the last satellite launched in Landsat series?

a) 6 b) 7
c) 8 d) 9

4. Which one is not an Internet search engine?

a) Google b)Askjeeves
c) Yahoo d)Popeye

5. Who is the Editor-in-chief of Yahoo?

a) Sam Mascerhanas b)Sabir Bhatia c) John Stranhich
d) S. Srinivasan

6. Till date how many Indian Remote Sensing Satellites (IRS0 have been launched? Name them.

7. INSAT – 2E was launched by Arian Launch vehicle on:

a) April 3, 1999 b) July 12, 1998
c) October, 7, 1999 d) 30 December, 1998.

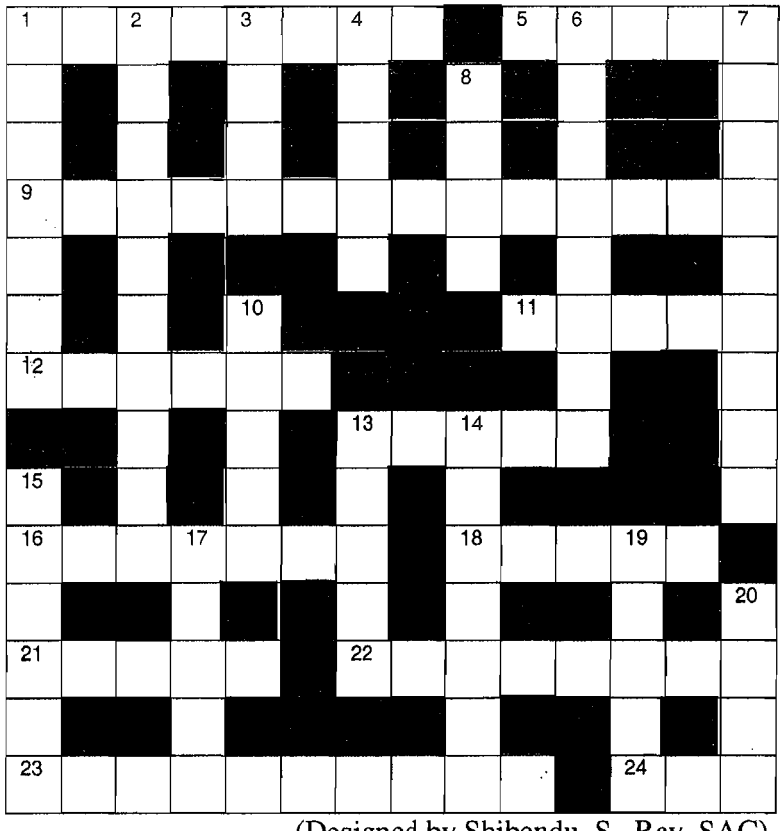
(By Shri K. K.Mohanty, MWRD, Space Applications Centre, Ahmedabad 380015)

Note: *Children (below 18 years) of members are encouraged to send the answers to the address given above before September 15, 2000. The name of children with correct answers will appear in the subsequent issue of Signature*

PSLV-C2 mission, is succeeded in orbiting three satellites- IRS P4, 110 KG KITSAT-3 of Republic of Korea and 45 kg DLR-TUBSAT of Germany.

ISRO has developed a series of sounding rockets for atmospheric research. During 1999 two RH-300 MARK-II rockets were flown to study Leonid Meteoroid effect. Two RH-200 were flown carrying meteorological payload

CROSSWORD



(Designed by Shibendu. S. Ray, SAC)

ACROSS

1. A branch of application science (8)
5. Manned Soviet space station (5)
9. A measure of error (4,4,6)
11. The direction in which energy is transmitted from an antenna (5)
12. Part of an eye (6)
13. A category of data compression technique (5)
16. Internal temperature of an object (7)
17. This centre helps in executing remote sensing projects –acronym (5)
21. Random or regular effects in data which degrade its quality (5)
22. Polar orbiting American meteorological satellite (8)
23. An atmospheric phenomenon (10)
24. Remote sensing satellite – acronym (3)

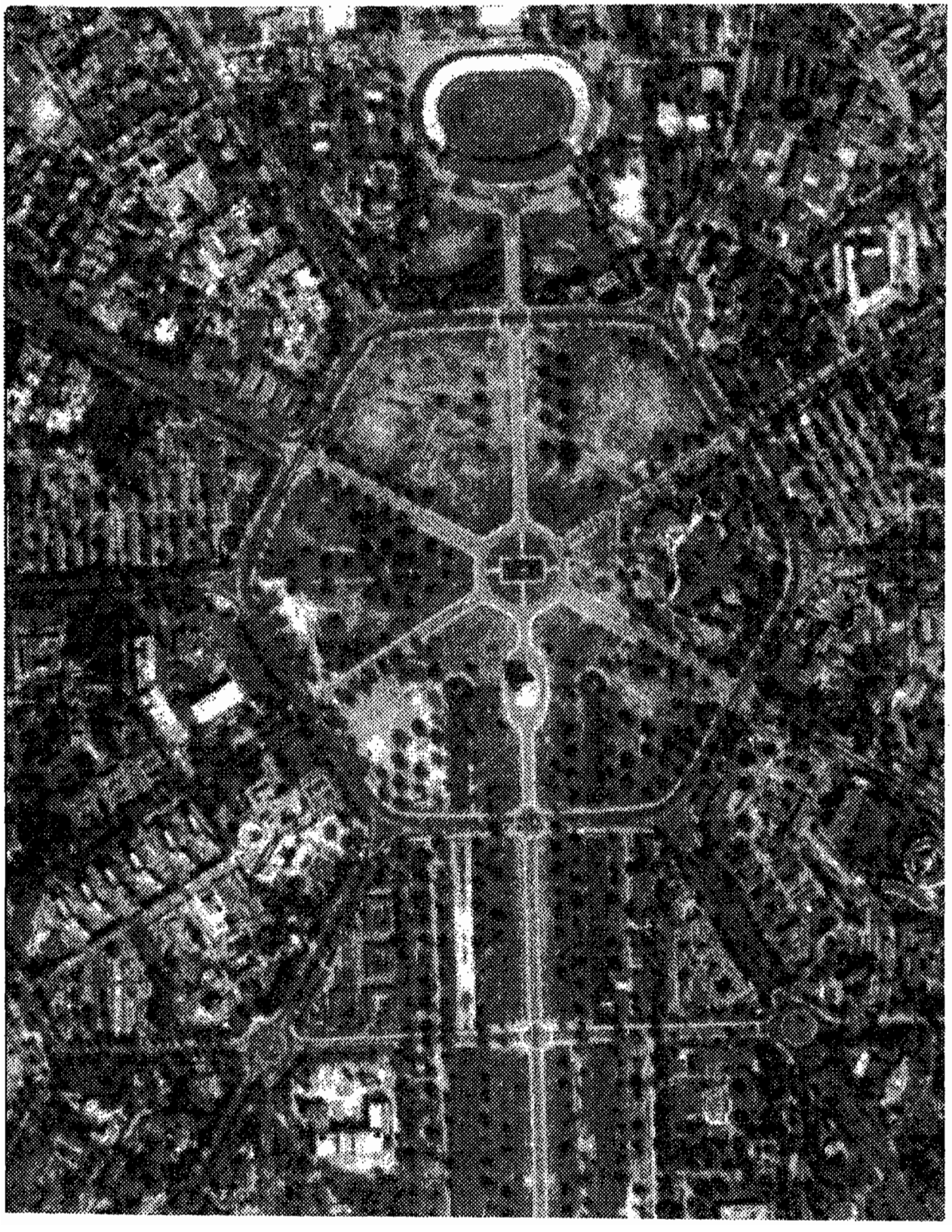
DOWN

1. A transformation technique (7)
2. A parameter characterizing a sensor (10)
3. Line, where edges of two images are joined together (4)
4. An active sensor – acronym (5)
6. It should be high for an experiment to be called valid (8)
7. Data transmission to a distant station (9)
8. An along-track scanner –acronym (4)
10. A geo-stationary satellite- acronym (5)
13. An international agricultural remote sensing experiment – acronym (5)
14. First stage rockets of PSLV (5,2)
15. This satellite even spots your car (6)
17. An organization selling IRS data-acronym- (5)
19. A vegetation index – acronym (5)
20. American polar orbiting satellite – acronym – (5)

(Solution of this crossword can be found in another page of this issue)

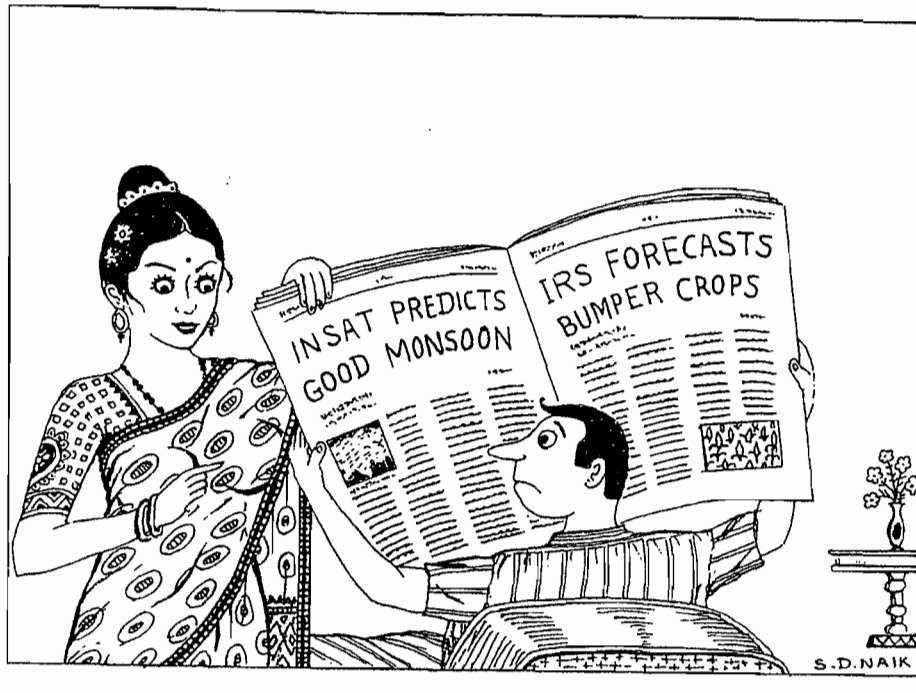
Looking at India Gate area, Delhi Through 2m. resolution image (Russian)

(Courtesy Dr M Chakraborty, SAC)



Lighter moment

(By Dr S D Naik, MWRD, Space Applications Centre)



EVEN SATELLITES HAVE BETTER UNDERSTANDING ! SEE HOW THEY SUPPORT EACH OTHER.

Book post

If undelivered please return to:

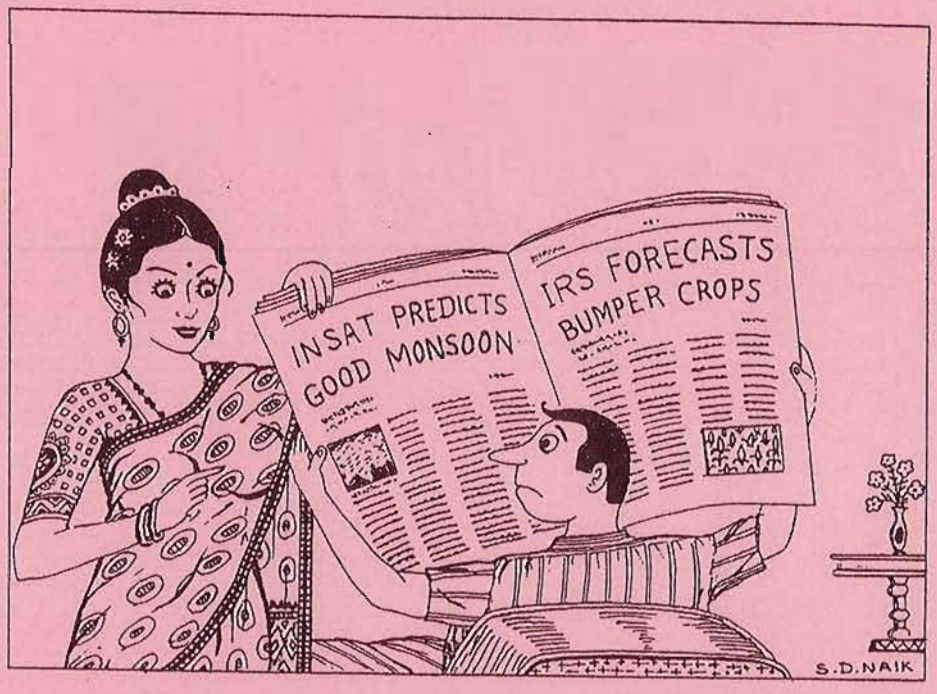
Secretary, ISRS-Ahmedabad Chapter
Remote Sensing Applications Area (RESA)
Space Applications Centre, Ahmedabad 380015

Printed at

Library and Documentation Division
Space Applications Centre, ISRO
Ahmedabad-380 015, INDIA

Lighter moment

(By Dr S D Naik, MWRD, Space Applications Centre)



EVEN SATELLITES HAVE BETTER UNDERSTANDING ! SEE HOW THEY SUPPORT EACH OTHER.

Book post

If undelivered please return to:

Secretary, ISRS-Ahmedabad Chapter
Remote Sensing Applications Area (RESA)
Space Applications Centre, Ahmedabad 380015

Printed at

Library and Documentation Division
Space Applications Centre, ISRO
Ahmedabad-380 015, INDIA

ISRS

SIGNATURES

Newsletter of Indian Society of Remote Sensing – Ahmedabad Chapter

Volume-14 *No. 1* *Month- March* *Year- 2001*

(A 5-km long ground fissure near the epicenter of January 26 earthquake. For details see article on earthquake)

In this Issue

	Page no.
Chapter Update	2
Gujarat Earthquake	3
Scenario of High Resolution Satellites	8
Basket Search	8
Chapter Activities	9
Silver Linings	15

Chapter Update

The Chapter itself enriched in terms of its membership during this period as evident from the fact that life membership increased by 52. The table below shows the detailed break up.

Category	No. of members
Life	314 (+38)
Annual	07 (+1)
Sustaining	08
Patron	04

Figures in parentheses show increase from last reported.

Executive Council

Chairman
Dr. Shailesh Nayak
Vice-Chairman
Prof. A B Vora
Secretary
Shri N S Mehta
Jt. Secretary
Shri Girish Baluni
Treasurer
Dr. M M Kimothi
Members
Shri P.J. Shah
Shri V Ravichandran
Ms Abha Chhabra
Shri S A Sharma
Shri J V Bhatt

Editorial Board

Editor
Dr. S Panigrahy
Members
Dr. S S Ray
Shri K K Mohanty
Prof. R D Shah

Dear Readers,

A lot of water has flown since we brought out the last issue. It is worth mentioning two events. One – the killer quake, that struck Gujarat on the 26 January 2001. Apart from the destruction to property and life, it wrecked havoc on emotional aspects and completely derailed our routine life. This is the main reason that can be attributed to the delay in brining out this issue of the Newsletter. We regret the delay and hope for the best in future. In this issue we bring to you an article, which may enlighten you on Gujarat earthquake.

The other event was the much-awaited launch of GSLV on March 28, 2001. Our excitement was turned to dejection when it failed to take off. However, all of us are familiar with the sea-saw of success-failure events in space programme. It is part of the learning process. What matters is the spirit and determination to succeed. We are glad to announce that the launch is again scheduled on April 18, 2001. Signature wishes the best and waits for the success news.

The editorial board is thankful to Dr. S.M. Bhandari, an esteemed member of the Chapter from SAC for his valuable suggestions to improve the quality of the Newsletter. He has also carried out critical reviewing of this issue of the Signature. We acknowledge his contribution and hope he will continue to extend his support. We hope you will enjoy reading this issue.

-Editor

News Flash

As the Newsletter goes for printing the news is flashed that GSLV blazed to success on April 18, 2001.

Estimation of Severity of Kachchh Earthquake of January 26, 2001 – Calculation of Peak Ground Acceleration and Damage Assessment

M. Chakraborty, Head, TSDD/ARG
Space Applications Centre, Ahmedabad

When the disastrous earthquake struck Kachchh and Gujarat on January 26, 2001 at 0847 hrs, very little about the nature and severity of it and extent of the affected areas was known. It was only days later when reports were received from Kachchh and other parts of Gujarat that the gruesome picture of the devastation began to emerge. However, it is possible today to generate a quick and realistic assessment of the severity and extent of the ground movement caused by an earthquake using various theoretical and empirical models that have been developed and modified over the last forty years. This information when used with the understanding of its impact on various man-made structures can lead to a realistic assessment of the damage and loss of life caused by the earthquake.

The role of these theoretical models is not restricted to post-earthquake scenario. The most important role these can play is in "*What.. If..*" situation. For example, the question "*What* impact an earthquake will have at a given location *if* the magnitude is M, focal depth is h km and the epicenter is r km from it" can be answered. The role of these models in the seismic zonation and micro-zonation is immense. These models are also very important when designing critical structures like dams, bridges, nuclear and hazardous chemical plants etc. These models require three important input parameters, viz., the magnitude of the earthquake, the geographical location of the epicentre and the focal depth.

Magnitude is a logarithmic measure of the strength of an earthquake or strain energy released by it, as determined by seismographic observations. The magnitude M in Richter scale is a relative scale devised by Charles F. Richter in 1935

$$M \approx (2/3)\,\mathrm{Log}_{10}E - C$$

Where E is the energy and C is a constant. There are a multitude of measures of M: viz. Mw the Moment Magnitude, Me the Energy Magnitude, Mb the body wave magnitude, Ms the Surface Wave Magnitude and ML the Local ("the original Richter") Magnitude. Because of the limitations of magnitude scales, ML, Mb, and Ms, a new, more uniformly applicable extension of the magnitude scale, known as moment magnitude, or Mw, was developed. In particular, for very large earthquakes moment magnitude gives the most reliable estimate of earthquake size. An increase of one unit of magnitude (for example, from 4.6 to 5.6) represents a 10-fold increase in wave amplitude on a seismogram or approximately a 30-fold increase in the energy released.

Epicenter is the location on the surface of the earth situated vertically above the "centre" of the volume of lithosphere from which the seismic energy of the earthquake is released. This hypothetical centre is called the *focus* or *hypocenter*. The epicenter is located by 'triangulation' by three or more seismographs using accurate clocks, time of onset of first P wave and the speed (including corrections) of P waves within the lithosphere. Current techniques can locate the epicenter within 10-15 km radius. *Focal depth* is the depth of the hypocenter from the surface.

Prior to instrumental observation and the introduction of the magnitude scale M, "size" of an earthquake was measured by its effect on the surface by a qualitative scale of Intensity of earthquake. One such scale was introduced by Mercalli in 1861, which has twelve levels I to XII, the higher the worse. This has been modified several times and is now referred to as the Modified Mercalli (MM) scale (Table 1). Intensity is a measure of the effects of an earthquake at a particular place on humans, structures and (or) the land itself. The intensity at a point depends not only upon the strength of the earthquake (magnitude) but also upon the distance from the earthquake to the point and the local geology at that point. It is in a sense a qualitative expression of the ground movement and the resulting damage caused by the earthquake.

Table 1. MM Intensity value and description of effect of earthquake

I.	Not felt except by a very few under especially favorable circumstances.
II.	Felt only by a few persons at rest, especially on upper floors of buildings. Delicately suspended objects may swing.
III.	Felt quite noticeably indoors, especially on upper floors of buildings, but many people do not recognize it as an earthquake. Standing automobiles may rock slightly. Vibration like passing of truck. Duration estimated.
IV.	During the day felt indoor by many, outdoors by few. At night some awakened. Dishes, windows, doors disturbed; walls make creaking sound. Sensation like heavy truck striking building. Standing automobiles rocked noticeably.
V.	Felt by nearly everyone, many awakened. Some dishes, windows, and so on broken; cracked plaster in a few places; unstable objects overturned. Disturbances of trees, poles, and other tall objects sometimes noticed. Pendulum clocks may stop.
VI.	Felt by all, many frightened and run outdoors. Some heavy furniture moved; a few instances of fallen plaster and damaged chimneys. Damage slight.
VII.	Everybody runs outdoors. Damage negligible in buildings of good design and construction; slight to moderate in well-built ordinary structures; considerable in poorly built or badly designed structures; some chimneys broken. Noticed by persons driving cars.
VIII.	Damage slight in specially designed structures; considerable in ordinary substantial buildings with partial collapse; great in poorly built structures. Panel walls thrown out of frame structures. Fall of chimneys, factory stack, columns, monuments, walls. Heavy furniture overturned. Sand and mud ejected in small amounts. Changes in well water. Persons driving cars disturbed.
IX.	Damage considerable in specially designed structures; well-designed frame structures thrown out of plumb; great in substantial buildings, with partial collapse. Buildings shifted off foundations. Ground cracked conspicuously. Underground pipes broken.
X.	Some well-built wooden structures destroyed; most masonry and frame structures destroyed with foundations; ground badly cracked. Rails bent. Landslides considerable from river banks and steep slopes. Shifted sand and mud. Water splashed, slopped over banks.
XI.	Few, if any, (masonry) structures remain standing. Bridges destroyed. Broad fissures in ground. Underground pipelines completely out of service. Earth slumps and land slips in soft ground. Rails bent greatly.
XII.	Damage total. Waves seen on ground surface. Lines of sight and level distorted. Objects thrown into the air.

(Bolt, Bruce A. Abridged Modified Mercalli Intensity Scale, *Earthquakes - Newly Revised and Expanded*, Appendix C, W.H. Freeman and Co. 1993, 331 pp.)

In 1964, Esteva and Rosenbluth had introduced quantitative measures of the intensity *I* and peak ground movements (acceleration, velocity and displacement). These have been modified over the years since then. We have modified these equations to fit to earthquake data of past and the current one pertaining to the Indian subcontinent. The generic equations are of the form:

Intensity at a place:
$I = C_1 + C_2 M - C_3 \log_{10} R$

Peak Ground Movement at a place:
$Y = B_1 \exp(B_2 M) R^{-B3}$

where M is the magnitude, R is the hypocentral distance (in km) of the place, C_1, C_2, C_3 and B_1, B_2, B_3 are model constants. Y stands for peak ground acceleration / velocity / displacement. The most important measures are the Peak Ground Acceleration (PGA) and the Intensity I (adjusted to MM scale).

Location of Epicenter

Three measures of epicenter location of current earthquake were available by 1800 hrs of January 26, 2001 via the Internet (Table 2).

Table 2. The sources and the corresponding data on epicenter

Source	Magnitude	Latitude	Longitude	Focal Depth (km)	Location
IMD	6.9 ML	23°36'	69°48'	15	NE of Bhuj
NEIC-USGS	7.7 Mw	23°23'56"	70°18'57"	23.6	N of Bachau
BS, China	7.6	23°12'	70°00'	20	N of Anjar

Model calculations using data of each source were checked with preliminary spot observations of volunteers of Jan Sangharsh Manch and other NGOs working in Kachchh district showed that the NEIC-USGS data gave the best matching with ground observations. Data of IMD had to be rejected due to its low magnitude value (currently, in seismographic measurements, ML scale is not accepted as accurate due to its restricted validity) and also the error in epicenter location (an error of 55-60 kms, which is way beyond acceptable limit of 15 kms).

The models were further improved and using NEIC-USGS data, intensity and peak ground accelerations were calculated for 85 villages/towns/cities of Gujarat. University of Roorkee (UOR) made three uncorrected measurements of PGA at Ahmedabad, Delhi and Roorkee on January 26. The PGA measured are Ahmedabad : 0.107 g, Delhi : 0.008 g and Roorkee:0.006 g). Table 3 gives the values of PGA at important places of Gujarat. The values of PGA are expressed in g (= 981 cm/sec^2), the acceleration due to gravity of earth. Fig 1 and 2 show the intensity circles computed by the models.

Table 3 shows that the PGA at Ahmedabad was 0.066 g, which is much lower than the design acceleration as per Building Code (IS 1893-1984) for multi-storey RCC frame structure for Zone III to which this city is assigned. The computed MM scale of VII for Ahmedabad is also consistent with Zone III. The qualitative description given in Table 1 for MM VII also matches with the observed effects in Ahmedabad. It should be noted that no RCC frame structure should breakdown or collapse when the intensity is MM VII.

Detailed ground verification in Bhachau, Bhuj and Rapar talukas of Kachchh district was carried out during February 17-18, 2001 by volunteers of Jan Sangharsh

Manch. The verifications were concentrated in two areas, viz., north of Bhachau town (upto 30 km) and north and northeast of Bhuj (upto 35 km). A 5-km long ground fissure was located south of Chobari Village (26 km N of Bhachau) near the *Kutch Mainland Fault* which showed all the characteristics of a ground manifestation of the fault slippage. The orientation of the fissure was measured to be 68 degrees west of north. The southern side of the fissure has gone down by 10 – 30 cms relative to the northern side. The USGS tensor solution shows the event as a reverse fault (the southern side of fault going down) and the strike angle is 71 degrees west of north. More such fissures have been located within 10-km radius of the USGS epicenter. Near total destruction was observed within the MM X circle (Fig. 2). The corresponding computed PGA is > 0.5 g. The maximum value of computed PGA is 0.62 g for Chobari village. Severe distortions of metalled roads have been seen south of Chobari village.

This analysis confirms that the epicenter indicated by USGS is more near the truth. Realistic assessments of peak ground acceleration and intensity of the Kachchh earthquake have been made using the models developed. The analysis shows that four talukas, viz., Bhachau, Anjar, Bhuj and Rapar are severely affected. The models developed can be fruitfully used to simulate effects of earthquake and carry out detailed earthquake zonation.

Table 3. Model computed PGA and MM Intensity at selected locations in Gujarat, Delhi and Roorkee.

Location	Model Calculated PGA in g	Intensity in MM
Chobari	0.617	X
Bhachau	0.615	X
Wondh	0.610	X
Adhoi	0.546	X
Dudhai	0.543	X
Chandrani	0.469	IX
Rapar	0.397	IX
Navlakhi Port	0.393	IX
Gandhidham	0.369	IX
Anjar	0.352	IX
Lodai	0.350	IX
Kandla Port	0.332	IX
Bhuj	0.235	IX
Morbi	0.191	IX
Mundra	0.151	IX
Jamnagar	0.121	IX
Rajkot	0.094	VIII
Ahmedabad	**0.066**	**VII**
Bhavnagar	0.047	VII
Bharuch	0.042	VII
Surat	0.038	VII
Vadodara	0.036	VII
Delhi	**0.008**	VI
Roorkee	**0.007**	VI

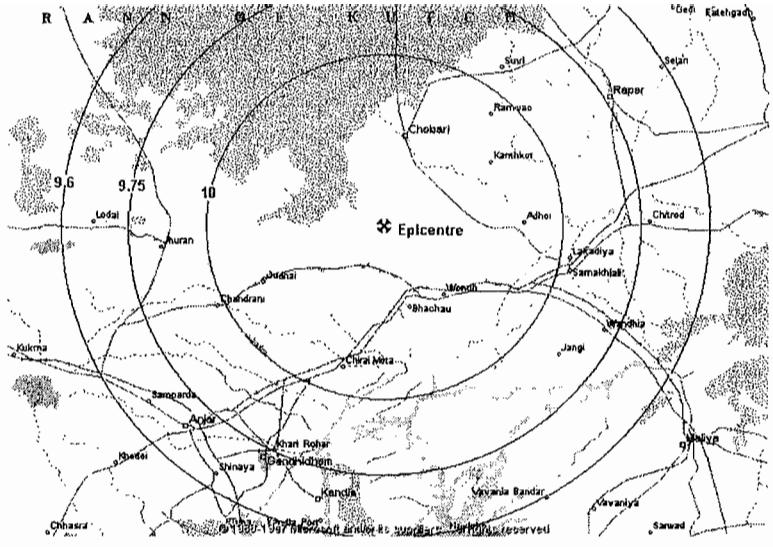


Figure 1 : Iso-seismal contours of MM intensity scale for Kachchh earthquake of January 26, 2001. (Fractional MM values have been plotted for convenience of interpolation only). Major ground fissures have been noticed south of Chobari and northeast of Dudhai villages near the epicenter which match the fault-plane movement as duduced from USGS tensor data

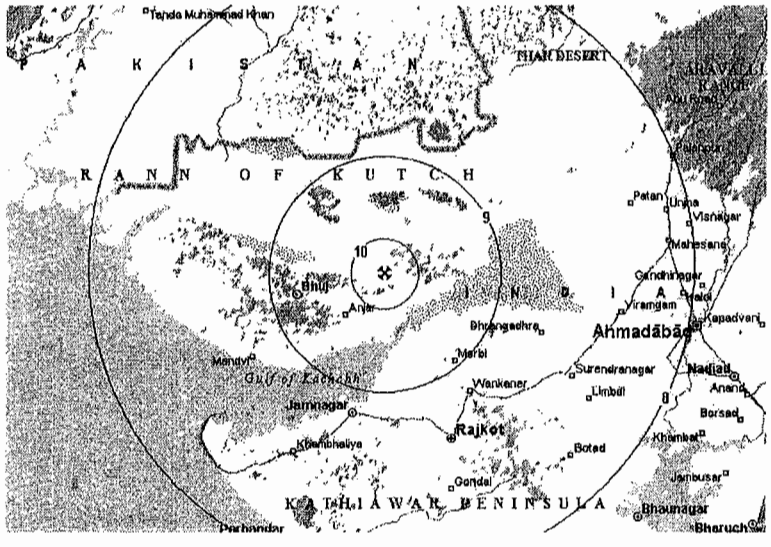


Figure 2 : Iso-seismal circles of computed MM intensities X, IX, and VIII over Kachchh and parts of Saurashtra and north Gujarat. Predicted severely damaged areas are within MM IX circle. Ahmedabad lies just outside the MM VIII circle

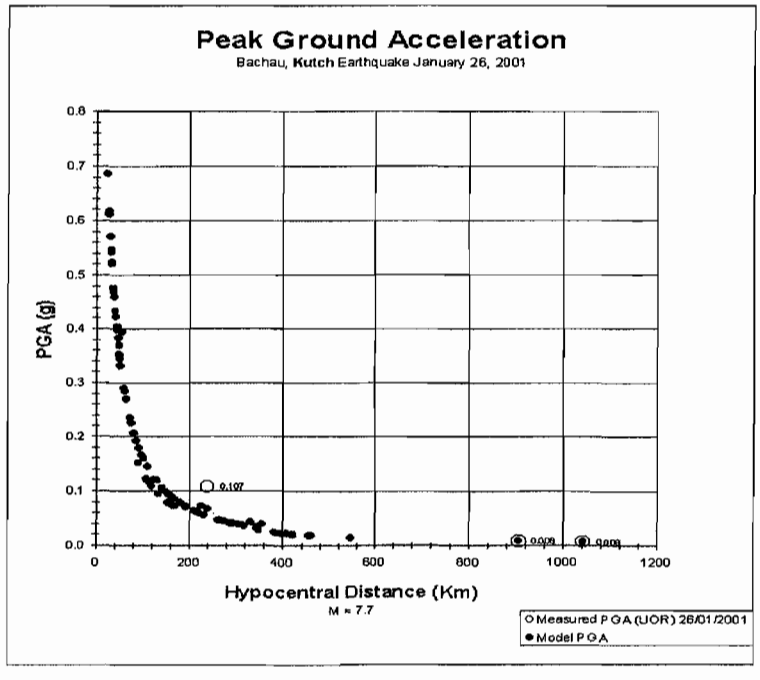


Figure 3. Variation of Model calculated PGA with hypocentral distance of locations in Gujarat for the January 26, 2001 earthquake. Shown also are three measurements made by University of Roorkee (UOR) on that day. (See Table 2)

Scenario of High-Resolution Optical Remote Sensing Satellites

EarthWatch Inc.'s QuickBird 1 designed to take images of 1m spatial resolution was lost due to an apparent rocket failure. It was launched on November 21, 2000 from the Plesetsk Cosmodrome in northern Russia aboard a Cosmos 3M rocket, which has a reputation for reliability. The satellite did not reach its designed orbit and it is believed that it ultimately re-entered the atmosphere. It was insured for $265 million, far more than the combined value of the satellite and launch vehicle.

It may be mentioned that the company's first satellite, dubbed EarlyBird and designed to take 3m spatial resolution images had also failed in orbit six days after successful launch in December 1997.

QuickBird 1 was to be followed by the launch of its twin satellite QuickBird 2 in mid-2001. But with the second failure in a row, the company's plans are uncertain. It may be mentioned that Space Imaging faced a similar situation following the loss of its first high resolution satellite Ikonos1.

QuickBird 1 was expected to bring a healthy competition for high resolution images in international market. The gap in the market could be filled by a non-U.S company such as ImageSat International (formerly called West Indian Space Ltd.), led by Israeli concerns and based in the Cayman Islands. ImageSat is scheduled to launch the first of its eight planned high resolution imaging satellite before the end of 2001.

Three high-resolution satellites have been lost during past 3 years:
EarlyBird 1- launched on December 1997-Lost six days after the launch due to power system problem
Ikonos 1, launched on April 27, 1999 - Lost due to rocket failure.
QuickBird 1, launched on November 21, 2000 - Lost due to rocket failure.

-Compiled by Editor

Basket Search

The Envisat satellite, to be launched this summer, will deliver a very large number of data products from its 10 instruments. The Envisat products will use a specific data format, where each product is orbit based, binary encoded and contains several geophysical quantities in the same product file. In order to improve the access to these data products, ESA has developed a product tool called EnviView. The trial version has just been released along with few sample images of simulated data sets.

Space Imaging and ESRI signed Carterra marketing deal. In a move designed to broaden Space Imaging's reach into the GIS community, Space Imaging has enlisted Environmental Systems Research Institute Inc. (ESRI) as a master reseller of its CARTERRA PRO image products. CARTERRA PRO is orthorectified at a scale of 1:12,000 and is GIS ready. More than 400 ESRI resellers will have access to Carterra products.

-Space News

India's IRS 1D remote sensing satellite, launched on September 29, 1997, has crossed its expected 3 year life expectancy. The achievement is noteworthy because it was placed into an unexpected orbit due to a problem with the fourth stage of PSLV.

-Space News

NASA's Mars Global Surveyor spacecraft imaging team has released more than 30,000 new images of Mars taken between September 1999 and February 2000, to the public through sites on the World Wide Web. The image gallery is available at: http://mars.jpl.nasa.gov/mgs.

– Space News

SPOT 5 is scheduled to be launched early in 2002. It will offer a spatial resolution of 2.5 m and 5 m in panchromatic mode, in addition to Vegetation 2 payload.

- Spot Magazine

Having given excellent service for nine years, the **ERS-1** came to an end on March 2000 when the satellite's onboard attitude control system failed.

- Spot Magazine

GPS degradation halted. Selected Availability (SA) –the artificial error introduced into satellite data by the U.S. Department of Defence to reduce accuracy for commercial users- was turned off midnight, May, 2000. Civilian GPS users now will be able to pinpoint locations upto 10 times more accurately.

– Imaging Notes

Vixel Corps. (Boulder, Colo.) announces the commercial availability of improved radar-derived elevation data products that use a shape-from-shading (SFS) technique or radarclinometry. SFS results in more accurate digital terrain models of areas such as deserts and rain forests which may not be ideally suited to DEM generation from more traditional stereo processing method.

– Imaging Notes

SPOT Image Corp. announced a new price structure for non-US customers. Price structure information is available at http://www.spot.com

Chapter Activities

Ahmedabad Chapter is always teeming with energy and plays an active role for the cause of the society, be it spreading awareness about space programme in the common segment of the society, or to the family members or rearing the talents of future citizens. It is no exaggeration to tell that the activities peaked during this period and not a single month is left when it is idle. We bring to the readers some of the major events that took place during this period.

Emotional/human activities

There is a proverb that a friend in need is friend indeed. The human face of the ISRS-AC emerged during the great misery that many of its members encountered. Though the Chapter has carried out a number of activities, which are routine as well as innovative ones, this particular one stands apart.

All of us know the tragedy that struck Gujarat on January 26, 2001 in the form of earthquake. Ahmedabad was also was affected, where the fear psychosis gripped the educated and illiterate alike. With the TV flashing the destruction non-stop 24 hours a day, the rumor mongers spreading the predictions about dooms-day, and the cracks in our dear abodes mocking at our helplessness, all we needed was some solace. At this juncture, the society felt the

need of soothing the troubled minds through relevant program.

The following activities were carried out by the society:

A lecture was delivered by Prof. R.S. Chaturvedi, Sr. Core Faculty Member, SIRD, Ahmedabad on February 8, 2001, on " Some Aspects of Bhuj Earthquake". The lecture clarified the doubts and misconceptions regarding earthquake.

A lecture on " Earthquake and it's impact on Buildings" was delivered by Shri Yogesh Vani, Consulting Engineer, Ahmedabad, on February 9, 2001. The lecture cleared many misconceptions about the safety aspects of buildings.

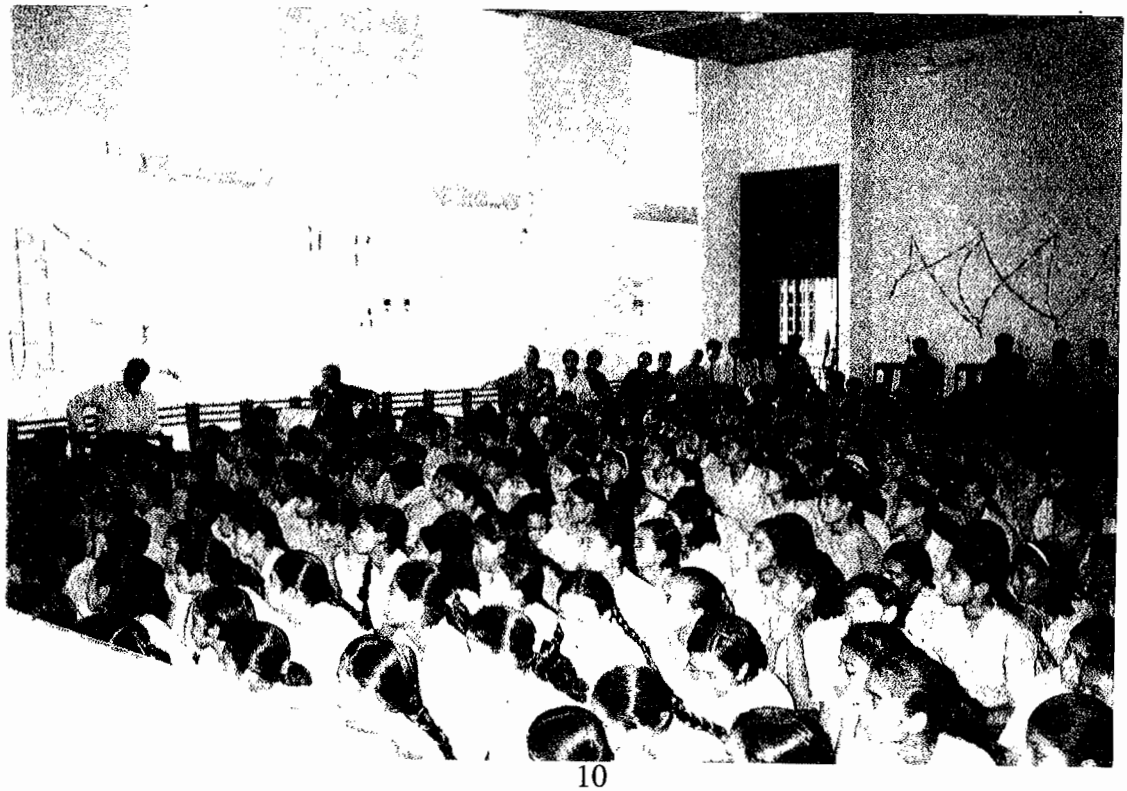
The society felt the need of providing reading material to members on basic facts of earthquake and it's impact on buildings. It distributed a handout titled " GOING BACK TO YOUR HOME: An Earthquake Primer For City Dwellers", (jointly published by CEPT and SBI) to all its members.

Educational Activities

i) Celebration of National Remote Sensing Day (August 12, 2000)

It was celebrated by ISRS-AC jointly with AG High School, Ahmedabad. The future citizens of the nation-the school students expressed their views on the topic " Man and Space" by participating in poster and painting competition. It was a big success judging from the participation and enthusiasm of the students. A total of 64 students of class VIII to X from 16 schools of Ahmedabad, belonging to both English and Gujarati medium, participated in the event. The innovative arguments of the students were a delightful surprise for all. It was really a difficult task for the judges to choose the winners from the sea of talent. Kumari Vankani Nikanj of Vidya Nagar High School, Ahmedabad bagged the first prize for poster competition titled "Man and Space". Kumari Sunayana Sitaram of Mt. Carmel School Ahmedabad, won the first prize for debate competition on the topic "Should India send Mission to Moon".

i) A packed house with eager listeners of the debate competition



ii) Ms. Vaikari Sikanj receiving 1st prize for poster competition

iii) Ms. Sunayana Sitaram receiving 1st prize for debate competition

ii) Popular Lecture

Shri S. K. Pathan, Head, LPPD/FLPG, SAC delivered a lecture on "The role of Remote Sensing and GIS in sustainable urban development and planning" on November 11, 2000 at Nirman Bhavan, Law Garden, Ahmedabad. ISRS-AC and Gujarat Institute of Civil Engineers and Architects organized the lecture jointly.

Lecture Series

i) 12th Shri L N Calla Memorial Lecture (2000-2002)

Dr Baldev Sahai, Visiting Professor, School of Planning, CEPT, Ahmedabad and former Deputy Director of Space Applications Centre, was invited to deliver the 12th lecture in the ongoing Shri L N Calla Memorial Lecture series. He delivered a lecture on 'Vedic Saraswati: Myth or Reality' on September 8, 2000. Dr Sahai perfectly blended mythology and science in his lecture. His lecture started with highlighting the importance of the river Saraswati from the Vedic period, and the findings of archaeological studies. He explained the missing links from Vedic to current period through the findings from the remote sensing. The lecture was a great success judging from the attentive audience drawn from SAC, PRL, CEPT and other educational institutes of Ahmedabad. It may be mentioned that Dr Sahai has carried out investigations using remote sensing data from various satellites to anylse the scientific basis of the prsesnce of river Saraswati. He has a number of publications on this subject.

ii) Prof. P. R. Pisharoty Lecture Series

The honour of delivering the 6th lecture in this series went to Prof. Trevor Platt, Bedford Institute of Oceanography, Canada. His lecture on 'Remote Sensing of Ocean Colour' was very interesting and enlightening as it covered the current global state of the art on ocean colour and future directions. Dr Platt was deeply moved by the aftermath of Gujarat earthquake and donated the honorarium for the lecture to the Chief Minister's Relief Fund. The society records its appreciation towards this gesture of Prof. Platt.

Workshop

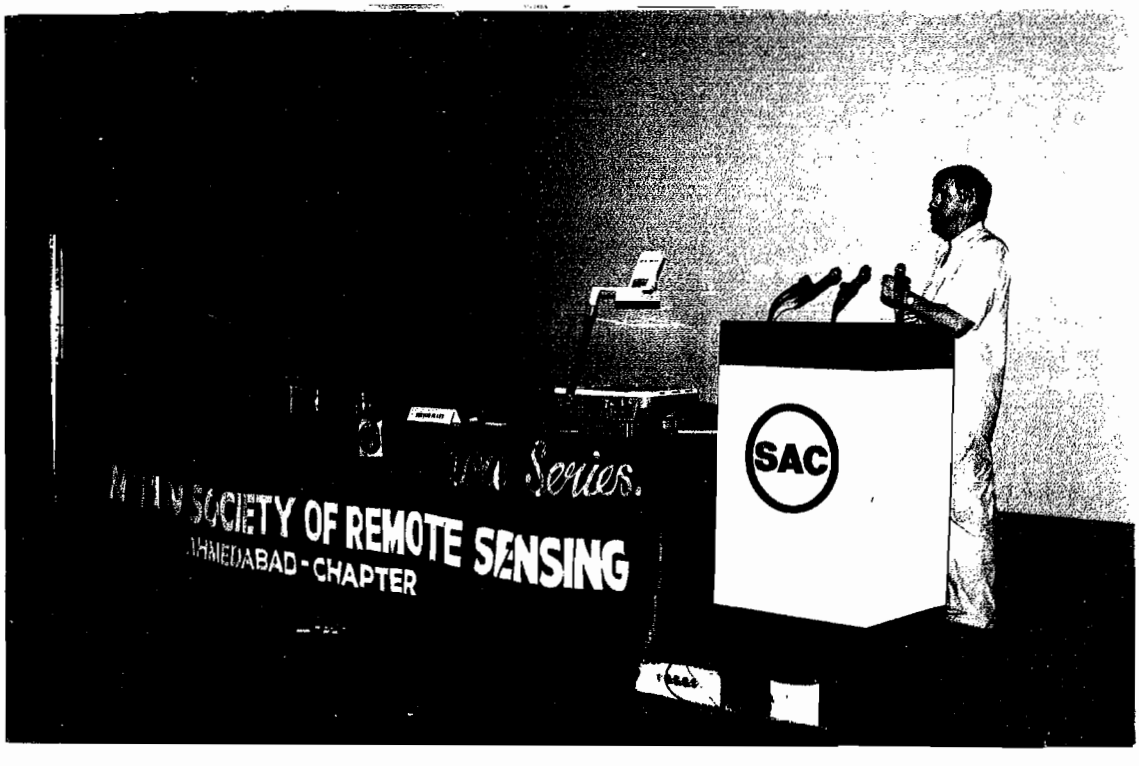
ISRS-AC celebrated the 'World Space Week' by organizing a one-day workshop which was preceded by three day Tutorials on Commercial Applications of "Remote sensing and GIS with special emphasis on Coastal Zone Management" (CARG-2000). This was carried out jointly with the Value Added Services Cell of SAC during October 3-6, 2000 at SAC, Ahmedabad. Shri Arjun Singh, Secretary-Forests and Environment, Govt. of Gujarat, graced the inaugural ceremony. A total of 34 and 150 participants attended the tutorials and workshop respectively. The proceeding volume of the workshop priced at Rs. 300 is available for member at a concessional price of Rs. 100/-. For details please contact Secretary, ISRS-AC, SAC, Ahmedabad, 380015.

Felicitation

Dr K Kasturirangan, *Honorary Fellow ISRS and Chairman, ISRO attained the silver age of 60 on October 24, 2000. ISRS-AC in association with other societies/associations felicitated him at SAC, Ahmedabad.*

Dr. Baldev Sahai receiving the memento from Dr. R R Navalgund, Ex Chairman of ISRS-AC after delivering the 12th Shri L N Calla Memorial Lecture at SAC, Ahmedabad.

Prof. Trevor Platt delivering the 6th Prof. P R Pisharoty Lecture at SAC, Ahmedabad.



Participants of the CARG-2000 workshop at SAC, Ahmedabad

Shri Arjun Singh addressing the audience on the occasion of CARG-2000

Other Activity

ISRS-AC organized a one-day educational excursion to Pavagadh on December 24, 2000. A total 47 members and their families participated in this excursion. The reading material, which included a FCC of IRS data of Pavagadh and its surroundings, provided by the society gave the basic knowledge about the hill, the temple and its mythological and environmental importance. Young and old alike enjoyed the journey to the top of the hill by ropeway, particularly after spending long hours in the queue.

Silver Linings

Ms Indrani Choudhury, One of the young member of the society and a research fellow in TSDD/ARG, SAC, won best paper award for her presentation in the ISRS Symposium held at IIT, Kanpur. Her paper entitled " Rice field mapping and monitoring using RADARSAT SAR data" authored jointly with Dr. M. Chakraborty highlighted research findings on SAR backscatter from rice fields in India.

Kumari Renu Pokharna won first prize for her meritorious performance as a member of the 'Youth Parliament' of her Vidyalaya which participated at the zonal level in the 12th National 'Youth Parliament' competition for Kendriya Vidyalayas, Kumari Pokharna is daughter of Dr. S S Pokharana, an esteemed member of the society and a scientist of SAC.

NEW MEMBER OF ISRS-AC

Sr. No.	Membership No.	Name and Address
01	L-2063	Shri L.M. Krishnan, P6/26/13, Sector 15, New Panvel, Navi Mumbai – 410 206
02	L-2064	Ms. Paru P. Thakkar, Plot No. : 1366/1, Sector 4/D, Gandhinagar – 382 006
03	L-2065	Shri Bhanu Prakash Rathore, Scientist, RESA, Space Applications Centre (ISRO), Jodhpur Tekra, P.O. SAC, Ahmedabad – 380 015
04	L-2066	Dr. Sasmita Satapathy, Scientist, CMD/ ARG / RESA, Space Applications Centre (ISRO), Jodhpur Tekra, P.O. SAC, Ahmedabad – 380 015
05	C-2795	Ms. Indrani Choudhary, CMD / ARG / RESA, Space Applications Centre (ISRO), Jodhpur Tekra, P.O. SAC, Ahmedabad – 380 015
06	L-1944	Shri V.E. Netajimariappan, CMD / ARG / RESA, Space Applications Centre (ISRO), Jodhpur Tekra, P.O. SAC, Ahmedabad – 380 015
07	L-1945	Shri Sushil Kumar Singh, MWRD / RESA, Space Applications Centre (ISRO), Jodhpur Tekra, P.O. SAC, Ahmedabad – 380 015
08	L-1946	Ms. Madhura Niphadkar, Tapodhan Society, Shahu College Road, Parvati, Pune – 411 009
09	C-2796	Shri Santosh Kumar Singh, MOG / RESA, Space Applications Centre (ISRO), Jodhpur Tekra, P.O. SAC, Ahmedabad – 380 015
10	C-2797	Ms. Jaya Vipat, MOG / RESA, Space Applications Centre (ISRO), Jodhpur Tekra, P.O. SAC, Ahmedabad – 380 015
11	C-2798	Shri S. Prakash, C-17, South Arcot Strct, Block – 19, Neyveli – 607 803
12	L-1947	Shri Girish Chandra Baluni, L-112, Swatantra Sainani Nagar, Nava Vadaj, Ahmedabad – 380 013
13	L-1984	Shri Yaswant Pradhan, JRF, MWRD / RESA, Space Applications Centre (ISRO), Jodhpur Tekra, Ahmedabad – 380 015
14	L-1985	Shri K.K. Mehta, E-2, Payal Flats, Opp. Goyal Park, Judges Bunglows Road, Ahmedabad – 380 015
15	L-1986	Shri J. Srinivasulu, Scientist, MWRD / RESA, Space Applications Centre (ISRO), Jodhpur Tekra, Ahmedabad – 380 015
16	L-2003	Shri D.R. Goswami, Scientist / Engineer, PCED/SEG/SEDA, Space Applications Centre (ISRO), Jodhpur Tekra, Ahmedabad 380 015
17	L-2004	Shri Nitin B. Bhatt, AMD/ARG/RESA, Space Applications Centre (ISRO), Jodhpur Tekra, Ahmedabad 380 015
18	L-2005	Shri S.A. Shah, Scientist / Engineer, IAD/SIITA, Space Applications Centre (ISRO), Jodhpur Tekra, Ahmedabad 380 015
19	L-2006	Shri Amitkumar B. Dave, Scientist /Engineer, PCED/SEG/SEDA, Space Applications Centre (ISRO), Jodhpur Tekra, Ahmedabad 380 015
20	L-2007	Mrs. H.K. Pandya, 64, Pankaj Society, Near Bhattha Stop, Paldi, Ahmedabad 380 007
21	L-2008	Ms. Sampa Roy, Scientist / Engineer, Space Applications Centre (ISRO), Jodhpur Tekra, Ahmedabad 380 015
22	L-2009	Shri Anand P. Pradhan, C/o. Mr. D.L. Dighe, A-4, Kaumudini Ganesh Apartment, Modern Colony, Paud Road, PUNE 411 038
23	L-2010	Shri R.K. Panchal, D-9 GEB Quarter, Diwada Colony, TA. : Kadana, Panchmahals 389 250

24	L-2011	Shri Rajesh Khanna, Flat No. 503, Bldg. No. 29, NRI Complex, Nerul, Navi Mumbai 400 706
25	L-2012	Shri Atul A. Sharma, Environment Cell, Gujarat Maritime Board, Sector 10-A, Six Road, Opp. Airforce Centre, Gandhinagar
26	L-2013	Shri Piyush P. Raval, W 1/2, G.M.B. Officer's Quarters, Sector – 8, Gandhinagar
27	L-2014	Shri N.C. Ramgopal, 303, Surbahar, Lokpuram, Thane (west) 400 601
28	L-2015	Dr. P.S. Rama Krishna, G-1, Pankti C.H.S. Ltd., Opp. Dnanodaya High School, Near Water Tank, Savarkar Nagar, Thane (west) 400 606
29	L-2016	Shri Praful Gharpure, Tata Consultancy Services, 6th Floor, Vidyasagar Building, Raheja Township, Malad (E), Mumbai 400 097
30	L-2017	Ms. Megha Pawar, Infrastructure, Leasing & Financial Services (IL&FS), C-22, G Block, Bandra Kurla Complex, Bandra (E),Mumbai - 51
31	L-2018	Shri Ranjit Rath, Sr. Engineer (O.E.D.), 8th E.I.B., Engineers India Ltd., New Delhi 110 066
32	L-2019	Shri Arvind Kale, 85, Ramnagar, Nagpur 440 010
33	L-2020	Shri Srigiriraju Srihari Rao, C-12, NABARD Vihar, St. Xavier College Road, Ahmedabad 380 006
34	L-2021	Shri Vijay S. Patel, Essar Oil Ltd., Post Box No. 24, Post : Khambhalia, Jamnagar
35	L-2022	Dr. L.K. Kshirsagar, 5, Sanjog-II, 157/24, Aundh, Pune 411 007
36	L-2023	Dr. Amar N. Joshi, 11, Roopkala, 128, West Avenue, Santacruz (w), Mumbai 400 054
37	L-2024	Shri Pradeep Dubey, E-19, DOS Housing Colony, Near IIM, Vastrapur, Ahmedabad 380 015
38	L-2025	Cdr. A.J. Modak, "JALASHREE" D-3, Erandawana Co-operative Housing Society, Pune 411 004
39	L-2026	Shri V. Ravikant, COMACOE 206, Killfire House, New Link Road, Dalia Industries Ltd., Andheri (W), Mumbai
40	L-2027	Shri Sanjeev Rai, COMACOE, 206 KILLFIRE HOUSE, New Link Road, Dalia Industries Ltd., Andheri (W), Mumbai
41	L-2028	Shri Girish P. Varecha, At Post Dhandhu, Ta. Palanpur, Dist. Banaskantha, North Gujarat 385 001
42	L-2029	Shri Shaji C.S., C-11, 2:3, Sector – 7, Sanpada, Navi Mumbai 400 705
43	L-2030	Shri Sheetal R. Palkar, BEENAR', Surat Nagar, S.No. 79, Paud Road, Kothrud, Pune 411 029
44	L-2031	Shri V.K. Sehgal, Scientist / Engineer, CMD / ARG / RESA, Space Applications Centre (ISRO), Jodhpur Tekra, Ahmedabad 380 015
45	C-2898	Shri I. Suresh, MWRD / RESA,, Space Applications Centre (ISRO), Jodhpur Tekra, Ahmedabad 380 015
46	L-2032	Shri Shandulal M. Chavan, Wernher House Plot No. 424-D, Prabhudas Lake, Old Aerodrome Road, Bhavnagar 364 001
47	L-2033	Shri Nrupal Shah, A-9, Karmacharinagar – 2, Rannapark, Ghatlodia, Ahmedabad 380 061
48	C-2899	Shri C.R.C. Nagur, MWRD / RESA, Space Applications Centre (ISRO), Jodhpur Tekra, Ahmedabad 380 015
49	L-2034	Shri Benidhar Deshmukh, MWRD / RESA, Space Applications Centre (ISRO), Jodhpur Tekra, Ahmedabad 380 015
50	L-2035	Shri Dharmendra G. Shah, MWRD / RESA, Space Applications Centre (ISRO), Jodhpur Tekra, Ahmedabad 380 015
51	L-2036	Shri P. Paniker, Head, TTID,TTID / PPG, Space Applications Centre (ISRO), Jodhpur Tekra, Ahmedabad 380 015
52	L-2037	Shri Rakesh N. Halari, A-1 Meghalaya Flats, Sardar Patel Colony Corner, Ahmedabad 380 014
53	L-2038	Prof. P.D. Sahale, Department of Civil Engineering, P.D.V.V.P. College of Engineering, Vilad Ghat, Ahmednagar 414 111
54	C-2900	Shri Nitin Raulji, 6-B, 6th Floor, Darpan Apartments, R.C. Dutt Road, Vadodara 390 007
55	L-2039	Shri Avula Mallikharjuna Reddy, 2, Ranjan Society Part – II, New Sardar Patel Colony, Naranpura, Ahmedabad – 380 013
56	L-2040	Ms. Neeti, JRF, FED / FLPG / RESA, Space Applications Centre (ISRO), Jodhpur Tekra, Ahmedabad 380 015
57		Shri Salil Latay, First Floor, 15 Sambuddhi Society, Behind L & T's Radhadaya Complex, Old Padra Road, Vadodara – 390 015
58		Shri Bimal Kumar Bhattacharya, CMD/ ARG / RESA, Space Applications Centre (ISRO), Jodhpur Tekra, P.O. SAC, Ahmedabad – 380 015
59		Shri Ashwin Kumar Parmar, 408/2, Near Mayur Apartments, Sector 28, Gandhinagar
60		Shri Samir Kanta Satapathy, Rolta India Limited, Plot No. 565/1, Sector – 8, Gandhinagar – 382 009
61		Mrs. Anjali Garg, Scientist / Engineer, DQED/SIIPA, Space Applications Centre (ISRO), Jodhpur Tekra, P.O. SAC, Ahmedabad – 380 015

Book post

If undelivered please return to:

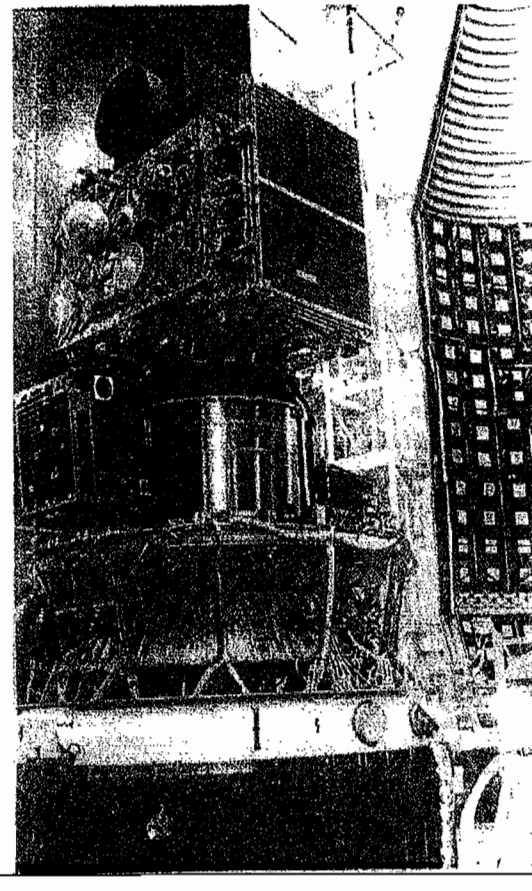
Secretary, ISRS-Ahmedabad Chapter
Remote Sensing Applications Area (RESA)
Space Applications Centre, Ahmedabad 380015

ISRS

SIGNATURES

Newsletter of Indian Society of Remote Sensing – Ahmedabad Chapter

Volume-1 5 ***No. 1*** ***Month- March*** ***Year- 2002***



In this Issue	Page no.	**In this Issue**	Page no
Chapter Update	3	Basket Search	12
Precision Farming..	4	Chapter's Activities	14
Emerging new Applications...	7	Silver Lining	24
Characterization of Apple ...	9		

Front cover

The TES Satellite – Another glorious achievement of Indian Space Programme
(Details in page no. 6)

Chapter Update

The Chapter has enriched in terms of its membership during this period (2000-2002) as evident from the fact that life membership increased by 52. The table below shows the detailed break up.

Category	No. of members
Life	350
Annual	07
Sustaining	08
Patron	04

Executive Council

Chairman
Dr. S R Nayak

Vice-Chairman
Prof. A.B.Vora

Secretary
Shri N S Mehta

Jt. Secretary
Shri Girish Baluni

Treasurer
Dri M M Kimothi

Members
Shri S A Sharma
Shri P.J.Shah
Shri V. Ravichandran
Dr Abha Chhabra
Shri J. V. Bhatt

Editorial Board
Editor
Dr Sushma Panigrahy
Members
Dr S S Ray
Shri K K Mohanty
Prof. R D Shah

Dear readers

Happy New Year greetings. We are glade to place the third and probably the last issue of the newsletter by this editorial board in your hands. This issue is specially devoted to the Chapter's activities keeping in view the quantum and quality of activities carried out during the period(2000-2002). Ahmedabad Chapter has added one more feather to its cap and earned accolades as a very organized and active Chapter by the overwhelming participation of members in the annual convention and seminar of the Indian Society of Remote Sensing held at Space Applications Centre, Ahmedabad. We bring details of this event for those who missed the opportunity and also to refresh the memory of those who participated.

This issue highlights some of the new applications of remote sensing images. The article on precision farming in Indian context is an interesting article.

We are thankful to the readers for their support, co-operation and suggestions that helped us to bring out three issues of the News Letter.

With best wishes

-Editor

Precision Farming In Indian Context and the Role of Remote Sensing

Jai Singh Parihar
Group Director
Agricultural Resources Group
Space Applications Centre, ISRO,
Ahmedabad-380 015

1.0 What is Precision Farming?

Precision farming (PF) aims to improve crop performance and environmental quality. It is defined as the application of technologies and principles to manage spatial and temporal variability associated with all aspects of agricultural production. In other words, precision farming is the matching of resource application and agronomic practices with soil attributes and crop requirements as they vary across a field.

Thus, the concepts of precision farming include:

- Variations occur in crop or soil properties within a field.
- These variations are noted, and often mapped.
- Management actions are taken as a consequence of the spatial variability within the field.

Though, the 20th century agriculture had been characterized by the increase in land and labour productivity, it has also been associated with the stimulation of uniformity in agricultural production areas and realization about the negative side-effects of agriculture. The PF techniques, by appreciating the variability within the field and adopting management practices to cater the variability, are serving the dual purpose of enhancing productivity and reducing ecological degradation. The real value from precision farming is that the farmer can perform more timely tillage, adjust seeding rates, fertilizer application according to soil conditions, plan more crop protection programs with more precision, and know the yield variation within a field. These benefits can enhance the overall cost effectiveness of crop production, however the grower must be willing to make adjustments in his management styles to make it work.

2.0 Tchnologies associated with PF

Many technological developments, which occurred in 20th century contributed to the development of the concept of precision farming. These technological developments are as follows.

2.1 Global Positioning System

GPS have been helpful in pinpointing the precise location. In the post- S/A (selective availability), the positional (horizontal) accuracy of the GPS can be of the order of 20 m, where as that for GPS operating in Differential mode is around 1 m.

2.2 GPS-Guided agricultural machinery

This is the major development, which brought the concept of precision farming. There are basically two categories of agricultural positioning system The first category is for monitoring or sensing pertinent soil and crop parameters, such as soil moisture content, nutrient availability, weed location or yield mapping. The second category, where in-field position is required, is for control of precision

application machinery (variable rate applicators) where actual position of the field vehicle must be related to a digital field map of the relevant parameter. For monitoring/mapping operations only the position in real time is required, where as for precision application, position in real time along with forward prediction of positioning is required.

2.3 Geographical Information System (GIS)

GIS has two different roles in precision farming vehicles. First, a combination of GIS and simulation models is highly relevant for precision farming. GIS helps in integrating geographical data on various aspects such as soil, crop, weather and field history along with simulation models. Another aspect of GIS support to precision agriculture is the engineering component, in which the research findings are translated into operational systems for use at farm level.

3.0 Role of Remote Sensing in Precision Farming

Precision farming needs information about mean characteristics of small, relatively homogeneous management zones. Various workers have shown the advantages of using remote sensing technology to obtain spatially and temporally variable information for precision farming. There are, basically, three approaches for use of remote sensing for precision farming. In the first approach, the multi-spectral images can be used for anomaly detection. These anomalies can be in the forms of disease/pest, weed growth, water stress, etc. The next approach is based on correlating variations in spectral response to specific variables such as soil properties or crop yield. The third approach is to integrate biophysical parameters (such as Leaf Area Index or temperature) derived from high-resolution satellite based remote sensing data, with physical crop growth modeling towards an operational decision support system for precision farming.

Keeping in view the agricultural scenario in developing countries, the requirement for a marketable RS technology for precision agriculture is the delivery of information with the following characteristics:

Low turn around time(acquired, corrected and processed) ~ 24-48 hrs

Low data cost (~ 100 Rs./acre/season)

High spatial resolution (at least 2m multi-spectral for 1 ha field size)

High spectral resolution (10-20 nm for retrieving biophysical parameters)

High temporal resolution (at least 5-6 dates per season)

Delivery of analytical products in simpler format

4.0 Prospects of Precision Farming in Indian Agricultural Situation

Precision farming, though in many cases a proven technology, is still mostly restricted to developed (American and European) countries. The reasons for limited implementation of PF in Asian countries are following:

a) Small land holdings
b) Cost/benefit aspect of PF system
c) Heterogeneity of cropping systems
d) Lack of local technical expertise

e) Knowledge and technological gaps

Out of these, the two major problems for implementing PF in Indian agriculture are small land holdings and cost of PF system. However, remote sensing provides a low cost alternative to GPS guided agricultural machinery. Again, with the availability of very high-resolution satellites such as IKONOS of Space Imaging and TES of India, catching the detailed variability, even for small field sizes, will be possible. Space Applications Centre has initiated a few studies to explore scope of remote sensing for precision farming in India. These studies are being for both subsistence agriculture at Tamil Nadu and high input agriculture in Punjab state. The initial studies have shown the capability of satellite based remote sensing in showing the crop and soil variability, within a so-called uniform zone.

5.0 Conclusion

Precision farming is essential for serving dual purpose of enhancing productivity and reducing ecological degradation. Though it is widely practiced for commercial crops in developed countries, it is still at a nascent stage in most of the developing countries. Remote sensing can provide a key input (variability map) for the implementation of precision farming at a lower cost. The study on precision agriculture has already been initiated in India, in many research institutes. In coming few years PF may help the Indian farmers to harvest the fruits of frontier technologies without compromising the quality of land and thereby turning the green revolution into an evergreen revolution.

TES - Another Feather in the Cap of India's Space Technology.

India joined the club of nations with a high-resolution satellite imaging capability, following the successful launch of its Technology Experiment Satellite (TES) on October 22, 2001. TES is able to detect objects as small as 1 meter and designed for specific studies that require such fine resolution. The 1,108 kilogram spacecraft was launched abroad India's Polar Satellite Launch Vehicle (PSLV) from Sriharikota. This is the sixth flight of PSLV. The satellite is orbiting the Earth at an altitude of 570 kilometers.

This is the sixth flight of PSLV. It is capable of imaging the same spot at every three days and has an adjustable camera for taking multiple images of the same spot on each pass. It is designed to operate for three years and will demonstrate other technologies, including a phased array antenna and an advanced telemetry system. The PSLV also carried two micro-satellites: ESA's Belgian built one for on-board autonomy and Germany's Bispectral and Infrared Remote Sensing Detection (BIRD) satellite that weigh 94 and 92 Kg. respectively. (*Space News*)

Emerging New Applications of Satellite Image

Search and Rescue Mission

Use of Radar and satellite images is emerging as the new approach for search and rescue operations. The effort comes after one of the sheriff's office in California used IKONOS image and airborne radar system to search for a missing aircraft and pilot. NASA has a Search and Rescue Mission office that supports federal agencies that use satellite based images for such purpose. It is also developing a low-frequency aircraft based imaging radar for this purpose.

Detection of Wreckages

High resolution Ikonos data has been used to detect the spot that could be the wreckage of Amelia Earhart's missing plane in the island of Nicumaroro in the southwest Pacific. There does seem to be an object on the edge of the reef off the western end of the island. Fisherman visiting that area had reported seeing a wreckage airplane. Readers may recall that Amelia and her navigator disappeared in 1937 during an attempt to fly around the world. Despite a tremendous search effort carried out, personally ordered by then US President Frankline D Roosevelt, no physical evidence of the plane or the humans were found. The International Group of Historical Aircraft Recovery (TIGHAR) in Wilmington is mounting on an expedition soon based on the evidence gathered from the image.

(*Space news*)

Preserving Threatened Sites

The Eoropean Space Agency (ESA) and United Nations are teaming up to use satellite images as a tool to help preserve some of the most threatened natural and historical sites in the world. The World Heritage Committee of UNESCO has so far prepared a list of 690 sites –138 natural sites and 529 cultural sites and 23 that are a mixture of both that come under threatened category. Of great concern at present are 30 sites that come under imminent danger category because of natural phenomena like earthquake, fire or man made like pollution (water/air) and war. *The Manas Wildlife Sanctury is one among the thirty.* UNESCO is crating a permanent staff of remote sensing experts who will maintain a data base using remote sensing. The project is funded with an 8 million dollar grant from UN Fund, set up by US billionaire Ted Turner.

(Space News)

Tracking Arctic Ice

Canada's Radarsat satellite has proven invaluable in plotting the formation of new ice in the Arctic region to guide commercial ships.It also seems to be cost effective compared to the air survey that works out to be 4,400 Canadian dollar for a four hour survey vs 473 Canadian dollar for same area – same scale image.

(Space News)

Historical Expeditions

Archeologists and historians will be using satellite images to shed more light on the historical expeditions. Work has already started on the expedition of Lewis and Clarke. Readers may recall that Meriweather Lewis and William Clarke along with a 35 person entourage hikes their way across the American West between 1804 and 1806 in search of an inland water route to the Pacific Ocean. Though they did their best to chronicle their journey, archeologists and historians are not very sure of the exact rout taken by them. NASA is assembling a three dimensional digital map for the area along the 3700 mile route along Missouri River through the Rocky Mountains and to the Pacific for this purpose.

Forest Fire

The availability of MODIS data significantly improve studies on monitoring forest fire. Middle infrared thermal bands on board MODIS (band no.20- 23) are found to be more sensitive to heat radiation than longer wavelength thermal bands (10-12 micro meter) from NOAA satellite that are till now used for such purpose.

(Space News)

Satellite Images show Island's effect on Ocean

The Hawaiian Islands trigger a large wind-ocean interaction between Asia and the islands. Scientists have reported the discovery of a narrow eastwarf flowing ocean current in an 8000 kilometer swath between Asia and Hawaii using data from NASA's Quick Scatterometer (QuickScat) satellite, European RS satellite and the U.S-Japanese Tropical Rainfall Measuring Mission.

(*Science, June 2001*)

Characterization of apple orchards using DEM and Remote sensing data

Nitin Bhatt
Agricultural Resources Group
Space Applications Center
Ahmedabad-380015

Apple is an important commercial fruit crop of India, concentrated in the hilly regions of the Himalayan region. Information on the location, extent and condition of the orchards is the pre-requisite for orchard management. In this respect satellite remote sensing has a significant role to play due to its synoptic, temporal and multi-spectral capability, that seems the optimum choice for such terrain condition. Due to the physiological requirement of low temperature for fruit setting, apple orchards are concentrated on higher elevations. Slope, aspect and elevation are some of the deciding factors on orchard condition and productivity. It is imperative to associate this information to characterize the apple orchards of an area. Digital elevation model (DEM) is one of the methods to derive such information. A study was carried out to in this direction under the Horticultural Studies – A Remote Sensing Application Mission Project at SAC. The results are encouraging.

The study is carried out for the apple orchards in Kotkhai tehsil of Jubbal – Kotkhai block of Shimla district. This tehsil have geographical area of 23486 ha. The orchards of the tehsil are famous for the golden delicious variety of apples.

The study will finally lead to identify a set of optimum geographical parameters suitable for occurrence of apple orchards.

IRS 1C LISS III digital data of May 27, 1999 was used for apple area identification. Survey of India (SOI) topographical maps on 1:50,000 scale were used to geo-reference the image. Contour, spot height, drainage pattern of the area were used to generate the Digital Terrain Model. Apple orchards were identified and extracted from IRS LISS III data, using MXL classification with complete enumeration method. This was used to generate a orchard mask. Orchard vigor was assessed using Normalized Difference Vegetation Index (NDVI) of the classified orchard pixels. A level slicing was carried out to categorise the classes on the bases of their vegetative growth e.g. Dense, Moderately dense and Sparse orchards.

Contour, spot height and drainage pattern were digitized using 1:50,000 scale topographic maps. These were used as input to generate Digital Elevation Model using VDEMINT module of X-Pace package in EASI/PASE software version 6.3. The DEM thus generated was used to extract information on slope and aspect of each pixel of the study area. Aspect and slope were calculated in terms of degrees while elevation was calculated in meters for each apple pixel.

A logical combination of NDVI, and information on elevation, slope and aspect of each pixel was carried out and analyzed to prepare a database on their correlation. EASI modeling technique was used to generate histograms of different criteria of elevation, slope,

aspect and NDVI values to calculate area under various graphic planes.

Findings

Earlier study had shown that data acquired during May-June is optimum bio-window for apple classification in Shimla district. Classification of LISS III data resulted 94 per cent accuracy for the training class pixels. Apple orchard occupied around 30 percent of the Kotkhai tehsil area (6929 ha). NDVI range for apple orchards varied from 0.21 to 0.64. The percent area of orchard under three categories of growth and NDVI range is shown in Table1.

Table-1Apple orchard categories based on NDVI

Orchard category	NDVI range	%Area (ha)
dense	0.48 - 0.64	21 (1485)
moderately dense	0.34 - 0.47	55 (3816)
sparse	0.21 - 0.33	24 (1628)
total	0.21 - 0.64	100 (6929)

Analysis of elevation, slope and aspect indicated that all the orchards grow between 1500 – 3400 meter elevation and up to 45 per cent slope. However, it is found that 62 percent of dense orchards are dominated in the range of 2000 – 2400 m elevation, 70 percent orchards found under 11 – 30 degree slope (Table2).

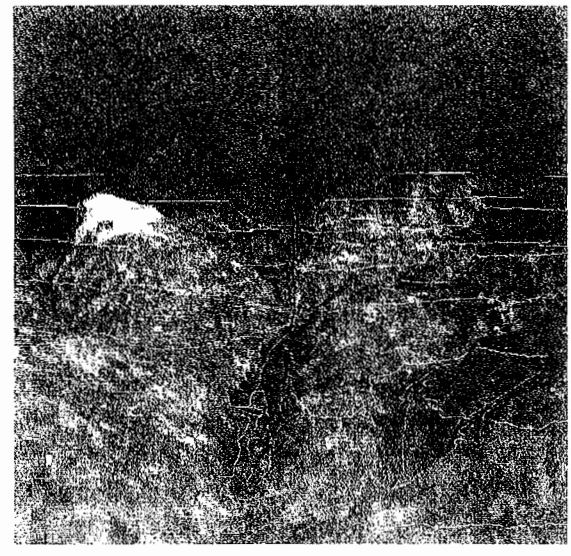


Fig. Apple orchard distribution as visualized in IRS LISS III data draped in DEM.

Major percentage of apple orchard (86 percent) are found in the elevation range of 1800–2600 meters. Similarly 91 percent of apple area is having less then 30-degree slope and 68 percent of the apple area is facing East and South directions. Thus, these parameters can be considered suitable for apple orchard in the study region (mainly for golden delicious variety). However, best orchards (dense) are found to be associated with 2000-2400 m elevation, 0-30 degree slope and north or east facing.

Table 2 : Orchard condition in relation to geographical parameters in Kotkhai tehsil

CLASS	TOTAL APPLE ORCHARDS	DENSE ORCHARDS	MODERATELY DENSE ORCHARDS	SPARSE ORCHARDS
AREA (HA)	**6929**	**1485**	**3816**	**1628**
ELEVATION (M)	AREA IN PERCENT			
< 1800	9	7	9	12
1801-2000	16	15	16	17
2001-2200	26	27	26	26
2201-2400	29	35	29	23
2401-2600	15	13	15	15
> 2600	5	3	5	6
2001-2400	55	62	54	49
1801-2600	86	90	86	81
SLOPE (DEG.)	AREA IN PERCENT			
< 10	21	18	21	22
11 – 20	38	43	39	33
21 – 30	32	30	32	33
> 30	9	8	8	12
< 30	91	92	92	88
ASPECT DIRECTION	AREA IN PERCENT			
NORTH	19	30	18	12
EAST	35	33	38	33
SOUTH	33	27	31	42
WEST	11	10	11	12
BEST CONDITIONS	AREA IN PERCENT			
ELEV. 1800-2600 SLOPE < 30 DEG.	77	83	78	71
ELEV. 2000-2400 SLOPE 11-25 DEG.	34	41	34	28
ELEV. 1800-2600 SLOPE < 30 DEG. IN EAST OR SOUTH	55	53	57	54

Basket Search

Ekosat satellite is a commercial Earth observation spacecraft aimed at the agricultural, environmental and other natural resources monitoring. It is an international programme that plans to use a satellite bus developed by KARI, a sensor payload jointly developed by Israel and Germany. A consortium of German and Israel aerospace firms and South Korean aerospace Research Institute (KARI) are seeking a partner to launch this.

Quickbird imagery falls under new restrictions.The improved resolution of QuickBird satellite image from 1 meter to 0.6 meter falls under a more restrictive US Govt.policy that bars its distribution internationally for 24 hours from the time of collection.

Canada's Radarsat-3 satellite is envisioned to focus on shipping and have the capability to shift automatically from a broad area-scanning mode to precise pointing and imagery collection at 3-meter resolution, once it detects ships. Radarsat-3 is expected to launch in 2005 and operate in tandem with Radarsat-2 that is scheduled to fly in April 2003.

Norway plans NSAT-1 for ocean surveillance demonstration. The mission is based on the finding that a small satellite in a 600 km polar orbit would be able to detect vessels with in 1 km, since each ship has a unique radar signature or fingerprint. The space based maritime radar tracking capability is of interest both to civilian and military authorities.

The US Army is conducting tests to determine whether disaster relief officials can use a mobile station designed to provide satellite imagery to commanders in the field during Atlantic hurricane season. The station, Eagle Vision 2 is a mobile antenna and mobile image processing system built in, that is designed to receive high-resolution commercial satellite images.

A new remote sensing satellite is planned by NASA for monitoring climate change and weather from space. The satellite called NPOESS Preparatory Project (NPP) will test the performance of three sophisticated weather sensors that also have applications for climate change.

Erdas Inc. has started shipping a new version of its Imagine software. Version 8.5 includes an upgraded mosaic tool that enables users to view merged multiple images. It also includes a upgraded 3-D visualization.

Radarsat International has teamed up with Agri Imag to offer a World Wide Web based mapping service using images collected by Landsat 7 and Radarsat satellite.

Europe's ERS-2 Radar Earth observing satellite is healthy enough to continue operations well into 2002 despite the failure of its primary attitude control system. ERS-2 will be used to calibrate Envisat's sensors. It also can provide data from its wind scatterometer instrument.

An international team of scientists has finished an intensive data gathering campaign in Asia that will test the ability of NASA'S Terra environmental satellite (Multi angle Imaging Spectroradiometer – MISR) to distinguish man made atmospheric particles from natural ones. By studying the atmosphere in four different spectral bands at nine different angles, MISR should be able to distinguish the type and size of aerosols more accurately.

A new government policy has cleared the way for the distribution of 1-meter resolution imagery from American owned Ikonos satellite to customers in India. The price of Ikonos image will be around 1700 rupees per sq. km with a minimum order of 120 sq. km.

Indian Mission to Moon

India could launch an unmanned probe to the moon purely for scientific knowledge. This may be taken up five years after the government approves such a mission. The lunar exploration task force was set up consisting of 20 experts from within and outside ISRO Chaired by Dr George Joseph, distinguished scientist of ISRO. The approximate cost of the mission may be 3-5 billion Indian rupees.

(Space News)

Science for All

Twelve high school students from Indiana, six of them deaf spent a week at NASA's Ames Research Centre, learning about space life science. Six students were from Indiana School for the Deaf. The researchers made sure that the science lessons personally imparted the students. While discovering how space affects astronaut's balance, students learned how ear functions affect balance on Earth. They also learned about instruments on the international space station and how NASA research is useful on Earth. An anonymous benefactor funded the trip.

(Space News)

Chapter's activities

The Chapter engaged itself in many productive and innovative activities to promote the cause of remote sensing and facilitate exchange of ideas among the remote sensing users and experts. Details of some of the major activities are highlighted for the benefit of the readers.

1. Celebration of World Environment Day

To bring awareness on environment related issues, June 5th is celebrated as World Environment Day. It was established by the United Nations General Assembly in 1972. It is a people's event with governments, individuals and community groups organizing activities to improve the environment.

On this occasion, ISRS-AC arranged an enlightening lecture by Dr Sudershan Iyenger, Director, Gujarat Institute of Development and Research, Gota, Ahmedabad. The lecture entitled " Society Environment and Development" was very informative. Around 200 members attended the lecture held at Space Applications Centre.

2. National Remote Sensing Day (NRS – Day) Celebration

On the eve of the birth anniversary of the late Dr. Vikram Sarabhai, ISRS-AC celebrated NRS day on August 11, 2001 by organizing exhibition competition for school children in association with Tulip School, Sterling City, Bopal. The theme of the exhibition was **" Space Technology for improving the Quality of Life".** Eleven schools participated in the competition. The enthusiasm of the children was overwhelming. Some of the exhibits are seen to be believed. It was a tough task for the Jury (Chaired by Shri Jai Singh Parihar, Group Director, SAC and Vice-President, ISRS) to select the prize wining ones.

Mount Caramel High School and Tulip Higher Secondary School won the first prize in Secondary and Higher Secondary School category respectively.

We provide a glimpse of the event through some the photographs taken during the occasion in the following page.

The Jury inspecting an exhibit by Tulip School

The concluding session in progress

3. Lecture Series on Indian Mission to Moon Programme

The following lectures were arranged for public awareness on future space missions and intricacies of space research in India.

i) " Prospects and Challenges of Indian Mission to Moon" was delivered by Dr George Joseph, Distinguished Scientist, ISRO.

ii) " Challenges and possibilities of Indian Launch Vehicle to carry a space craft to orbit the Moon" delivered by Dr Adimurthy, Vikram Sarabhai Space Centre, Thiruvanthpuram.

iii) " Moon as a Celestial object and Scientific & other interest for study" by Dr N. Bhandari, Sr Scientist, Physical Research Laboratory, Ahmedabad

iv) " The Challenges and realization of a moon orbiting spacecraft" by Dr N. Thyagrajan, Programme Director, Small Satellite System, ISRO Satellite Centre, Bangalore.

The lectures organized jointly by ISRS-AC and IMSA and held at the Town Hall on December 1, 2001, was attended by more than 500 participants from different walks of life.

3. Training

A one day work shop, preceded by 4 day tutorials on Commercial Applications of Remote sensing and GIS (CARG) was held during 24-28 September, 2001. The event organized jointly by ISRS-AC , Value Added Services Cell, SAC and ISG was held at the All India Institute of Local Self Government, Mumbai. Thirty three participants, mostly from the corporate sector participated in the Tutorials and one hundred attended the workshop.

4. Painting Competition

The Chapter organized jointly with the Pranav Bharathi Foundation, a painting competition for the school children on September 2, 2001. The event held at Kendriya Vidyalaya, SAC was well participated by over five hundred children.

5 National Symposium of the Indian Society of Remote Sensing (ISRS)

(Rreport by Shri N.S.Mehta, Organising Secretary, ISRS – 2001 Symposium)

ISRS – Ahmedabad Chapter hosted the National Symposium of the Indian Society of Remote Sensing (ISRS) jointly with Space Applications Centre (ISRO), at Ahmedabad during December 11 – 13, 2001. The focal of the symposium was " Advances in Remote Sensing Technology with Special Emphasis on High Resolution Imagery and Annual Convention was also organised by ISRS.

Dr. A.K.S. Gopalan, Chairman, ISRS – 2001 Symposium & Director, Space Applications Centre (ISRO) in his welcome speech dwelt upon the advances made in the country in the field of remote sensing with respect to sensors, image processing and applications. The symposium was inaugurated by Dr. M.H. Mehta, Vice – chancellor, Gujarat Agriculture University. In his inaugural speech, Dr. Mehta laid special emphasis on networking and taking the technological fruits to the grass-root level. Citing the example of Gujarat Agriculture University's Krishi Gosthi programme, he brought home how the space technology is being used to fulfill the needs of farmers.

Dr. George Joseph, Distinguished Professor, ISRO recounted the history of Indian Remote Sensing Programme and delivered key note address entitled "Journey from km to meter". He gave a vivid and stimulating account of Indian Remote Sensing Satellite Programme beginning Bhaskara to TES (Technological Experimental Satellite) through IRS series of satellites.

The symposium got overwhelming response from more than 400 scientists from over 100 organisations across the country. Total 237 abstracts were received and were grouped into following 14 sessions / themes :

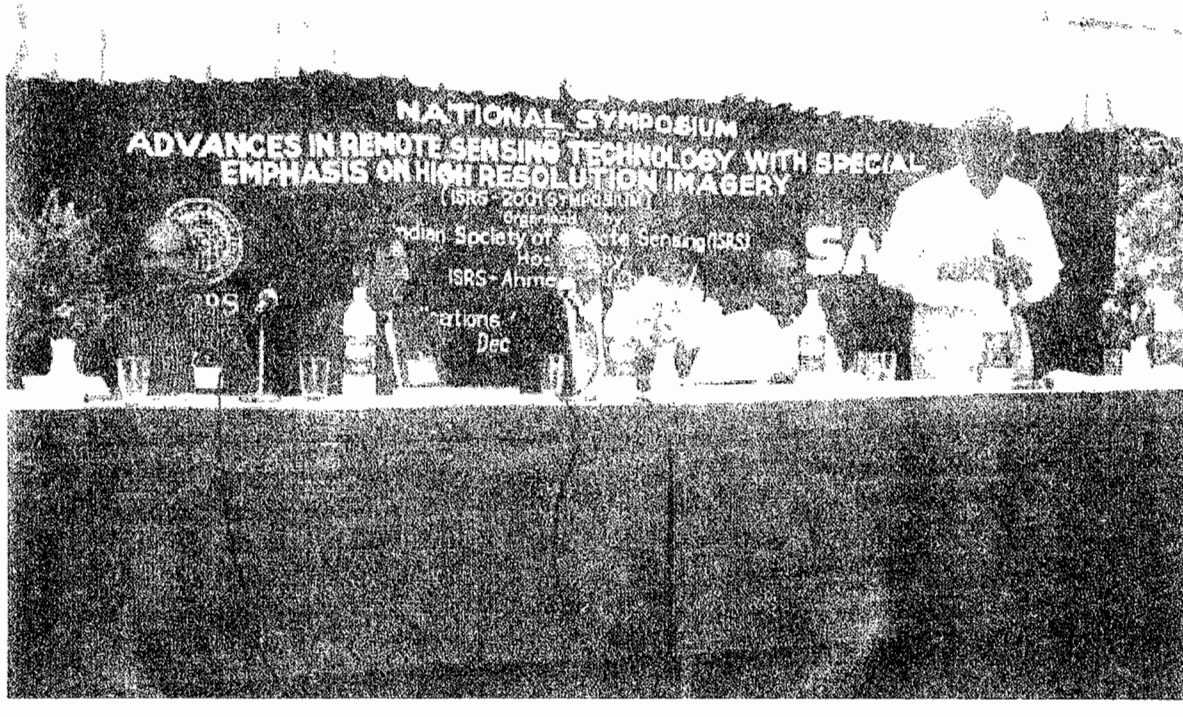
- Remote Sensing Technique, Applications and Education
- High Resolution
- Natural Disaster Management
- Agriculture
- Terrain Evaluation
- Image Processing and Technique Development
- Integrated Resource Monitoring and Terrain Evaluation
- Environment and Forest
- Coastal Zone Management
- Water Resources
- Satellite Oceanography
- Land use and Soil
- Spatial Data Infra – structure
- Marine Environment

SPECIAL SESSIONS

Two special sessions on Natural Disaster Management (NDM) and Spatial Data Infra-structure For Disaster Management were conducted during the symposium as a part of International Society of Photogrammetry and Remote Sensing (ISPRS) Technical Commission-VII and Working Group IV activities. The sessions were chaired by Dr. R.R. Navalgund, Director, National Remote Sensing Agency, Hyderabad and Chairman ISPRS TC - VII and Dr P.S. Roy, Dean, Indian Institute of Remote Sensing, Dehradun and Chairman, Working Group – IV / IV. The special session on NDM focussed on the use of RS and other inputs in disaster management, and deliberated on the role of space technology for resource and environment monitoring in which India holds a key place.

A GLIMSE TO THE EVENT THROUGH EYE OF THE LENS

Inaugural session in progress



Enthusiastic audience of the inaugural function

A very hectic schedule for the volunteers

HIGHLIGHTS OF THE SEMINAR

Three very important issues were discussed and deliberated during the symposium :

- Advances in Remote Sensing Technoligy
- Natural Disaster Management
- Spatial Data Infra – structure

Significant advances have been made in the field of Remote Sensing Technology. Our capabilities of remote sensing have been enhanced from 80 meters resolution to 5 meters, which helped in better monitoring of agricultural crops, snow cover and even small fields and small crops would be possible. The plan for launch of RESOURCESAT – 1 in 2002, CARTOSAT – 1 in 2003, CARTOSAT – 2 in 2004 and RISAT – 1 in 2005 will further strengthen the application potential in coming years for resources survey and environmental protection.

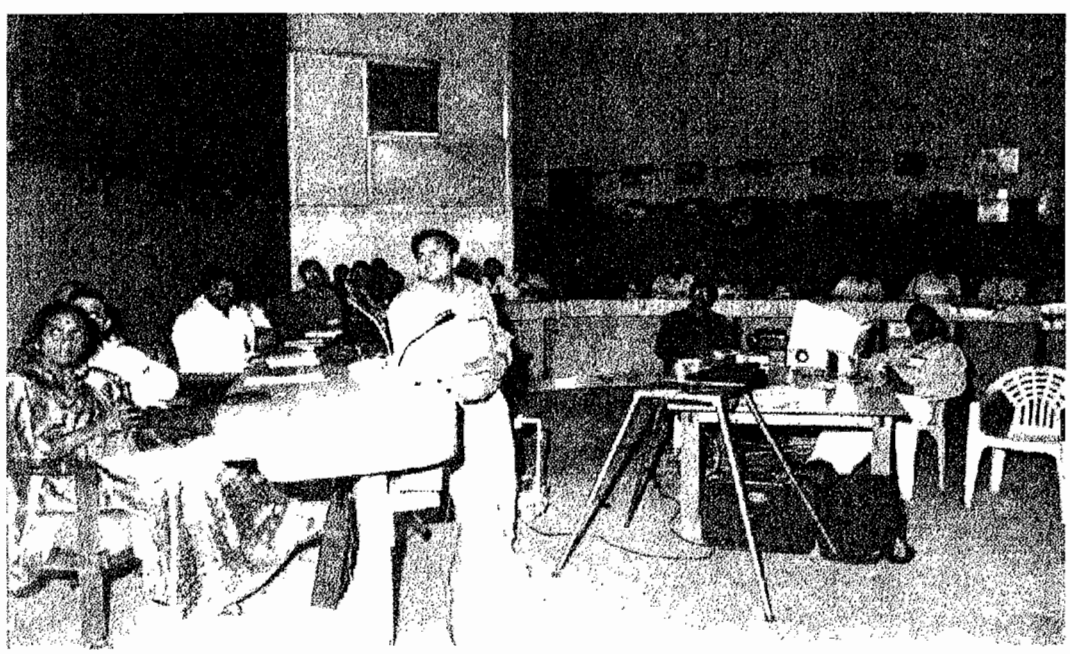
Remote Sensing, GIS and GPS are the three technologies which are going to provide significant and key information which will be vital importance in development of knowledge based Disaster Management Network.

In short Span of 3 decades Satellite Remote Sensing has emerged as one of powerful technology for generation of spatial data and information. Multi - spectral sensing in narrow bandwidth in the digital mode has been the key factors in the emergence of remote sensing technology. There has been continuous improvements in sensor technology, methods of interpretation and analysis of data which has enabled generation of spatial data and information on global, regional and local scales. Availability of digital data from remote sensing satellites also enabled generation of spatial information in the digital mode which subsequently led to development of GIS. The advent of GIS technology has transformed the shape of spatial data handling capabilities, storage and retrieval.

More clips of the Symposium

Main Technical Session in progress

Presentation in the parallel session



Discussion in the interactive session

Food for thought

AWARDS

ISRS – SPECK award is given for the best paper presentation. The award carries a citation and cash prize of Rs. 2000/- and reimbursement of second-class return rail fare. ISRS – OPTOMECH award is given for the best paper presentation by a student. The award carries a citation and cash prize of Rs. 1000/- and reimbursement of second class return rail fare.

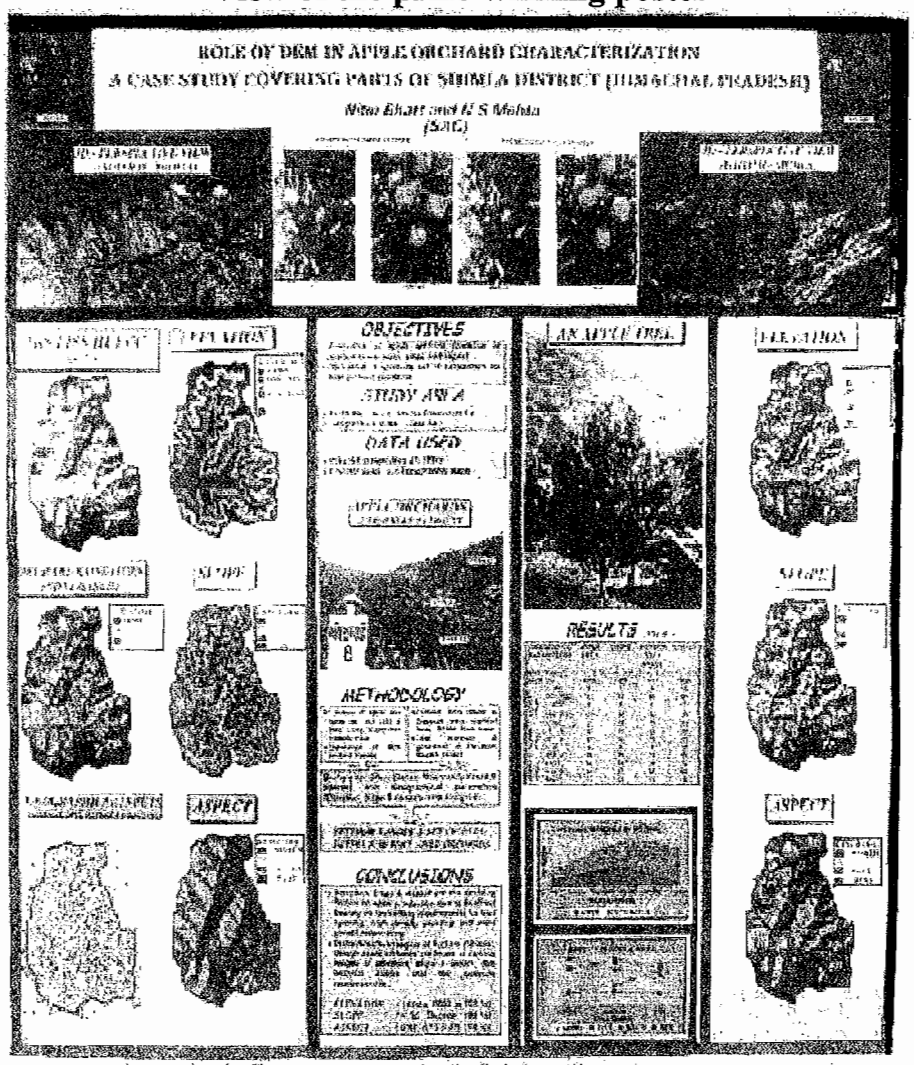
A selection committee was constituted under the chairmanship of Dr Baldev Sahai, Fellow , ISRS, To select papers for awards.

The satisfaction of winning an award

Silver Lining

Shri Nitin Bhatt, one of the young member of the society from Agricultural Resources Group, Space Applications Centre won best poster award for his presentation in the ISRS Symposium held at SAC, Ahmedabad. His paper entitled,' **Role of DEM in apple orchard characterization –case study for Shimla district, HP**," authored jointly with Shri N. S. Mehta, highlighted the importance of geographic parameters like slope, elevation and aspect in condition of apple orchards. The newsletter extends the heartiest congratulation to him for his achievement and expects many such excellent outputs from him

View of the prize-winning poster



Dr. S.S Ray, a member of the society, received second prize in oral presentation (Non-hindi section) for his paper 'Sukshmavadharit Krishi mein Sudur Sambedan ki Bhumika' in the inter-state Technical Hindi Seminar , held at SAC, Ahmedabad on 22nd February, 2002.

Dr. M.M. Kimothi, the treasurer of the society, received second prize in poster presentation for his paper 'Bhukamp Grasit Sambedanshil Himalay: Madhya Himalay (Uttaranchal) mein Chamoli 29th March, 1999 Bhukamp ke Prabhav ka Eik Vishleshan Bharatiya Sudur Sambedan Upagrah evam Anya Ankodon Dwara'. in the inter-state Technical Hindi Seminar , held at SAC, Ahmedabad on 22nd February, 2002.

Forthcoming Event

International Symposium on Resource and Environmental Monitoring
Hyderabad, India, December 3-6,2002

Organised by: ISPRS Technical Commission VII and ISRS

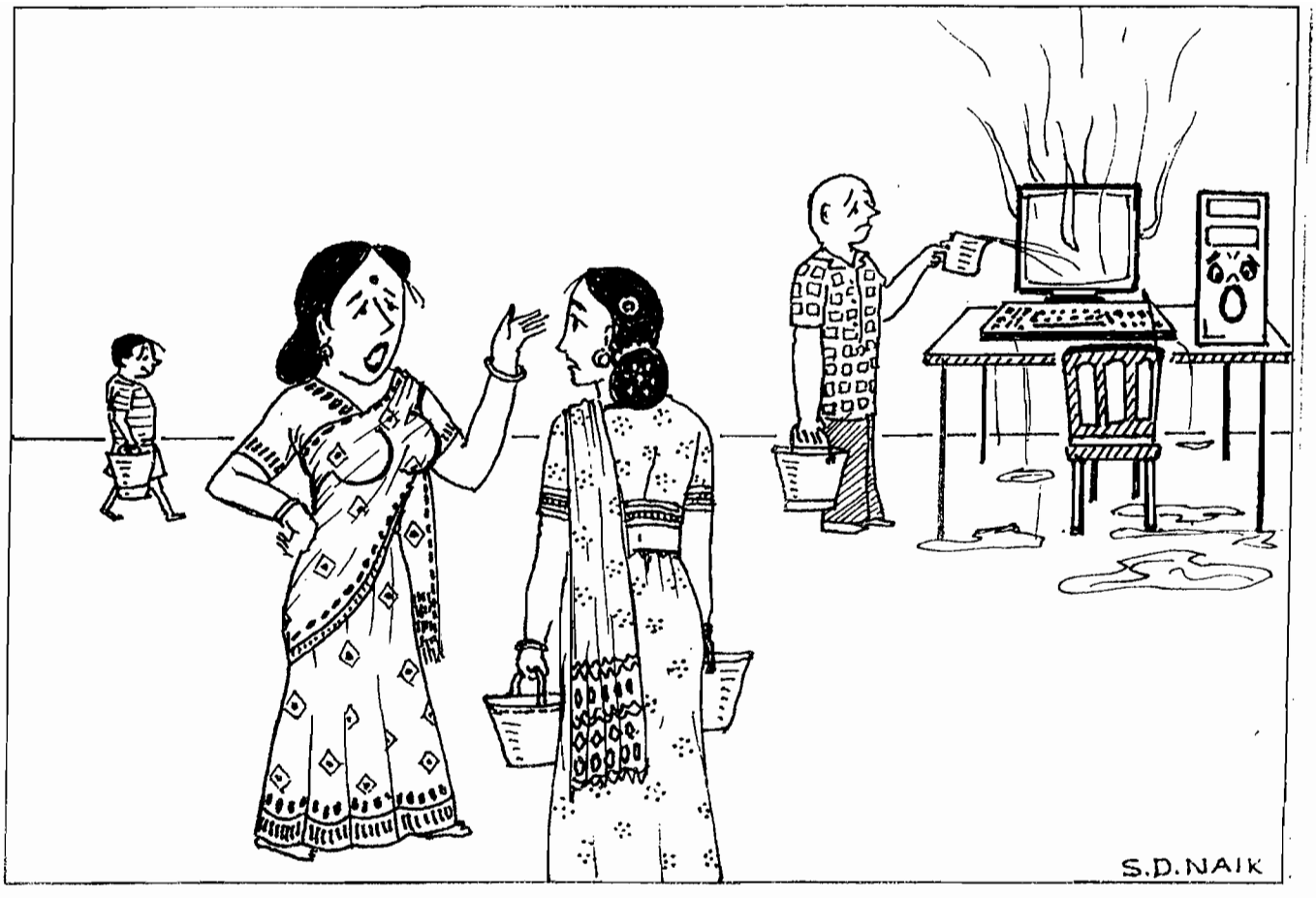
Important Dates:

Abstract submission	May 31,2002
Full Paper submission	Sep. 30,2002

Pre-symposium Tutorial:

a) Sustainable Agriculture
b) Integrated Coastal Zone Management

Website: www.commission7.isprs.org



(I have been telling him every time not to do remote sensing work at home. Today, he was analyzing "Thermal Infrared data")

If undelivered please return to:

Shri N.S.Mehta
Secretary, ISRS-AC
ARG/ RESA(Room no.4036)
Space Applications Centre
Ahmedabad -380015

Published by

ISRS-AC

Printed by

Library
SAC, Ahmedabad

Printed at

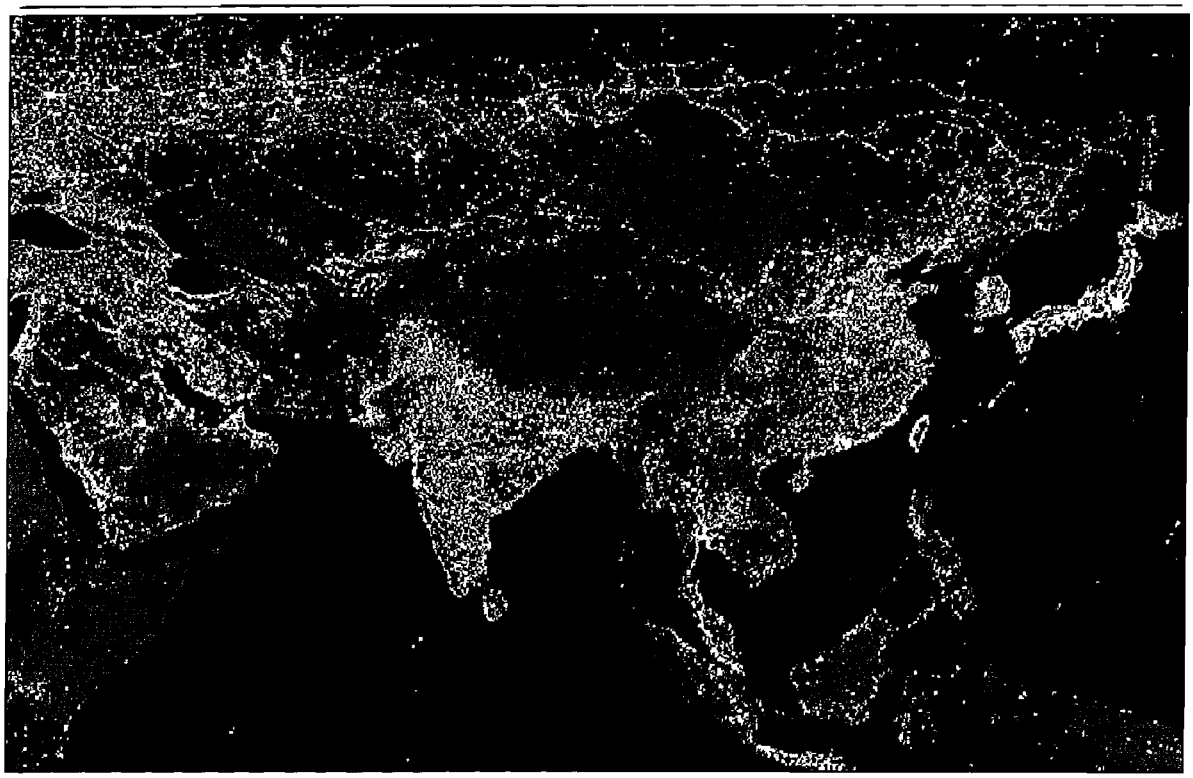
Library and Documentation Division
Space Applications Centre, ISRO
Ahmedabad-380 015, INDIA

ISRS

SIGNATURES

NEWSLETTER OF THE INDIAN SOCIETY OF REMOTE SENSING –AHMEDABAD CHAPTER

Volume-16 *No. 1* *Month- March* *Year –2003*



NIGHT LIGHTS OF INDIA AND ITS NEIGHBORS AS SEEN BY DMSP

IN THIS ISSUE

	PAGE NO.		PAGE NO.
ARTICLES		**REGULAR FEATURES**	
CHAPTER UPDATE	03	BASKET SEARCH	13
A SATELLITE VIEW OF AEROSOLS	04	CHAPTER ACTIVITIES	20
SAR DATA UTILISATION FROM RISAT..	08	ENVIRONMENTAL NEWS	27
SOME COMMON COMPUTER TERMS	11	SILVER LINING	29
MODIS DATA POTENTIAL FOR LAND	15	LEISURE CORNER	30
SATELLITE STEREO PHOTOGRAMMETRY FOR GLACIERS...	18	NEW MEMBER'S LIST	31

Front cover

Image of Earth's city lights was created by NASA, with data from the Defense Meteorological Satellite Program (DMSP) Operational Linescan System (OLS). Originally designed to view clouds by moonlight, the OLS is also used to map the locations of permanent lights on the Earth's surface.

The brightest areas of the Earth are the most populated, but not necessarily the most urbanized. Cities tend to grow along coastlines and transportation networks. Even without the underlying map, the outlines of many countries are still be visible. Indian capital town New Delhi is seen as a bright spot in the picture and lights along the highways are also prominent.

Even more than 100 years after the invention of the electric light, some regions remain thinly populated and unlit. Deserts in Arabia, Thar and Mongolia are poorly lit along with the great mountains of the Himalaya.

Indian Society of Remote Sensing- Ahmedabad Chapter update

The Ahmedabad chapter of Indian society of Remote Sensing has got additional strength in terms of new membership during 2002-2003. Seventy-two life members and 7 annual members have been enrolled during 2002-03. This also includes 43 life members who are enrolled for the regions outside the ISRS-AC jurisdiction. The table below shows the details of the membership.

Life members	371
Annual members	07
Sustaining members	04
Patron members	07

Executive Council

Chairman
Shri J. S. Parihar

Vice-Chairman
Ms. Anjana Vyas

Secretary
Dr. M.M. Kimothi

Jt. Secretary
Shri S.A. Sharma

Treasurer
Shri A.S. Rajawat

Members
Shri A. K. Sharma
Shri K. K. Mohanty
Shri K. R. Manjunath
Dr. S. M. Bhandari
Shri R. K. Arora

Editorial Board
Editor
Dr. Sushma Panigrahy
Members
Shri Prakash Chauhan
Dr. S.S. Ray

Dear Readers,

New Year greetings. We are happy to place the new year issue of 'Signatures" in your hands. This issue is specially devoted to the new and upcoming research frontiers in remote sensing arena. The article on satellite view of aerosols highlights the importance of aerosol remote sensing in climate system. Newer research applications in the field of microwave remote sensing are going to unfold with the launch of Indian RISAT satellite. The article on RISAT gives an overview of these activities. India has started receiving MODIS-TERRA data at NRSA, Hyderabad. This has opened up a new frontier for earth system science studies for better understanding of our planet earth. The article on MODIS data potential should help in understanding the MODIS science series satellites. Number of chapter activities were carried out during the period (2002-2003). We are happy to provide glimpses of these activities in this issue of "Signatures".

We are thankful to the readers for their support, co-operation and suggestions that helped us to bring out this issue of the News Letter.

With best wishes.

-Editor

A satellite view of aerosols in the climate system

M. Mohan and Indrani Das
Space Appplications Centre
Ahmedabad

Anthropogenic aerosols are intricately linked to the climate system and to the hydrologic cycle. The net effect of aerosols is to cool the climate system by reflecting sunlight. Depending on their composition, aerosols can also absorb sunlight in the atmosphere, further cooling the surface but warming the atmosphere in the process. To accurately study aerosol distribution and composition requires continuous observations from satellites, networks of ground-based instruments and dedicated field experiments. Increases in aerosol concentration and changes in their composition, driven by industrialization and an expanding population, may adversely affect the Earth's climate and water supply.

Aerosols are solid or liquid particles suspended in the air. It is a trace substance in the atmosphere and the amount of aerosols vary from place to place and from time to time. They have size ranging from ~ 10^{-3} to 10^{2} μm with the number density decreasing with increasing size. The size range of aerosols is further subdivided into three classes: Aitken particles (~10^{-3} to 10^{-1} μm), large particles (10^{-1} to 1.0 μm) and giant particles (1.0 to 10^{2} μm). In the atmosphere, aerosols are mostly confined to lower troposphere (that is, up to boundary layer heights ~2-3 kms) except on occasions of strong volcanic eruptions when they can be injected into the stratospheric altitudes.

Large quantities of aerosol particles are continually being put into the atmosphere by natural as well as man made (anthropogenic) activities. Dust particles, soot particles, water-soluble particles, industrially produced sulphuric acid droplets, volcanic ash, etc. are some examples of aerosols (WCP, 1984). Wind blowing over deserts or over dry and loose agricultural top soil, large scale forest fires, ocean waves breaking on the beaches, major industrial centres are all sources of aerosol production. They have a wide variety of chemical compositions related to their generation mechanism. Table 1 shows the chemical compositions of different types of aerosols and their generation sources.

Table 1. Aerosol generation sources and their chemical compositions

Generation source	*Type of aerosols*
Wind over the deserts and loose soil	Silicate, minerals, clay and carbonaceous particles
Forest and man made fires	Soot particles
Volcanic eruptions	Sulphate particles
Large scale vegetation	Organic particles produced through photo chemical reactions of biogenic gases
Ocean surface waves	Salt (sodium chloride) particles
Industrial activities	Sulphates, nitrates, metallic particles
Oceanic phytoplankton	Sulphate particles produced through the oxidation of dimethyl sulphide released during the blooms

Residence time of aerosols

Once released into the atmosphere, aerosols remain airborne for long periods of time. The residence times of different particles are decided by their coagulation behaviour, cloud forming properties, gravitational settling velocity and fragmentation characteristics. The particles of size ~ 0.3μm have the longest residence time in the troposphere (~ 10days). The particles smaller than ~ 0.1μm remain in air only for ~ 1 – 2 days. They are lost as individual particles through

coagulation among themselves or recombination with larger particles due to their Brownian motion. The shorter residence times for particles bigger than ~ 1μm is because of faster gravitational settling. In the case of aerosols injected into the stratosphere by strong volcanic eruptions, they remain there for months to years.

Physical effects of aerosols

Aerosols are responsible for a number of physical effects in the atmosphere ranging from reducing the visibility, causing air pollution and influencing the microphysics of cloud formation (acting as cloud condensation nuclei) to modifying the weather and the climate on a regional and global scale by changing the atmospheric radiation balance. Aerosols interact with the incoming solar radiation and the outgoing terrestrial radiation through scattering and absorption. The radiative energy absorbed by aerosols can warm the atmosphere and change the vertical temperature profile thereby affecting the strength of atmospheric convective motions. Aerosols also interfere with the remote sensing data requiring their radiative interferences to be removed for the correct retrieval of geophysical parameters.

The most important among all the aerosol effects is their role in the atmospheric radiation balance because of their interaction with the incoming solar radiation (albedo effect) and the outgoing terrestrial radiation (green house effect). Besides this, through their role in cloud formation, they also indirectly influence the atmospheric radiation budget via the radiative properties of clouds. Their concentration, size distribution and chemical composition determine the droplet concentrations precipitation rate and life time of clouds.

In recent years, a number of attempts have been made to assess the impact of aerosols on the earth's weather and climate with the help of numerical prediction models. Some of these studies have indicated that on a global scale, the albedo effect aerosols can offset the greenhouse forcing by about 20-40%. Whereas the regional scale experiments show the aerosols to reduce the vertical mixing in the tropical atmosphere (through modification of the vertical temperature profile), narrow down the ITCZ (Inter Tropical Convergence Zone) and weaken the trade winds, cool the north Atlantic atmosphere, weaken the monsoon by reducing the land - sea temperature contrast, etc.

All these studies have brought out the important role of aerosols in the atmospheric dynamics. But to account for the physical effects of aerosols in the atmospheric dynamics, one need to have quantitative information on the aerosol parameters on regional as well as on global scales at frequent intervals.

Measurement of aerosol parameters

The most appropriate way of detecting aerosols is through their property of scattering and absorption of light from a known source. The combined effect of scattering and absorption of aerosols can be expressed through a parameter called - aerosol optical depth (AOD in short). With a sun photometer, one can measure the columnar AOD of the atmosphere from the ground, ship, aircraft or a remote controlled balloon by pointing this instrument towards the sun. Another technique of estimating aerosols is to shoot a pulse of laser beam into the atmosphere and to record the radiation scattered back as a function of time. From the time history of the intensity of return signal, one can determine the profile aerosol distribution in the direction of laser beam. This is the principle employed in the Lidar sounding of the atmosphere.

Satellites, with their capability for large area coverage and frequent repeativity, are the most ideal means for acquiring global information on aerosols. The satellites SAM-I&II (Stratospheric Aerosol Measurement) and SAGE-I&II (Stratospheric Aerosol and Gas Experiment) have for several years (from late 70's to early 90's) monitored stratospheric aerosols through limb viewing sun occultation technique. The currently orbiting ocean colour satellites like IRS P3-

MOS-B, IRS P4-OCM, SeaWiFS and MODIS-TERRA/AQUA, though primarily meant for monitoring ocean water constituents, can also be used to detect atmospheric aerosols over the oceans with a global coverage of one or two days. The channels 1 and 2 of NOAA AVHRR sensor are also used for the operational mapping of marine aerosols on a routine basis.

The MOS-A sensor of the IRS P3-MOS satellite has the capability to detect aerosols in two or three atmospheric layers through the differential scattering /absorption of solar radiation in four narrow band channels within the O_2A (Oxygen) absorption band around 760 nm.

Scattering in the atmosphere

Scattering is a process in which a particle in the path of the electromagnetic radiation takes energy from the incident ray and reradiates in all the directions. In the atmosphere, all the particles ranging from gas molecules (size $\sim 10^{-8}$cm) to aerosols (size $\sim 10^{-3}$ to $10^{2}\mu$m) to large rain drops (size ~ a few mm) to hail particles (size ~ 1cm), scatter radiation. Among these, aerosols is a major agent responsible for scattering in the visible to infrared region of the spectrum

The intensity of scattered radiation as a function of scattering angle (angle between the incident and the scattered rays) known as scattering phase function, depends strongly on the ratio of particle size to the wave length of the radiation. This ratio, known as the size parameter is expressed as $\chi = 2\pi r/ \lambda$ where r is the radius of the particle. For particles whose sizes are very small compared to the wave length, χ is very small (say, less than ~ 0.1) and the scattering pattern is independent of the shape of the particle and is symmetrical in the forward and the backward directions. This is known as Rayleigh scattering. Scattering of light by air molecules in the atmosphere falls in this regime. But as the particle size increases and becomes comparable to the wave length, the scattering gets more and more concentrated in the forward direction. The exact angular distribution will then depend on the size, shape and orientation of the particle. If the scattering particle is spherical in shape, the scattering is known as Mie scattering and the phase function is determined by Mie theory. Besides scattering, the radiation energy can also be lost through absorption in the medium.

Aerosol parameters from ocean colour sensors

As mentioned earlier, ocean colour sensors, though meant for the remote sensing of ocean water constituents, have the additional capability for the detection of marine atmospheric aerosols. This is achieved by making use of radiance data in the atmospheric correction bands which have wavelengths above ~700nm, where, because of high infrared absorption by water, the ocean surface acts as a dark background. Ocean colour sensors can provide two aerosol parameters: AOD and aerosol particle size. Figure 1 shows the dust plumes in early December 2002, strong winds were blowing dust and sand from the Makran Mountains in southern Pakistan and Iran out over the Arabian Sea. The image of the dust plumes was acquired by the Moderate Resolution Imaging Spectroradiometer (MODIS) instrument, flying aboard NASA's Aqua spacecraft.

Figure 2 is an IRS P4-OCM image showing the total column AOD distribution near Trivandrum in the month on October 15, 1999. One can notice in this image streaks of aerosols extending from the land to the oceans in various directions caused by the prevailing winds at the time of satellite pass. The dark patches are areas masked for the highly reflecting land and cloud surfaces. While land surface has sharp edges, the clouds have optically thin parts near the edges which have not been masked. Taking the logarithm of the Angstrom's turbidity formula and eliminating β using two atmospheric correction bands at wavelengths λ_1 and λ_2, one can determine the Angstrom exponent (or

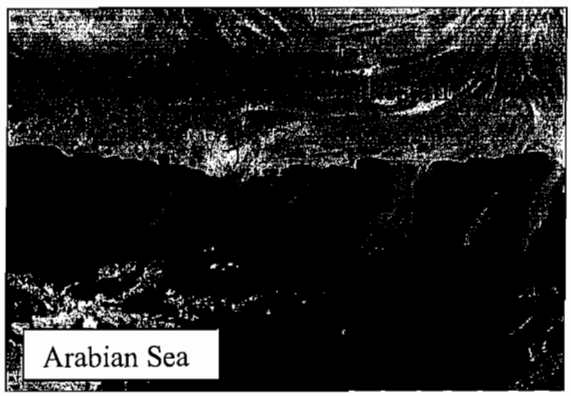


Fig1

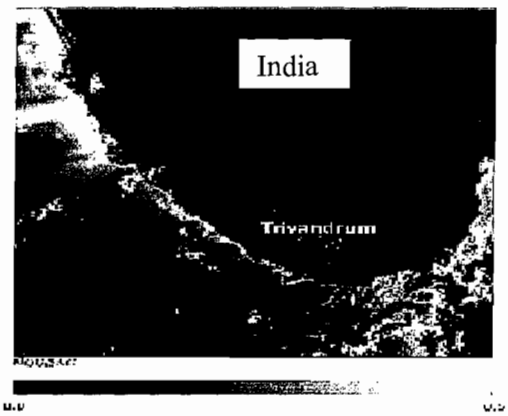


Fig.2

aerosol particle size index) α. With increasing value of α, the particle size distribution gets steeper indicating more amount of smaller particles in comparison with larger particles. Thus, larger Angstrom exponent can be taken to mean a predominance of smaller particles and therefore, a smaller value for the average particle size while smaller Angstrom exponent would mean a larger value for the average particle size.

Aerosols in climate change

The cooling influence of aerosols on climate, directly through the reflection of sunlight to space and indirectly through changes in cloud properties, has been appreciated for over a decade, and has triggered a large number of observations, simulations and analyses. The effect of anthropogenic aerosols is not limited to cooling by sulphates. Instead, carbonaceous compounds that include light absorbing black carbon can be an important warming agent, and the sign of the temperature change from aerosols can vary depending on the aerosols' radiative properties and their distribution over the dark ocean and reflective land. The cooling of the Earth's surface from absorbing aerosols (compared with the top of the atmosphere) and consequential warming of the atmosphere causes a flattened vertical temperature profile in the troposphere, which is expected to slow the hydrologic cycle, reduce evaporation from the surface and reduce cloud formation. It has also been suggested that as aerosols tend to reduce cloud droplet sizes, and hence precipitation, rain and snow may be shifted from highly polluted populated areas to the more pristine oceanic regions. This raises the question of whether there has been or will be a change in the availability of fresh water due to aerosols.

Future research will need to unravel the magnitude of the aerosol effect on clouds and precipitation, on regional and global scales, and its sensitivity to aerosol chemistry and cloud dynamics. Given the importance of the absorption of sunlight by black carbon, a quantitative assessment of black carbon sources, its lifetime in the atmosphere, its distribution around the globe and its impact on the hydrologic cycle will need to be explored. To associate the aerosol impact with human activity, we need to distinguish natural from anthropogenic aerosols. By measuring separately fine and coarse particles, remote sensors distinguish the emission and transport of dust (mostly from natural sources) from pollution and smoke aerosols (mostly anthropogenic) around the planet. Remote sensors also map the distribution and properties of clouds precipitation and the Earth's reflected solar and emitted thermal energy to space as these atmospheric constituents are impacted by the aerosol. These global data and source characterization feed aerosol models to show us an increasingly realistic picture of aerosols around the world and their impact on the environment. To achieve these ends, ground-based and *in situ* measurements, models and satellite observation have to be each improved and integrated.

Pre-launch activities towards utilization of the Synthetic Aperture Radar (SAR) data from Indian Radar Imaging Satellite

Sushma Panigrahy
Convener, RISAT Data Utilization Programme
Space Applications Centre, Ahmedabad

India has established its position in satellite remote sensing with the launch of a series of satellites like IRS 1A, 1B, 1C, 1D, IRS P3, P4 that provide a wide range of optical sensor data. A number of applications in the field of natural resources survey and monitoring have been demonstrated and carried out in an operational manner for national development. Each and every satellite launched in the country is based on careful research, survey and scientific analysis to fulfill specific need of the nation. This has enabled to evolve a long-term remote sensing programme in the country. Time is ripe now to integrate the benefits of the other sensors, particularly that of the microwave in the remote sensing applications programme of India. Microwave region extends from frequency 0.3 GHz to 300 GHz (1m to 1 mm). The most common imaging Radars operate at frequency between 1.25 to 35.2 GHz (24cm to 0.8 cm). Due to the unique sensitivity of microwave to the dielectric and geometrical properties of the feature being sensed, these sensors provide a set of information that are complementary to the information provided by the visible or infrared waves. Besides this, because they have their own illumination (the radar pulses), they can image at any time of day or night, regardless of sun illumination. The radar wavelengths being much longer than those of visible or infrared light, SAR can also "see" through cloudy and dusty conditions that visible and infrared instruments cannot. This is of particular relevance to the time critical and assured data requirement programmes not met by the optical sensors.

The work related to Microwave Imaging Radar systems in India has been initiated few decades ago at Space Application Centre (SAC), ISRO, Ahmedabad, The first in this series was X-band Airborne Side Looking Airborne Radar (SLAR), which was a Real Aperture Radar (RAR) and was developed during the late eighties. The C-band Airborne Synthetic Aperture Radar (ASAR) system was taken up in early nineties that provided data in both VV and HH polarisation. During the past few decades, the world is witnessing numerous improvements in microwave solid-state technology, data recording, computer processing. This has led to the successful launch and operation of a variety of SAR sensors internationally like SeaSAT, SIR-A, SIR-B, SIR-C, IFSAR, ERS, JERS, and RADARSAT etc. Limited use of data from many of these sensors has given insight to the possible use of SAR in various natural resource inventory and survey programmes in our country. For example, the feasibility of rice crop monitoring established with the ERS sensor is now an operational programme being carried out every year since 1998 using data from the RADARSAT SAR.

The experience gained so far has given confidence to venture into having our own space borne Synthetic Aperture Radar sensor in order to exploit the full potential of SAR data. The proposed sensor is a highly advanced C band Synthetic Aperture Radar called Radar Imaging Satellite (RISAT). A number of advanced state of the art features such as high-resolution Spotlight mode, Strip mode, wide swath SCANSAR modes, Quad Polarisation mode selectable anywhere over 400 Km swath is proposed. The system proposed is also capable of imaging on either side of the orbit to provide more opportunities for data gathering. The system is expected to be realized sometime during 2004-2005. Table-1 gives a tentative proposed plan of RISAT beam modes.

Table 1: Proposed RISAT SAR Modes

Data Acquisition Mode / Polarization Type	Spotlight Mode (HRS)	Fine Resoln. Mode (FRS)	Wide Swath I (MRS)	Wide Swath II (CRS)
Single Polarization (VV/HH/HV/VH)	A	A	A	A
Dual Polarization (HH&HV /VV&VH)	A	A	A	A
Polarimetric (HH&VV&HV&VH)	NA	A	NA	NA

* A = Available, NA = Not Available

(source; RISAT Data Utilisation Programme Document, SAC, 2001)

One of the most important RISAT pre-launch activities is a programme called " Joint Experiments for RISAT data utilization." The major goal of this pre-launch programme is capacity building and user preparedness for effective use of RISAT data utilization. To achieve this goal, the following objectives are set;

- To explore the potential of C band SAR for various application fields in collaboration with user agencies.
- To carry out research/ investigative studies in collaboration with research/educational Institutes to develop thorough understanding of SAR interaction with targets.
- To identify specific software and algorithm required for SAR data analysis and interpretation.
- Studies using multi-parameter SAR is also proposed to identify optimum sensor parameters (application specific) for future space programme.

As mentioned above, the project activities are planned under two categories:

1. User collaboration studies: Experimental and semi-operational studies which require either experimental planning, intense field data collection, accuracy and validation are envisaged to be carried out in collaboration with central and state user departments.

2. Academic collaboration studies: Activities related to specific model developments, softwares and basic research to undrstand SAR interation are envisaged to be carried out in collaboration with academic institues of excellence.

The investigations are planned to be carried on with the help of available SAR data from airborne and space borne sources. Indigenous AirSAR (C band) developed at SAC is envisaged

to be used extensively for exploratory studies. Available space borne SAR data from RADARSAT-1,2, ENVISAT and ERS will be used to gain experience on C band polarimetric, and interoferometry data. Limited use of ground experiments with scatterometer data is also envisaged.

Among the applications themes, high priority is given to the agricultural crop monitoring, particularly to the major Kharif crops other than rice like ground nut, cotton, sorghum, pearl millet, soybean etc. C band polarimetric data is expected to accentuate some of the characteristic properties of each crop that may improve its identification accuracy. Other important themes are snow and glacier studies, where C band polarimetric data can be useful in identifying wet and dry condition, thickness of the deposits, identify the hidden crevasses etc. These parameters are some of the important inputs to study the glacier mass balance and snow melt run off estimation. Interoferometry is another unique SAR technique, which will be used to quantify the land surface subsidence like that happening in Jharia coalfield, geological displacements due to earthquake etc. Use of polarimetric interferometry is envisaged for tree height/volume studies that are the crucial input to estimate forest biomass, timber harvest etc. In the field of Oceanography, the focus is for shallow water bathymetry; wind and wave spectra and oil spill detection. The other investigations proposed are detection of buried channels/features, detection of aeoline-covered minerals, mostly found in Rajasthan. Soil moisture and hydrology is another important application. Investigations towards semi-empirical models for surface moisture, profile moisture, application to simulation of flood, drought, run off etc. are envisaged.

Space Application Centre is taking a lead role in giving a final shape to this programme. The Centre has the advantage of the hardware, software and the applications groups, all having enough expertise in the respective area of Imaging Radar. Thus, a well coordinated and planned programme is assured that will lead to gainful utilization of RISAT data in future.

(For further information readers are requested to contact Shri N S Pillai, Dy Programme Director (RISAT), SAC and Shri J S Parihar, Mission Director, RSAM, SAC).

Crossword Solution

Across: 1. Aerosol, 4. Retina, 8. IRSAT, 10. AMIE, 11. HIV, 12. INSAR, 13. KBPS, 14. PE&RS, 15. O.D. (Optical Depth) 17. CNES/ESA, 19. EVI, 22. FAO, 24. EURO, 27. Carto, 28. Row, 30. Emit, 31. IOC, 34. Absorption, 35. EOS

Down: 1. Atmosphere, 2. SARVI, 3. LISS/Sensor, 5. Track, 6. ADEOS, 7. VHRR, 9. TIROS, 16. detection , 18. ATSR, 20. IPR, 21. RF, 23. Cosmos, 25. UTM, 26. ORTHO, 29. ENVI, 30. EIA, 32. CEE, 33. IP

SOME COMMON COMPUTER TERMS:
We Ought To Know

*(Compiled by **C. Patnaik**, Space Applications Centre, Ahmedabad)*

100Base-T - refers to a maximum network transmission speed of 100,000,000 bits per second (100Mbps). Sometimes referred to as fast Ethernet.

Auto-sensing - the ability of a hub or switch to automatically determine the maximum speed that it can communicate to a device that is connected to one of its ports Auto-switching - the ability of a hub or switch to change speeds on any one of its ports to match the maximum speed of a connected device

Backbone - In a hierarchically arranged distributed system, the backbone is the top level, or central, connection path shared by the nodes or networks connected to it. The backbone manages the bulk of the traffic, and it may connect several different locations, and even smaller networks. It often uses a higher-speed protocol than the individual local-area network (LAN) segments.

Backbone Network - Is one with a central cabling scheme (the backbone) to which other networks are attached. Nodes in one network can talk to nodes in other networks by sending packets across the backbone network.

Client - refers to a computer that is reliant upon another computer for some kind of data or service (files, printer, internet).

Client/server - refers to a network relationship where an actual server and clients exist, as opposed to peer/peers.

Collisions - refers to what happens when two data packets arrive at the same time at the destination. In an Ethernet network, the two sending nodes "back off" for a random number of milliseconds and then re-transmit.

Domain Name System-The Internet protocol for mapping host names, domain (a unique name used to identify an Internet network) names and aliases to IP addresses.

Domain name server - A repository of addressing information for specific Internet hosts. Name servers use the domain name system to map IP addresses to Internet hosts by name resolution.

Firewall - A firewall is a program that protects the resources of one network from users from other networks. Typically, an enterprise with an intranet that allows its workers access to the wider Internet will want a firewall to prevent outsiders from accessing its own private data resources.

Gateway - A gateway is a network point that acts as an entrance to another network. A gateway may also be any machine or service that passes packets from one network to another network in their trip across the Internet.

Hub - a central connection point in a star topology network. This is a broadcast device where all transmitted data is send to all nodes. Can be very inefficient and cause excessive collisions when a lot of data is being sent over the network. It is referred to by the number of ports it has ("an 8 port hub") and can be auto-sensing and auto-switching.

IP address - a unique identifier for a node in a TCP/IP based network. This type of address consists of 4 sets of numbers (bytes), which are represented as decimal values separated by periods, as in 123.45.67.89. In order to ensure uniqueness, IP addresses are assigned in part by the Internet Assigned Numbers Authority (IANA).This is a number. IP addresses on the internet can either be static - permanently assigned to a particular hardware device (such as a NIC inside a computer or print server) - or dynamic, which changes with every log on to the internet service. There are Class A, Class B and Class C type IP networks, which can be further broken down by subnetting.

MIME- (Multipurpose Internet Mail Extensions) - MIME is a mail handling standard developed by the IETF (Internet Engineering Task Force) to provide support for multimedia and multipart messages. MIME makes it possible to encode and transmit and receive sound, video, and formatted data in a single message.

Name resolution - the process in which an URL is converted to an IP address. This is

necessary because computers (except for the DNS servers) do not know how to handle the names that we humans use e.g. *http://www.isrsindia-ac.org.*

Packet - A packet is a well-defined block of bytes, which consists of header, data, and trailer. In layered network architecture, packets created at one level may be inserted into another header/trailer envelope at a lower level. Packets can be transmitted across networks or over telephone lines.

Peer to peer - refers to a network relationship where no actual server exists (although there may be a computer acting in the role as a server -- usually referred to as "server", in quotes), as opposed to client/server.

Port (TCP/IP) - Within the *TCP/IP* protocol, there are 65,535 ports. These are like doorways through which different types of data flow. These data types are other protocols that work within TCP/IP. HTTP is on port 80, FTP is 21, and so on.

Protocol - A protocol is a set of predefined rules that govern how two or more processes communicate and interact to exchange data.

Router - The function of a router is to provide a path from a node on one network to a node on another network. The two networks may be separated by several intervening networks over distances.

Switch - a central connection device in a star topology network. Unlike a hub, this is not a broadcast device. This device routes the data to the intended destination. This decreases network noise and increases efficiency and therefore apparent speed. It is referred to by the number of ports it has ("24 port switch") and can be auto-sensing and auto-switching.

Subnet - a way to break a large network into smaller, independent, pieces.

Subnet mask - an IP address that determines what *subnet* a node will be in. For example, 255.0.0.0 will include all address available in a Class A IP network and 255.255.255.249 would be a subnet of a Class C network and would allow only 5 IP address to be assigned.

TCP/IP (Transmission Control Protocol / Internet Protocol)-The underlying "language" of the internet and for most LANs. TCP provides connection- and stream-oriented, transport-layer services. TCP uses the IP to deliver its packets. **IP** provides routing and connectionless delivery services at the network layer.

URL (Universal Resource Locator)-. What you type into you web browser or FTP client to get to that site e.g.: *http://www.isrsindia-ac.org.*

Achievements in Space by India- 2002

The year 2002 was a fruitful year for India not only in terms of launching satellites and launch vehicles but also in taking up new initiatives in space applications. The following are the highlights:

- METSAT, the first exclusive meteorological satellite built by ISRO, was launched by Polar Satellite Launch Vehicle (PSLV-C4) from Satish Dhawan SpaceCentre, SHAR, Sriharikota. ISRO, on September 12, 2002.
- The Tele-medicine Project for Andaman & Nicobar Islands was inaugurated by Prime Minister on July 3, 2002. It links the G B Pant Hospital, Port Blairwith Sri Ramachandra Medical College and Research Institute (SRMC&RI) at Chennai.
- The Government approved in April, the development of an advanced version of ISRO's Geo-Synchronous Satellite Launch Vehicle, GSLV Mk-III, which will have a capability to launch four tons satellites into Geo-synchronous Transfer Orbit (GTO).
- EDUSAT, an exclusive satellite for developmental and educational communication was also initiated. The satellite will be launched by GSLV.
- ISRO's latest satellite in the INSAT-3 series, INSAT- 3C, was launched by an Ariane launch vehicle of Arianespace from Kourou, French Guyana on January 24,2002. After orbit raising operations and in-orbit testing, INSAT-3C was dedicated to the nation by the Prime Minister on July 3, 2002.

Basket Search

NEWS BRIEFS

India dedicates satellites to Dr. Kalpana Chawala: The Prime Minister of India, Mr Atal Bihari Vajpayee, annouced during the condolence meeting held for Dr. Kalpana Chawla at Parliament Annexe, New Delhi, on February 5, 2003 that India's meteorological series of satellites, METSAT, will be named as KALPANA. The first of the series, METSAT-1, launched by India's PSLV on September 12, 2002 by India's PSLV, will be now known as KALPANA-1.

(http://www.isro.org)

PSLV to Launch Singapore University Satellite: Antrix Corporation of Department of Space and Nanyang Technological University, (NTU), Singapore signed an agreement on, January 24, 2003, under which ISRO's PSLV will launch X-Sat of NTU. The 100 kg class X-Sat, which is being developed by NTU, Singapore, is a remote sensing micro-satellite for earth observation and imaging in visible spectral bands. The satellite will be used for land and coastal observations employing multi-spectral imaging. The three-axes stabilized spacecraft will have deployable solar panels.

X-Sat is the fifth satellite for which Antrix Corporation is providing launch service using ISRO's PSLV. The satellites launched earlier are PROBA of Belgium, BIRD and DLR-TUBSAT of Germany and KITSAT-3 of Korea. Under the agreement signed today, besides launching X-Sat on one of the forthcoming launches of PSLV during 2005/06, Antrix will also provide NTU with the necessary support for testing the satellite. (http://www.isro.org/)

India, U.S. in Discussions on possible Space Accord: Both the countries have held preliminary discussions on a bilateral accord that could significantly expand the scope of space cooperation between the nations and their respective industries, according to a US government official. The United States is interested in expanding cooperative activities into areas such as satellite navigation, earth observation, distance learning and space sciences, says Kenneth Hodkins, deputy director of the office of Space and Advance Technology in the US State Department.

(Space News , January 2003)

ISRO proposes Agrisat for crop monitoring: The Indian Space Research Organization (ISRO) is proposing a constellation of remote sensing satellites called AgriSAT for monitoring crops and predicting grain production. ISRO chairman Dr. K. Kastrurirangan said ISRO has adopted a policy of "theme oriented" satellites, each of which will serve a national development goal, such as education, health and poverty elimination.

While Agrisat has yet to receive financial approval from the government, Healthsat, for telemedicine; and Edusat, for linking and beaming educational programs to schools, already have been cleared by government.

(Space News, January 2003)

Survey of India releases first digital map in WGS84: The Survey of India has released the first map in digital format on WGS84 datum for civilian use. On November 20, 2002, Prof. V. Ramamurthy, Secretary, Department of Science and Technology, Government of India released the digital map of Gujarat state at 1:25,000 scale on World Geodetic System (WGS-84). Map was released both in analogue and digital format and is available for sale at Surveyor General's office.

(GIS Development team)

NASA makes preparations for study on Cirrus clouds: NASA is making scientific preparations for a $15 million field study aimed at resolving a key issue in the scientific debate over global warming. An experiment will be conducted by US scientist using two NASA research aircrafts,

a host of ground radars, and several US environmental satellites to determine exactly how billowing, anvil-shaped thunderstorms born over the Florida Everglades end up as wispy, high-altitude cirrus clouds.

Cirrus clouds reflect sunlight, and in doing so have a cooling effect on the atmosphere. But these clouds also reflect and absorb heat emitted by Earth, and this has a warming effect. The net impact of these cirrus clouds on global warming, and the rate of their formation has emerged as great debate among US scientists.

(Space News, September 2002)

NASA funds for new crop of Remote Sensing Instruments: NASA is sowing seeds for a new generation of environmental research satellites that would be positioned beyond low Earth orbit. The US space agency has awarded $22 millions in late December for nine remote sensing technology development projects meant to enable the observation of Earth's atmosphere, land and oceans on a continuous basis rather than at hourly or daily intervals. "We are looking at the enabling capabilities that would help us focus on the time component of our observations" says Ghassem Asrar, NASA associate administrator for Earth Sciences.

(Space News, January 2003)

E-governance in Ahmedabad Municipal Corporation: The Ahmedabad Municipal Corporation (AMC)'s e-governance plan will materialize soon, AMC Commissioner P. Pannerervel said. Under the plan, residents will be able to use Internet to lodge complaints regarding water, drainage and garbage on the net. In addition, people can even submit building plans and pay property tax bills through the net. The plan makes extensive use of GIS, GPS and remote sensing technologies.

(GIS@Development, Sept. 2002)

Tool to improve fish harvest: Using remote sensing, the Coimbatore based Sapience Softwares has developed a fish-forecasting model aimed at tackling problems related to fish stock assessment. The application is understood to have reduced search time of the fisherfolk by 25-40 per cent.

(Business Line, 13 June 2002)

Indian President calls for space force to protect satellites: President his Excellency Dr. A.P.J. Kalam has issued a call for international space force to protect satellites from any war that may spill into space. " I am sure India would contribute its best to the creation and sustenance of such an international space force" Kalem said Jan. 4, 2003 at the space summit hosted by Indian Space Research Organistion.

(Space News, January 2003)

NEW PRODUCTS LAUNCHED

ERDAS Imagine 8.6: ERDAS Imagine 8.6 is the latest release of the ERDAS Inc.'s industrial-strength image processing and geospatial analysis system and its first release since ERDAS became part of Leica Geosystems. Version 8.6 represents a significant upgrades with many new capabilities. One of the most visible changes is in a new (optional) user interface called the Geospatial Light Table (GLT).

ArcGIS 8.3: The new version features rule based Geo-database topology, linear referencing, editing enhancements and disconnected editing. The new extensions to the software are ArcScan, ArcGIS Survey Analyst, ArcGIS Tracking Analyst.

INTERNET RESOURCE FOR GIS: The Idaho State University (ISU) GIS training and research center web site (**http://giscenter.isu.edu**) is designed to help users learn GIS and obtain free geospatial data. Web site offers a wide range of resources, including on line "Principal of GIS" course as well as details about other GIS classes. The GIS center maintains about 11,000 geospatial datasets available for free download.

MODIS AND ITS ROLE IN ESTIMATION OF LAND SURFACE PARAMETERS

R.P.Singh and V.K.Dadhwal

Space Applications Centre (ISRO), Ahmedabad-15

The land surface processes play an important role in regional/ large–scale climate modeling due to their role in providing the surface boundary conditions to energy/water exchange with the atmosphere. Land is a major component of climate system, but inclusion of land biophysical processes in climate models is still relatively simplistic. Remote sensing from satellites provides the only means of obtaining regular global land data to force and validate land surface processes in the climatic models. Land-atmosphere interactions have traditionally been described in terms of four sub-disciplines: biogeophysical fluxes, biogeochemical fluxes, hydrology, and ecosystem dynamics. The land surface parameters such as surface albedos (direct beam and diffuse for visible and near-infrared wavebands), upward longwave radiation, sensible heat flux, latent heat flux, and surface wetness forms some of the important inputs in climate modeling.

Global data available from Earth Observing System (EOS) -Terra and Aqua's instruments have potential to identify the land use and land cover change, including those over which humans exert some influence. Estimation of key land surface parameters will help in global change research by relating the underlying processes of change and their manifestation. High quality, consistent and well-calibrated satellite measurements are needed to detect and monitor changes and trends in these variables. The Moderate Resolution Imaging Spectroradiometer (MODIS) instrument, which was launched on the Terra platform on December 18th, 1999, is designed to observe and monitor the surface of the Earth in a wide spectral range, moderate spatial resolution of 250m to 1km, with near daily global coverage. A brief background to MODIS sensor (Table 1) and the information on the various available land data products is covered in this article.

MODIS Design Concept: The MODIS instrument provides high radiometric sensitivity (12 bit) in 36 spectral bands ranging in wavelength from 0.4 μm to 14.4 μm. The responses are custom tailored to the theme specific needs of users and provide exceptionally low out-of-band response. Two bands are imaged at a nominal resolution of 250 m at nadir, with five bands at 500 m and the remaining 29 bands at 1,000 m. A ±55-degree scanning pattern at the EOS orbit of 705 km achieves a 2,330-km swath and provides global coverage every one to two days. The Scan Mirror Assembly uses a continuously rotating double-sided scan mirror to scan ±55-degree driven by a motor encoder built to operate at 100 percent duty cycle throughout the 6-year instrument design life. The optical system consists of a two-mirror off-axis afocal telescope which directs energy to four refractive objective assemblies; one for each of the VIS, NIR, SWIR/MWIR and LWIR spectral regions.

MODIS Land Surface Products: The data products have been designed by MODIS Land Group (MODLAND) to remove the burden of certain common types of data processing from the user community and meet the more general needs of global-to-regional monitoring, modeling, and assessment. The land surface products have been categorized mainly in three category, viz. Radiation budget variables, Ecosystem variables and Land cover characteristics. The salient point of each product type (along with product no.) is discussed below.

(1) Radiation Budget Variables

Surface Reflectance/Atmospheric Correction Algorithm Products (MOD09): The surface reflectance product is the input for product generation for several land products: Vegetation Indices (VIs), BRDF, thermal anomaly, snow/ice, and Fraction of absorbed Photosynthetically Active Radiation/Leaf Area Index (FPAR/LAI). Simultaneous retrieval of atmospheric characteristics from MODIS channels are used as input for atmospheric correction of reflectance data.

Land Surface Temperature (LST) and Emissivity (MOD11): Surface temperature is a

good indicator of both the energy balance at the Earth's surface and the greenhouse effect because it is one of the key parameters in the physics of the land-surface processes. It is required for a wide variety of climate, hydrological, ecological, and biogeochemical studies. With a number of narrow channels in 8-12 μm region, emissivity retrieval with higher accuracy than many previous sensors like NOAA-AVHRR, LANDSAT- TM is achieved.

Snow and Ice Cover (MOD10): Snow cover, with its high albedo, is a key parameter of the global energy balance, reflecting much of the incident solar radiation back to space. With SWIR channel, both snow mapping & characterization is achieved.

BRDF and Albedo (MOD43): The reflectance of the surface of the Earth depends on the direction of viewing and solar illumination because of the optical and structural properties of the surface elements. The bidirectional reflectance distribution function (BRDF) describes this dependence and may be used to normalize observed reflectances to a standard view and illumination geometry. It may also be interpreted in terms of surface properties. The albedo is closely related to the average surface reflectance over all angles as a function of solar angle. It is a key parameter controlling the global radiative budget. Using multiple view angle generated during a fixed period (i.e. 8 days), a simple semi-empirical fit provides coefficients for BRDF kernel.

(2) Ecosystem Variables

Vegetation Indices (MOD13): Vegetation indices are used for global monitoring of vegetation conditions. The VIs are used as input in the land cover and land cover change products. They also play an important role in the derivation of the FPAR, LAI, and thermal products. An enhanced vegetation index (EVI) which uses blue, red and NIR has been proposed.

Leaf Area Index (LAI) and Fractional Photosynthetically Active Radiation (FPAR) (MOD15): LAI defines an important structural property of a plant canopy which is the one-sided leaf area per unit ground area. FPAR measures the proportion of available radiation in the photosynthetically active wavelengths (400 to 700 nm) that a canopy absorbs.

Vegetation Production, Net Primary Productivity (NPP) (MOD17): This product provides an accurate measure of terrestrial vegetation growth and production activity. It uses LAI/FPAR products over an annual cycle , insolation estimates from other sources and a detailed model on conversion of respiration efficiency to compute NPP.

Evapotranspiration & Surface Resistance (MOD16): These two parameters are essential for global modeling of climate, water balance and gas traces. In addition, they are required in estimating photosynthesis, respiration, and net primary production.

(3) Land Cover Characteristics

Fire and Thermal Anomolies (MOD40): Fire is an important ecosystem process and source of trace gas emissions. This product identifies the location and timing of fires. The product includes fire occurrence (day/night), fire location, the logical criteria used for the fire selection and an energy calculation for each fire.

Land Cover (MOD12): This is a seasonal product important for biophysical and biogeochemical parameterization and is used as input to global and regional scale models of climate, hydrologic processes, and biogeochemical cycling.

Vegetative Cover Conversion (MOD44): This product uses the 250m Surface Reflectance products to detect and label changes in land cover.

Vegetation Continuous Fields: This product produce 1km global fields of percent cover for basic land cover types.

Almost every day over the entire globe, the sensor monitors changes on the land surface, thereby building upon and extending the heritage begun by Landsat. MODIS maps the areal extent of snow and ice brought by winter storms and frigid temperatures. The sensor observes the "green wave" that sweeps across continents as winter gives way to spring and vegetation blooms in response. It sees where and when disasters strike—such as volcanic eruptions, floods, severe storms, droughts, and wildfires. MODIS' bands are particularly sensitive to fires; they can distinguish flaming from smoldering burns and provide better estimates of the amounts of aerosols in the atmosphere.

Table 1: MODIS Technical Specifications

Orbit:	705 km, 10:30 a.m. descending node (Terra) or 1:30 p.m. ascending node (Aqua), sun-synchronous, near-polar, circular
Scan Rate:	20.3 rpm, cross track
Swath Dimensions:	2330 km (cross track) by 10 km (along track at nadir)
Telescope:	17.78 cm diam. off-axis, afocal (collimated), with intermediate field stop
Size:	1.0 x 1.6 x 1.0 m
Weight:	228.7 kg
Power:	162.5 W (single orbit average)
Data Rate:	10.6 Mbps (peak daytime); 6.1 Mbps (orbital average)
Quantization:	12 bits
Spatial Resolution:	250 m (bands 1-2) 500 m (bands 3-7) 1000 m (bands 8-36)
Design Life:	6 years

Primary Use	Band	Bandwidth[1]	Spectral Radiance[2]	Required SNR[3]
Land/Cloud/Aerosols Boundaries	1	620 - 670	21.8	128
	2	841 - 876	24.7	201
Land/Cloud/Aerosols Properties	3	459 - 479	35.3	243
	4	545 - 565	29.0	228
	5	1230 - 1250	5.4	74
	6	1628 - 1652	7.3	275
	7	2105 - 2155	1.0	110
Ocean Color/ Phytoplankton/ Biogeochemistry	8	405 - 420	44.9	880
	9	438 - 448	41.9	838
	10	483 - 493	32.1	802
	11	526 - 536	27.9	754
	12	546 - 556	21.0	750
	13	662 - 672	9.5	910
	14	673 - 683	8.7	1087
	15	743 - 753	10.2	586
	16	862 - 877	6.2	516
Atmospheric Water Vapor	17	890 - 920	10.0	167
	18	931 - 941	3.6	57
	19	915 - 965	15.0	250
Surface/Cloud Temperature	20	3.660 - 3.840	0.45(300K)	0.05
Atmospheric Temperature	21	3.929 - 3.989	2.38(335K)	2.00
	22	3.929 - 3.989	0.67(300K)	0.07
	23	4.020 - 4.080	0.79(300K)	0.07
	24	4.433 - 4.498	0.17(250K)	0.25
Cirrus Clouds Water Vapor	25	4.482 - 4.549	0.59(275K)	0.25
	26	1.360 - 1.390	6.00	150(SNR)
Cloud Properties	27	6.535 - 6.895	1.16(240K)	0.25
	28	7.175 - 7.475	2.18(250K)	0.25
	29	8.400 - 8.700	9.58(300K)	0.05
Ozone	30	9.580 - 9.880	3.69(250K)	0.25
Surface/Cloud Temperature	31	10.780 - 11.280	9.55(300K)	0.05
Cloud Top Altitude	32	11.770 - 12.270	8.94(300K)	0.05
	33	13.185 - 13.485	4.52(260K)	0.25
	34	13.485 - 13.785	3.76(250K)	0.25
	35	13.785 - 14.085	3.11(240K)	0.25
	36	14.085 - 14.385	2.08(220K)	0.35

Satellite Stereo Photogrammetry for Himalayan Glacier Mass Balance Estimation

Ishmohan Bahuguna
Space Applications Centre (ISRO), Ahmedabad

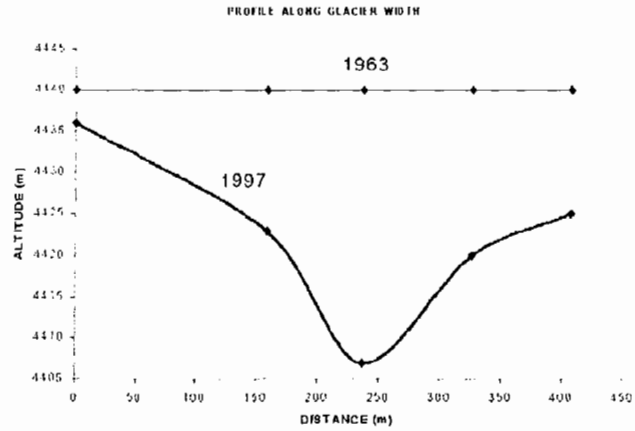
Development of digital satellite stereo photogrammetry from analog and analytical methods has come as a boon for Himalayan glaciological applications. The high altitude zones of Himalayan physiograhic regime in Indian subcontinent are bestowed upon with huge concentration of glaciers. These bodies of snow and ice are the perennial sources of freshwater feeding almost all the north Indian rivers and catering to need of domestic water requirements, micro mini and major hydroelectric projects and irrigation in hills and Indo Gangetic plains.

One of the vital glaciological applications is mass balance of glaciers. Glacial mass balance studies are concerned with change in the mass of a glacier and the distribution of these changes in space and time. Mass balance measurements at points are normally expressed as equivalent volumes of water per unit area. Thus they have dimensions of length. Variations in the rate of accumulation of snow and melting of ice from one year to other effects the mass of the glacier and ultimately in the rates of river flow. However it is not feasible to study all the glaciers by conventional field inventory every year due to rugged terrain and extremely cold climatic conditions in Himalayan region. Therefore stereo photogrammetric method can be conveniently used to monitor this glacial parameter. Satellite stereo data can be processed for automated extraction of digital elevation model (DEM). DEM can be used to make plannimetric and vertical measurements over the glacier surface. Use of satellite Photogrammetry in this application has been demonstrated in monitoring ice masses of Arctic or Antarctic ice sheets. Of course the other techniques such as laser terrain mapping (LTM) and radar interferometry are also gaining momentum in this field.

About seven stereo pairs of IRS 1C PAN sensor acquired covering glaciated region have been processed so far at Earth Sciences and Hydrology Division at Space Application Centre. IRS 1C PAN sensor acquires data in panchromatic range (0.50-0.75 m). It has a spatial resolution of 5.8m and dynamic range of 6 bit (saturation radiance 47 mw/sq. cm/str/micron). It can be tilted across track upto 26° either sides. It has 70 km swath. This capability can be used to generate stereo pair of desired B/H ratio. DEM has been generated using integrated software developed for processing of IRS 1C/1D panchromatic stereo data in digital mode using the softcopy photogrammetric workstation at Satellite Photogrammetry and Digital Cartography Division of Space application Centre.

Though the technique of change detection is simple but the task of generating a good DEM for hilly region is not so. There are mainly two factors, which control a generation of good DEM. First is the collection of good GCPs and the second is automatic image matching or registration of stereo images. Due to lack of man made features in mountainous terrains; identification of good GCPs becomes difficult. Mostly sharp bends of streams or confluences of streams are taken, as GCPs. GCPs can be collected using topographical maps or GPS operated in differential mode in the field. Both the sources are based on different ellipsoids. This causes little difference in the coordinates of Resulting DEM.

Image matching in glaciated region is governed by presence of snow, orientation of slopes of hills in two tilted images of stereo pair and different dates of pass of the satellite. Since snow has very high albedo, the PAN sensor gets saturated. Therefore, image matching is rendered poor in accumulation zone (snow covered part above equilibrium line). This results in poor accuracy of DEM. Glacier ice has substantially lower reflectance than snow, but higher than rocks and soil of the surrounding area. Zone of ice below equilibrium line is known as ablation zone. This



is the region where image matching is relatively not a problem. Therefore, it has a better accuracy than accumulation zone. The other reason for poor image matching in hilly region is because of one of the basic differences in aerial photogrammetry and satellite photogrammetry. In the former case the optical axis of the camera remains vertical or near vertical while taking the overlap of the area. In case of satellites the altitude is so high that overlap of adjacent paths with camera viewing nadir restricts the optimum B/H ratio. In order to compensate for this the camera has to be tilted from other paths to get the overlap and desired B/H ratio (> 0.5). This causes distortion in the images. In the mountainous region, distortion in the images results in poor image matching. Overlap from different paths is possible on different dates of satellite pass. This difference is very crucial in glaciology because different dates result in change in radiometry of the image due to solar elevation effects and melting of ice and snow. This too causes poor image matching.

In order to generate DEM with good accuracy in hilly region, the area of interest should be made as small as possible of course not below a threshold. One of the images should be nadir or near nadir viewing. Stereo pair can be generated in the workstation itself by choosing suitable images from existing pairs. This has been demonstrated for one of the region. Since glacial valleys are very broad and almost flat, the accuracy of DEM with 15 to 20m error can be obtained provided GCPs are well distributed and correctly identified. For this it is recommended that GCPs should not be chosen on high slopes and instead should be identified on riverbeds with gentle slopes. GCPs collected using DGPS in the field can improve the DEM however accessibility to such points in mountainous tracts has to be ascertained first. An example of using stereo data for estimating changes in the mass is presented here. Elevation profiles drawn across the valley of Shaune garang glacier of Basapa valley, Himachal Pradesh are shown here. The reference for this change is Survey of India topographical map of 1962 from where initial elevations of glacier surface are taken. Elevations derived from DEM generated using stereo images of 1998 are compared with SOI elevations. This glacier has been checked for deglaciation during the ground truth. A retreat of about 980m has been observed for this glacier since 1962. A maximum change of 35m in the thickness of ice in the middle of the glacier valley has been observed.

Cartosat –1 satellite is to be launched in near future. The satellite is planned to have sun synchronous orbit with two panchromatic cameras-fore and aft, with a fixed tilt of +26 and –5 degrees with respect to the nadir along the satellite ground track to provide a near real time along track stereo capability. The ground resolution of the above cameras is around 2.5m. The data with 10-bit radiometric quantisation level will not saturate over the areas with very high reflectance characteristics. This will help in better accuracy even in accumulation zone of the glacier.

Chapter's Activities

The Chapter engaged itself in many productive and innovative activities to promote the cause of remote sensing and facilitate exchange of ideas among the remote sensing users and experts. Details of some of the major activities are highlighted for the benefit of the readers.

- **WORLD ENVIRONMENT DAY CELEBRATION**

To bring awareness on environment related issues, June 5th is celebrated as World Environment Day. It was established by the United Nations General Assembly in 1972. It is a people's event with governments, individuals and community groups organizing activities to improve the environment.

On this occasion ISRS-AC and Gujarat Ecological and Educational Research (GEER) Foundation, Government of Gujarat jointly organized a popular lecture and visit to Indroda Nature Park , Gandhinagar on the occasion of World Environment Day on June 05, 2002. Lecture on, "Remote sensing for forestry and environment with special emphasis on forest damage study", was delivered by Dr. R.N. Jadhav, Scientist SG, SAC. Dr. J.P. Aggarwal, PCCF, Government of Gujarat, chaired the programme. The function was attended by around 100 officers of Gujarat Forest Department and members of the Chapter.

- **TREE PLANTATION PROGRAMME**

ISRS-AC, Gujarat State Forest Department and Ahmedabad Urban Development Authority (AUDA), jointly organized a tree plantation programme on July 27, 2002 to bring awareness regarding urban environment protection among school children, parents and family of ISRS-AC members. The site was along 132 ft ring road between Drive-in road and IIM - Vastrapur cross roads. Students of Kendriya Vidyalaya, SAC, Saint Xaviers, Mount Carmel, Tulip, Delhi Public School, CEPT and Gujarat University participated in the programme. Around 200 students participated in the programme. Around 400 saplings along with tree guards were put. The programme was inaugurated and graced by Dr. J.P. Aggarwal, PCCF, Govt. of Gujarat and Dr. A.K.S. Gopalan, former Director SAC.

- **NATIONAL REMOTE SENSING DAY CELEBRATION**

ISRS-AC and Nirma Institute of Technology, Ahmedabad jointly organized an exhibition on, "Remote sensing applications for natural resources survey and disaster management", for college students at Nirma Institute of Technology on August 12, 2002. Prof. H.V. Trivedi, Director, Nirma Institute of Technology inaugurated the exhibition. Dr. A.K.S. Gopalan, Director SAC and Shri A.R. Dasgupta, Deputy Director SAC also graced the occasion. A wide publicity to the event was given and response from college students was overwhelming. Around 1000 students visited the exhibition.

We provide a glimpse of the event through some the photographs taken during the occasion on the following page.

Tree plantation by School children

Shri J. S. Parihar, Chairman, ISRS-AC, having discussions during National Remote Sensing Day Celebrations with distinguished participants.

EDUCATION/TRAINING:

- **COMMERCIAL APPLICATIONS OF REMOTE SENSING AND GIS (CARG-2002)**

A one day Workshop on, "Commercial Applications of Remote Sensing and GIS" preceded by 4-day tutorials on, "Commercial Applications of RS & GIS with special emphasis on Geoinformatics for Environmental Impact Asessment", was organized jointly by ISRS-AC, Indian Society of Geomatics (ISG) and Value Added Services Cell of Space Applications Centre at State Remote Sensing Applications Centre, Goa. In all 53 participants mostly from corporate sector, participated in the Tutorials and around 100 Delegates attended the Workshop. Lecture notes and Proceedings were brought out as hardcopy prints as well softcopy on CD and were distributed to all participants. ISRS-AC mainly provided local support and technical expertise to organize the event.

- **WORKSHOP ON URBAN PLANNING AND INFRASTRUCTURE DEVELOPMENT**

Indian National Cartographic Association (INCA) organized an International Conference on "Convergence of Imagery, Information Maps" at Ahmedabad from October 30-November 01, 2002. Two days Pre-Conference Workshops on themes viz. I) Urban Planning and Infrastructure Development, ii) National Spatial Data Infrastructure (NSDI) and iii) Information extraction from high resolution imagery were organized. One of these Workshop on "Urban Planning and Infrastructure Development", was organized by ISRS-AC. In all twelve participants attended this Workshop.

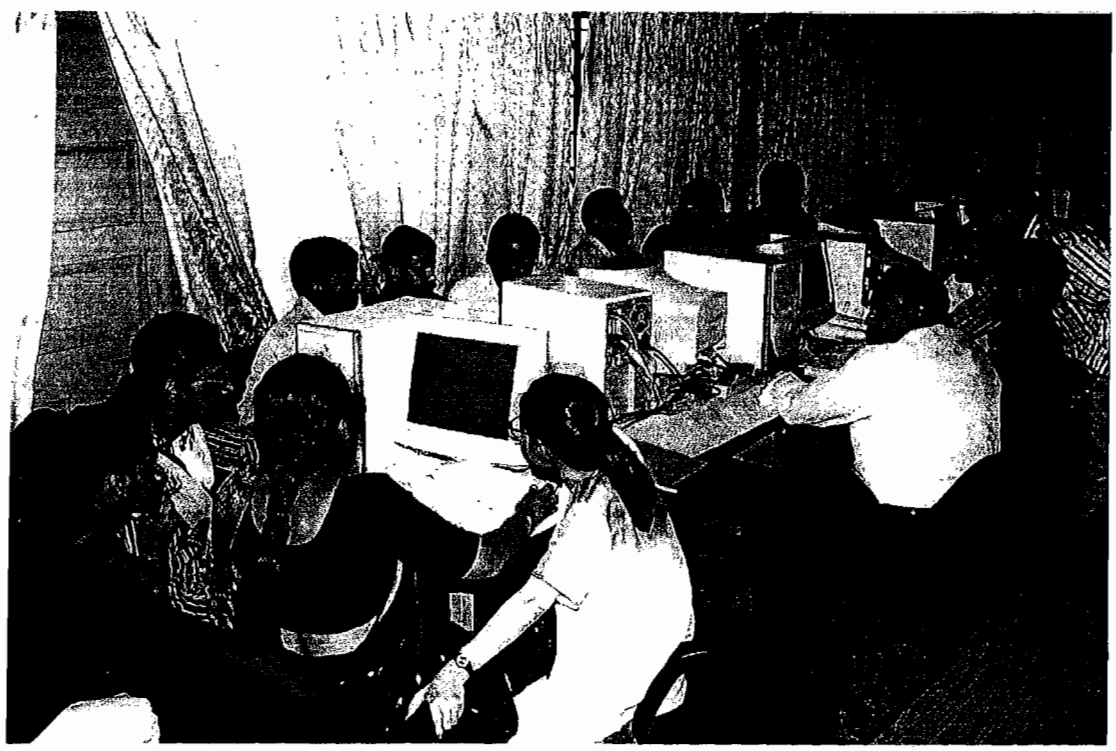
- **ISRS-2001 SYMPOSIUM**

Proceedings of the National Symposium of the Indian Society of Remote Sensing (ISRS) on, "Advances in Remote Sensing Technology with Special Emphasis on High Resolution Imagery", hosted jointly by ISRS-AC and Space Applications Centre (ISRO), Ahmedabad during December 11-13, 2001 was brought out on CD. Around 600 copies have been made. This CD is being released during the ISRS & ISPRS-TC-VII International Symposium on, "Resource and Environmental Monitoring" to be held at Hyderabad, India during December 03-06, 2002. Copies of the Proceedings shall be distributed to all the delegates of ISRS-2001 Symposium and shall also be available on sale to interested persons.

We provide a glimpse of the event through some the photographs taken during the CARG-2002 on the following page.

Lecture Session in progress during CARG-2002

Tutorial session in progress during CARG-2002



- **ISRS-AC WEB SITE**

  Web-site namely http: // www.isrs-ac.org is maintained and updated for disseminating information about chapter activities, notices, members profiles, major events of main Society and to increase professional interaction among the members and the remote sensing community at large etc. This has also resulted in minimizing the postal expenses and immediate dissemination of information. As on November 22, 2002 around 1300 hrs 3121 hits are recorded to this Website.

- **SUPPORT TO ISPRS COMMISSION VII**

  Website for ISPRS-Technical Commission VII is being maintained by ISRS-AC.

SCIENTIFIC MEETINGS

- **PROF. P.R. PISHAROTY SERIES LECTURE (April 05, 2002)**

  Prof. P.R. Pisharoty Series Lecture (7th Lecture) was organized on April 05, 2002 at Space Applications Centre (ISRO), Ahmedabad. The lecture was delivered by Prof. Y.K. Alagh, on "Sustainable Economic Policy for Forestry Sector". The lecture was well attended by around 200 members of the Society and invited guests from SAC and PRL.

- **SPECIAL LECTURE (October 22, 2002)**

  Special lecture was organized jointly by ISRS-AC, Indian Society of Geomatics, Ahmedabad Chapter (ISG-AC), Indian Meteorological Society, Ahmedabad Chapter (IMSA) and Gujarat Branch of Indian National Cartographic Association (INCA) on October 22, 2002 at Space Applications Centre (ISRO), Ahmedabad to honor and felicitate Dr. A.K.S. Gopalan, Director SAC on his sixtieth birth-day. The lecture was delivered by Dr. A.K.S. Gopalan, Director, SAC, on "Indian Space Programme: My Experiences and Vision". The lecture was well attended by around 250 members of all four Societies.

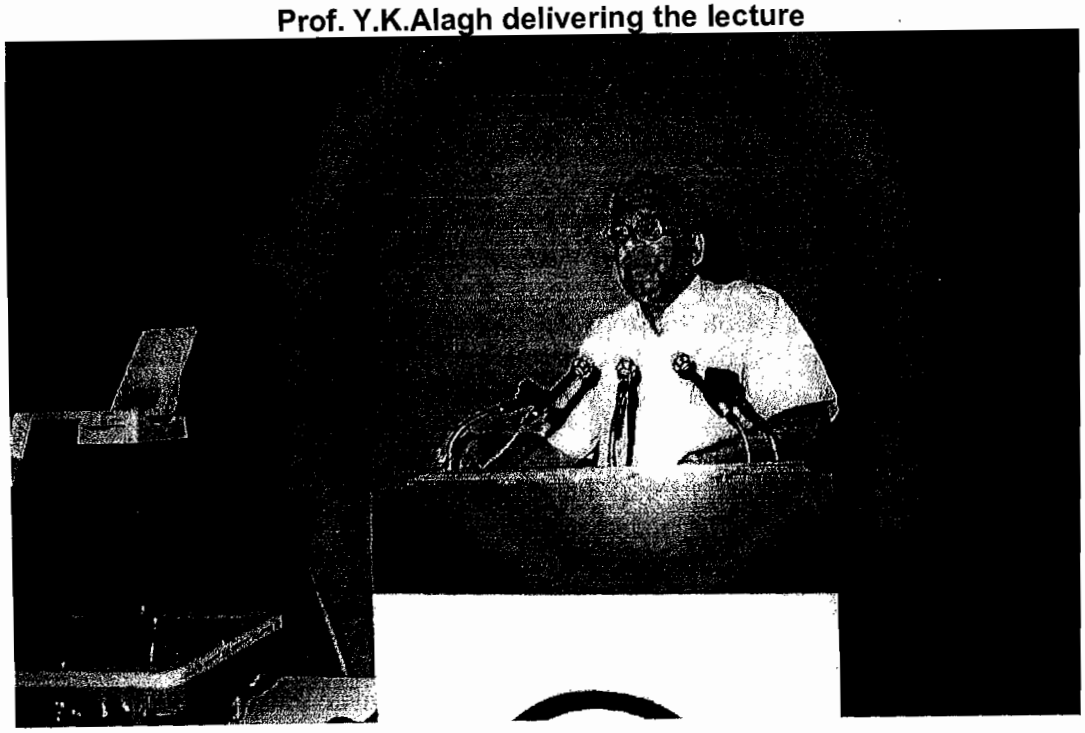
- **Shri L.N. Calla Memorial Lecture Series (March 05, 2003)**

  A lecture was jointly organized by ISRS-AC and Centre for Environmental Planning and Technology (CEPT), Ahmedabad for Shri L.N. Calla Memorial Lecture Series on March 5, 2003 by Shri P. Panneerval, IAS, Municipal Commissioner, Ahmedabad Municipal Corporation on "Liveraging Technology for better Governance".

We provide a glimpse of the event through some the photographs taken during the Prof. P.R. Pisharoty lecture series on the following page.

Glimpses of Prof. P.R. Pisharoty lecture series

Prof. Y.K.Alagh delivering the lecture



A token of appreciation from the chapter to Prof. Alagh being handed over by Controller SAC.

Prof. P. R. Pisharoty (1909-2002)

The sad demise of Prof. P.R. Pisharoty, father of Indian remote sensing program and noted meteorologist, on September 24, 2002, had left world scientific community with a sense of great loss as one of its pioneering member had left for his final journey.

Prof. Pisaroty was born at Kollengode village of Palghat district of Kerala, on Febuary 10, 1909. He graduated from University of Madras in 1931 in Physics and subsequently joined research under Prof. C.V. Raman at Indian Institute of Sciences, Bangalore. He got associated with India Meteorological Department, Government of India in 1942. He got his Ph.D. from University of California in 1954 and joined Alibaug Magnetic Observatory at Colaba, Mumbai and later became Director of the Institute of Tropical Meteorology, Pune. Prof. Pisharoty joined Physical Research Laboratory, Ahmedabad in 1967 and later he became Director, Remote Sensing and Satellite Meteorology at Space Applications Centre, Ahmedabad.

The famous experiment on coconut-wilt-root disease in Kerala, which was conducted by Prof. Pisharoty in 1969, became the founding stone of the Indian remote sensing program. His contribution to remote sensing and meteorology is beyond any description. Indian Society of Remote Sensing-Ahemdabad chapter would always draw inspiration from words and deeds of this 'Karmayogi'.

New Satellite Launches

- ADEOS-II, now renamed as Midori-2 was launched on December 14, 2002 from Japan and started working successfully on January 10, 2003. It has got a variety of earth observation sensors on-board such as, POLDER, GLI, SeaWiNDS,ILAS-II and AMSR.
- First dedicated meteorological satellite of India "METSAT" was launched by ISRO on Sept. 12, 2002. (http://www.isro.org)
- MODIS-AQUA was launched on May 4, 2002 by NASA. Find more details on http://aqua.nasa.gov/.
- SPOT-5 with a PAN camera of 5m resolution was launched on May 4, 2002 by CNES. (http://www.spotimage.fr/)
- ENVISAT satellite of ESA was launched on March 1, 2002 it has multiple environmental payloads such as MERIS, ASAR etc. (http://envisat.esa.int)
- Gravity Recovery and climate experiment (GRACE) was launched on March 17, 2002 by NASA the twin satellites will be useful to provide finer details of Earth's gravity field. (http://www.csr.utexas.edu/grace/)

Know more about our Environment

(Complied by Dr. Abha Chhabra, SAC)

Few relevant environmental websites

http://www.unep.net

- This recently developed website from United Nations Environment Programme (UNEP http://www.unep.org) promotes UNEP's programme of partnership and cooperation in preserving the environment. This site brings together a lot of information and data on current environmental issues, future environmental challenges and at the same time facilitates their exchange through Internet. The site also provides access to remote databases that are constantly updated and generally available free of charge.
  (Source: Down to Earth 31 January, 2003)

http://www.unfccc.de/

- United Nations Framework Convention On Climate Change (UNFCCC)

http://www.foe.co.uk/climatechange/real.html

- The world's top climate scientists now agree that our climate is changing, and probably for the worse.

http://www.ipcc-nggip.iges.or.jp

- Intergovernmental Panel on Climate Change (IPCC) - established by the World Meteorological Organization (WMO)

http://ipcc-ddc.cru.uea.ac.uk/

- The IPCC Data Distribution Centre Gateway

http://www.tip.net.au/~edmonds/greenhouse/whatis.html

- what the greenhouse effect is, and how it is responsible for warming the atmosphere. The greenhouse effect has been described as potentially the most

http://www.iea.org/ipcc.htm

- IPCC/OECD/IEA Programme for National Greenhouse Gas Inventories

http://www.geocities.com/Athens/Parthenon/5173/greenhouse_effect.html

- An overview about the Greenhouse Effect and Global Warming.

http://www.geic.or.jp

- GLOBAL ENVIRONMENTAL INFORMATION CENTRE

http://www.wotr.org

- Watershed Organization Trust (WOTR) instituted under the auspices of the Indo-German Watershed Development Programme provides information and help in all conceivable areas of watershed management. More information on concept and how to implement the concept of water harvesting is available on this site.

Few relevant websites related to Remote Sensing and Environment

http://www.spie.org/info/ae/

- Remote Sensing of the Atmosphere, Environment, and Space

http://ice.ucdavis.edu/echo/remote_sensing.html

- The Information Center for the Environment

http://www.frf.usace.army.mil/duck94/exp7.html

- Airborne Remote Sensing of the Environment in the Littoral Zone

http://rouge.engr.wisc.edu/cee/courses/cee352.html

- Remote Sensing and Forest Monitoring

RECENT NEWS

- **Satellite mapping of India's forests finishes first phase**

  The digital mapping of rich flora spread over an area of about 84, 000 sq kms. Has been finished under a joint programme undertaken by Department of Biotechnology, Department of Space, and Union Ministry of Environment of Forests. The first phase of mapping covered 46 percent of total forest cover in biodiversity hotspots of North East, Western Himalayas, and Western Ghats with the aid of state-of-the-art satellite technology. This research will benefit international scientific community and also expected to facilitate bioprospecting in India.

(Source: Down to Earth 28 February, 2003)

- **Indo-French satellite to help forecast drought**

  Megha Tropiques, a satellite currently under construction by Indian Space Research Organization (ISRO) in collaboration with French Space Agency Centre National d'Etudes Spatiales. The satellite will be placed in low earth orbit by a polar satellite launch vehicle and expected to be launched in 2006. Megha Tropiques will provide frequent measurements of a number of parameters related to the water cycle and energy budgets. Such data is expected to improve invaluable tool for forecasting drought conditions in tropical regions.

  (*Down To Earth 28 February, 2003*)

AMAZING FACT

- In India, over 170 million people do not have access to safe water and 69% of population lack adequate sanitation. Only around 217 towns and cities out of a total of 3, 119 have any kind of treatment for waste water.

  (*Down to Earth 31 January, 2003*

Silver Lining

- Dr. K. N. Shankara, Life Member of ISRS-AC has joined as Director, Space Applications Centre, Ahmedabad. The ISRS-AC family extends hearty welcome to Dr. Shankara at SAC and wishes him a very fruitful tenure as Director, SAC

- Four life members of the chapter have been awarded Astronautical Society of India (ASI) annual awards. Prof. P. D. Bhavsar, Former SAC Director, has been awarded Aryabhata award for the year 1999. Dr. K. N. Shankara, Director, SAC and Dr. A. R. Dasgupta, Dy. Director, SAC has been awarded ASI award for the year 2000. Dr. V.S. Iyengar, Visiting Scientist, SAC and Dr. K.L. Majumdar, Group Director, SIPG/SIIPA, SAC has been awarded ASI award for the year 1999. Many congratulations to all of them.

Prof.P.D.Bhavsar

Dr. A.R. Das Gupta

Dr. K.L.Majumdar

- Dr. Baldev Sahai, senior member of ISRS-AC and former Dy. Director of Remote Sensing Area, Space Applications Centre, Ahmedabad was conferred with ISRS Bhaskara Award for the year 2000 for his life-time contributions to remote sensing at the inaugural function of ISPRS TC VII International Symposium & ISRS Annual Convention held at Hyderabad. ISRS-AC wishes him hearty congratulations.

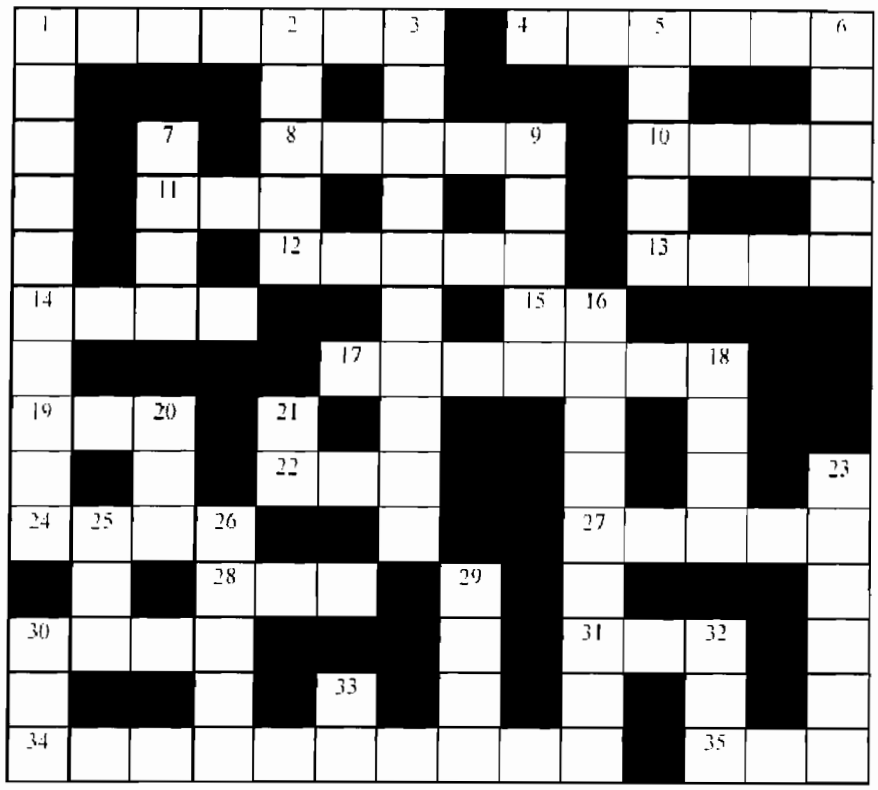
- Dr. Shailesh Nayak, former Chairman of ISRS-AC has been appointed as Chairperson, of ISPRS working group VII/3 on "Integrated monitoring system for resources management. ISRS-AC wishes him many congratulations.

- Shri R.K. Sarangi, Life member of ISRS-AC was awarded best paper award for publication in Journal Indian Society of Remote Sensing (JISRS) for the year 2001, for his contribution entitled "Chlorophyll-a concentration along west coast of India usingISR-P3 MOS-B data". Many Congratulations.

- Ms. Abha Chhabra, life member of ISRS-AC was awarded Doctor of Philosophy (Ph. D.) degree by Maharshi Dayanand Saraswati University, Ajmer on her thesis work on "Spatial Modelling of carbon pools and fluxes of terrestrial biosphere of India". Many Congratulations.

LEISURE CORNER

Crossword



(Designed by R .K. Sarangi, SAC)

Across

1. Atmospheric particles (7)
4. Part of an eye (6)
8. Future Indian Radar Satellite (5)
10. An Indian association of Engineers (4)
11. A deadly virus (3)
12. DEM generation technique (5)
13. Data transfer rate (4)
14. An American Remote Sensing Journal (4)
15. Characteristics of atmospheric attenuation (2)
17. Two space agencies of Europe (4,3)
19. A vegetation index (3)
22. An UN organization for natural resources (3)
24. The new European currency (4)
27. Process of mapping (5)
28. Dimensional parameter (3)
30. Radiate in terms of temperature (4)
31. International Oceanographic Authority (3)
34. The principle of absorbing (10)
35. Global observation program (3)

Down

1. Blanket around the earth (10)
2. A vegetation index-acronym (5)
3. Indian remote sensing camera (4,6)
5. The path of satellité (5)
6. Japanese Space Mission (5)
7. An INSAT payload (4)
9. An American sensor (5)
16. A technical acronym for identification (9)
18. Thermal infrared sensor of ERS (4)
20. An Institute for physical sciences at Gandhinagar (3)
21. Short term of a frequency used for communication purpose (2)
23. A synonym for our universe (6)
25. A projection system (3)
26. True planimetric projection (3)
29. A remote sensing software package (4)
30. Popular term used in ecological assessment (3)
32. Short form of an environmental institute at Ahmedabad (3)
33. Short term used in networking (2)

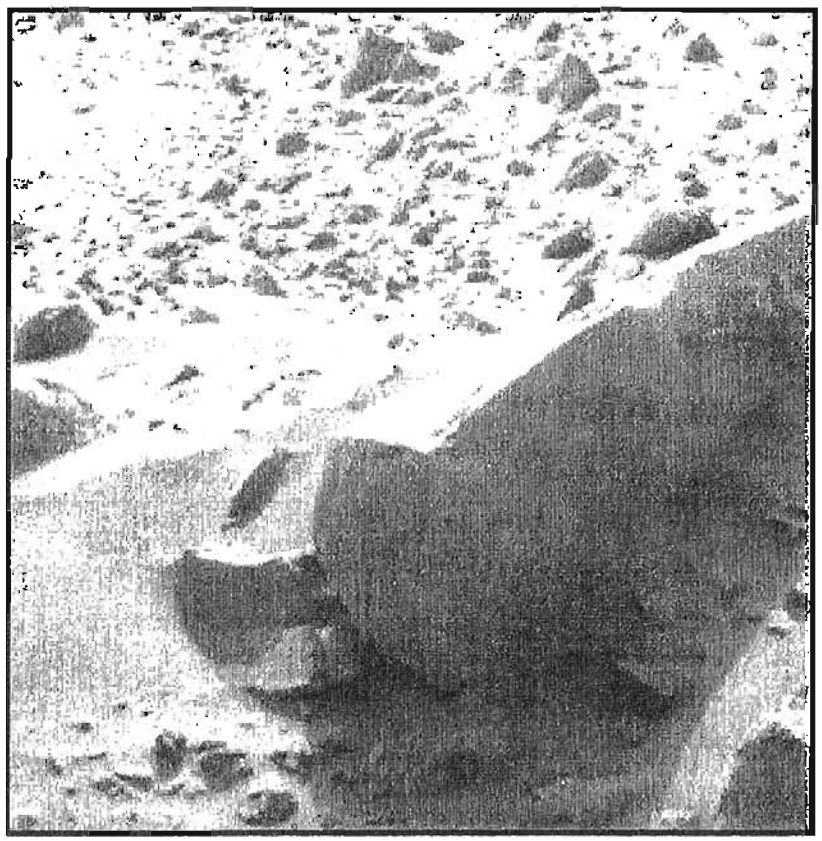
(Solution to this crossword can be found somewhere on another page of this issue)

ISRS

SIGNATURES

NEWSLETTER OF THE INDIAN SOCIETY OF REMOTE SENSING –AHMEDABAD CHAPTER

Volume-17 *No. 1* *Month- March* *Year –2004*



A ROCK ON MARS AS SEEN BY MARS EXPLORATION ROVER SPIRIT'S PANORAMIC CAMERA

IN THIS ISSUE

ARTICLES	PAGE NO.	REGULAR FEATURES	PAGE NO.
SITE SUITABILITY ANALYSIS FOR BIODIESEL PLANTS: A METHODOLOGY	03	BASKET SEARCH	13
NARROWBAND VEGETATION INDICES: RECENT ADVANCES	06	AWARDS AND HONOURS	14
2003 AN EVENTFUL YEAR FOR SPACE PROGRAMME IN INDIA	11	CHAPTER ACTIVITIES	15
A VISIT TO ANTARCTICA	21	RELAX ZONE	22
		NEW MEMBER'S LIST	21

Indian Society of Remote Sensing-Ahmedabad Chapter

Executive Council (2002-2004)

Chairman
Shri J. S. Parihar

Vice-Chairman
Ms. Anjana Vyas

Secretary
Dr. M.M. Kimothi

Jt. Secretary
Shri S.A. Sharma

Treasurer
Shri A.S. Rajawat

Members
Shri A. K. Sharma
Shri K. K. Mohanty
Shri K. R. Manjunath
Dr. S. M. Bhandari
Shri R. K. Arora

Chapter Update

The Ahmedabad chapter of Indian society of Remote Sensing has got additional strength in terms of new membership during 2003-2004. Five life members and one annual members have been enrolled during 2003-04. The table below shows the details of the membership.

Life members	376
Annual members	01
Sustaining members	04
Patron members	07

Editorial Board

Editor:
Dr. Sushma Panigrahy

Members:
Dr. S.S. Ray
Shri Prakash Chauhan

Front cover

This image, acquired by the Mars Exploration Rover Spirit's panoramic camera on the 53rd martian day, or sol, of the rover's mission, struck science and engineering teams as not only scientifically interesting but remarkably beautiful. The large, shadowed rock in the foreground is nicknamed "Sandia" for a mountain range in New Mexico. An imposing rock, "Sandia" is about 33 centimeters high (1 foot) and about 1.7 meters (5.5 feet) long

(Source: http://marsrovers.jpl.nasa.gov)

Site Suitability Analysis for Biodiesel plants: A methodology

C.P.Singh
VASC/RESIPA
Space Applications Centre, Ahmedabad

Introduction

Coupled with concern over diminishing fossil fuels soaring import bills & rising demand, and the continued rise in volume of vehicles on roads, there is a need to go for alternate fuels to propel the vehicles of the future. Biodiesel is one such alternate fuel. The biodiesel can be extracted from certain species of tree that are common in many parts of India, such as the Jatropha *carcus* (Rataan-jyot), Pongamia pinnaat (Karanja) and Mahua. These sturdy tree species grow easily, even in dry conditions and would be ideally suited for an estimated 70-130 million hectares of wasteland. Now the problem is to identify suitable land from these large wasteland areas for growing these plants. Further, the areas should fulfill the other requirements like its connectivity to the milling and processing centers as well as availability of the labour around to collect the seeds. This can be solved by using remote sensing and GIS technologies.

Objectives

The main objectives around which the methodology is crafted are:

1. Identification of sites suitable for plantation of biodiesel trees.
2. Zone identification for seed produce procurement / collection and oil expelling centers.
3. To devise a monitoring scheme for assurance of supply in required quality & amount for each region.

This will provide the concerned organisation(s) with sufficient information to:

- Make an assessment of the areas suitable for plantation activity based on the recent datasets for landuse, land-capability and socioeconomic status of the area.
- Make an assessment of the sites suitable for setting up the seed collection and processing units based on the proximity analysis to the transportation network and location of plantation area.

The Scheme

As Biodiesel is being produced from vegetation products, feasibility in terms of planting trees capable of producing raw material at commercial scale largely depends on the availability of land (mostly wasteland), demand and requirement, environmental fragility and priority, and socioeconomic condition of the region. Therefore, taking into consideration all these factors prevailing in Indian conditions could be studied using remote sensing and GIS (Geographic Information System) techniques. Due to its synoptic view capability, remote sensing tends to be the best technique available for land observation and due to its spatial data mining capability GIS turns to be the best technique available for prioritising areas for plantation of biodiesel trees.

The Project Team

The following subject matter expertise will be required and an empanelment can be made out of the experts available in each field:

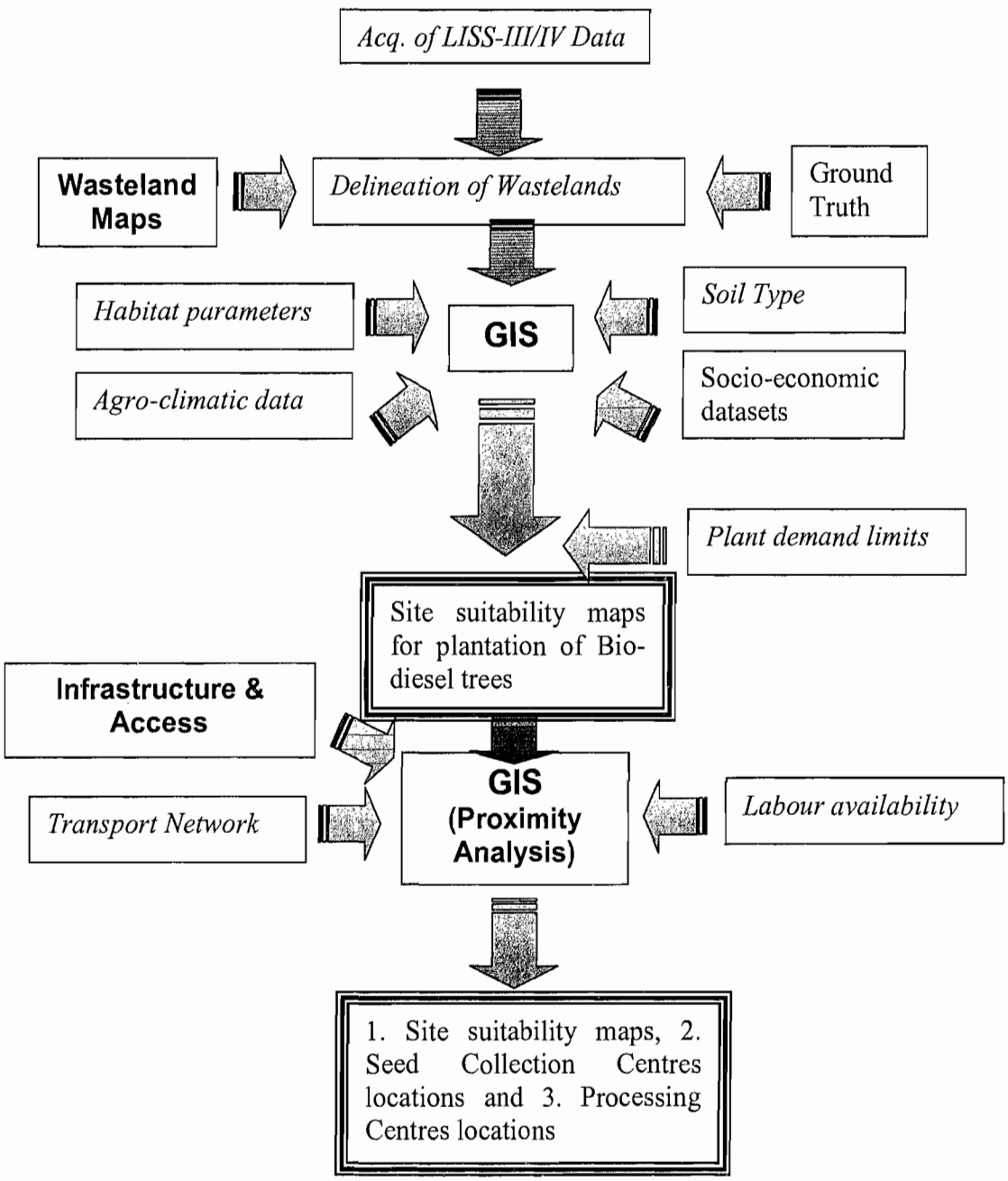
S.N.	Area of expertise
1.	Forest ecologist
2.	Soil scientist
3.	Biodiesel experts
4.	Remote sensing specialist
6.	GIS specialist

Advice on the various issues related to the formation of biodiesel would be an important input to generate a realistic scenario for the site suitability.

Methodology

Site suitability and feasibility analysis on the basis of availability of wastelands, rural poverty, agro-climatic conditions, and infrastructure for processing will be carried out as below:

Methodology flowchart



Sources

IRS LISS-III/IV data, Wasteland maps, and Soil Maps along with the socioeconomic status of the area from pertinent sources. Cloud free satellite data may be browsed for optimal landcover season. The acquisition presumes proper selection for maximum landcover feature segregation due to seasonality and thus the vegetation and other related natural features give varied spectral signatures. November to March time period provides better phenological conditions to understand different vegetation cover classes with deciduous vegetation.

High resolution PAN data may be acquired for the date of pass as that of the LISS- III/IV. Features with high degree of change need perfect matching in shape and pattern and the same should be ensured and the same day acquisition helps in achieving the perfect matching.

Query and Analysis

Once the data is developed we can begin to ask questions related to our project such as:

- Where are all the sites suitable for planting biodiesel trees?
- What is the dominant soil type for Jatropha?
- If we build a new approach road here, how will save the cost?
- How many houses lie within 100 m of this site?
- What is the total number of population having less than Rs.100 per day income (may be considered as labour) within 10 km of the proposed site?

  etc....

Outputs

The proposed methodology will give following outputs:

1. Site suitability maps for plantation of Biodiesel plants.
2. Site suitability maps Seed Collection Centres and Processing Centres.

The outputs can be more with widened scope of few more value added solution.

Conclusion:

Since biodiesel trees are locale specific and can grow in certain specific and harsh conditions, require planning before they get planted for commercial purposes. A site suitability study as well as monitoring using state of the art techniques like Remote Sensing and Geographic Information System (GIS) is important to harness the full potential of the land available for the purpose. Remote sensing data in conjunction with ground truth information and other collateral data can be used to facilitate the up-to-date repository of data in GIS domain. GIS can be a handy tool to retrieve, manipulate and query such spatial datasets to generate site suitability maps for planting biodiesel trees.

Narrowband (Hyperspectral) Vegetation Indices: Recent Advances

Shibendu S. Ray
Agricultural Resources Group,
Space Applications Centre, Ahmedabad
Email: ssray@sac.isro.org

Few years back we (Ray and Dadhwal, 1995) had written an article in this newsletter about the various vegetation indices and their usefulness. That article contained information about a few narrow-band indices. However, post 1995, a large amount of work has been carried out in developing and using narrow-band indices for quantifying biophysical characteristics. One of the reasons for this development is the availability of data from very high-spectral resolution (1-3 nm) ground based spectroradiometer and also airborne and spaceborne (e.g Hyperion of Terra mission) hyperspectral sensors. Also narrow-band indices have been shown to be crucial for providing additional information with significant improvements over broad-bands, in quantifying biophysical characteristics of agricultural crops, especially those related to crop phenology and stresses due to weeds, water and nitrogen. Thus introductory information on narrow-band indices might be useful to the remote sensing community.

1. Hyperspectral Data and Sensors

Conventional remote sensing is based on the use of several rather broadly defined spectral regions, where as hyperspectral remote sensing is based on the examination of many narrowly defined spectral channels (Campbell, 1996). Sensor system such as SPOT multi-spectral, IRS-LISS, Landsat - MSS and TM provide 3-7 spectral channels. Hyperspectral sensors can provide as many as 200 or more channels each only 10 nm or less wide. Although hyperspectral remote sensing applies the same principles and methods as conventional remote sensing, it requires specialized data sets, instruments, field data and software to the extent that it forms a specialized branch of remote sensing.

Like the other conventional remote sensing broadband data the hyperspectral data can also be available from sensor on-board three levels of platforms, satellite based, aircraft based (air-borne) and ground based.

Though there are many satellite-based sensors, which have provided narrow band data for land applications, including MOS-B on-board IRS P4, the first true satellite based hyperspectral sensor is Hyperion of NASA's EO-1 system. The Hyperion provides a high-resolution hyperspectral imager capable of resolving 220 spectral bands (from 0.4 to 2.5 μm) with a 30 meter resolution. The instrument can image a 7.5 km by 100 km land area per image and provide detailed spectral mapping across all 220 channels with high radiometric accuracy (http://eo1.usgs.gov/instru/hyperion.asp). Other upcoming hyperspectral sensors include hyperspectral imaging spectrometer with 105 spectral bands on-board Australian Resource Information Environmental Satellite-1 and Warfighter-1 with 200 channels onboard ORBVIEW-4. The various hyperspectral imagers flown on aircrafts include AVIRIS (Range: 380-2500nm; No. of Bands:224; Resol.:10nm); ISRO's AIS (Range:450-880nm; No. of Bands: 143; Resol.:3nm) and CCRS's CASI (Range: 458-1000 nm; No. Bands: 96; Resolution: 6.8nm). However majority of works on narrow-band indices have been carried using ground based sepctroradiometers. The two most common spectroradiometers are those of ASD (Analytical Spectral Devices) and GER. These instruments generally have spectral resolutions around 3 nm in visible and VNIR range and 10 nm in middle infrared range.

2. Narrow-band Indices

The reflectance and absorption features in narrow-bands are related to specific crop

physico-chemical characteristics such as biochemical composition, physical structure, water content, and plant ecophysical status (Strachan, 2002). Many studies indicate that broad band indices could be better predictors of photosynthetic capacity than narrow-band indices because the sensitive bands saturate too rapidly (Yoder, 1992). However, these broad band indices can be poor indicators of physiological changes at fine temporal scales under stress conditions because most physiological changes only produce changes at specific wavelengths of the reflectance pattern (Gamon et al., 1992). Penuealas et al. (1994) have classified narrow-band indices into three categories: i. Physiological indices, ii. Multivariate indices, and iii. Derivative analysis indices.

i. Physiological indices.

These indices are mostly simple ratio (SR) or normalized difference (ND) indices, located at specific wavelengths depending upon the typical absorption features of leaf pigments or leaf water. Leaf pigment (chlorophyll, carotenoid and anthocyanin) content can provide valuable insight into physiological performance of leaves. The chlorphylls have strong absorption peaks in the red and blue regions. However, since the blue peak generally overlaps with the absorption of carotenoids, it is not generally used for estimation of chlorophyll. In the red region the 660-680 nm has highest chlorophyll absorption. However it should not be used as it saturates with relatively low chlorophyll content. The ND and SR indices located at 750 and 700 are closely associated with chlorophyll content (Sims and Gamon, 2002). Penuelas et al. (1994) have developed an index called NPCI (Normalized Pigments Chlorophyll ratio Index, (R880-R430)/(R880+R430)), which is highly correlated to chlorophyll content. Since carotenoid absorption peaks overlap with that of chlorophyll, generally ratio of carotenoid to chlorophyll is estimated instead of absolute carotenoid. Such indices compare the reflectance of blue region with that of red region. The indices of this category include PRI (Photochemical Reflectance Index) developed by Gamon et al. (1992), SIPI (Structure Insensitive Pigment Index) developed by Penuelas et al. (1995) and PSRI (Plant Senescence Reflectance Index) developed by Merzlyak et al. (1999). These indices are defined as follows:

PRI = (R531-R570)/(R531+R570)
SIPI = (R800-R445)/(R800-R680)
PSRI= (R680-R500)/R750

PRI can estimate rapid changes in the relative levels of xanthophyll cycle and thus serves as an estimate of photosynthetic light use efficiency (Penuelas et al., 1995).

For detecting stress due to water, the water absorption band between 930-980 nm can be compared with a reference wavelength (900 nm), which does not absorb water. Such an index developed by Penuelas et al., (1993), is called WBI (Water Band Index) which is expressed by R970/R900. Similarly the WBR (Water Band Ratio) is defined as R960/R930. The water stress can be detected by a three-band ratio (TBR) developed by Pu et al. (2002), which is defined as follows:

TBR ={(Average (950~1000)}/0.5* {Average (860~930)+Average (1040~1075)}

The TBR tries to remove the linear reflectance effect and thereby enhances the water absorption feature.

ii. Multivariate Indices

In this, the entire spectral signature is used to estimate plant variables based on multiple variable analysis such as principal component analysis or discriminant analysis. The principal component analysis tries to derive a new set of uncorrelated (orthogonal) variables, thereby reducing the number of variables. It is a statistical technique to identify a relatively small number of factors that can be used to represent relationships among sets of many inter-related variables. In one of our studies, using spectroradiometer (300-1100 nm) for LAI estimation, we have found that the first four principal components (PC1, PC2,

PC3 and PC4) could explain 96 percent of the variance in the whole data set. The discriminant analysis is carried out to find out the most optimal hyperspectral band to discriminate (separate) between different land cover classes using multivariate reparability measures, such as Wilks' Lambda, Pillai's trace and Average canonical correlation. Thenkabail (2002) has found that to discriminate between agricultural crops (wheat, barley, chickpea, cumin, lentil and vetch) the six most optimum hyperspectral bands are 489,547,675,718,904 and 975 nm. The reflectance of these bands can be directly used to estimate biophysical parameters or can be used through indices like NDVI or SR.

iii. Derivative Analysis Indices

Demetriades-Shah et al. (1990) suggested that derivatives of canopy reflectance may be used to eliminate the contribution from soil background reflectance, thus improving the possibility of isolating the ecophysical state of the canopy. The derivative analysis indices are based on the shape of the spectral reflectance curve. Among these indices the most popular is the inflection wavelength of red edge. Red edge is the near infrared reflectance region between 670 – 780 nm. The red edge describes the position of the maximum slope of reflectance and defines the transition between the red and near infrared portions of the spectrum (Horler et al., 1983). The position and shape of red edge change under stress condition, hence indicator of plant parameters. The blue shift (shift towards lower wavelength) indicates stress condition, whereas the red shift (shift towards higher wavelength) indicates healthier condition. The red edge is characterized by inflection wavelength, which is the wavelength, at which the rate of increase of reflectance is the maximum.

Penuelas et al. (1994) have defined many derivative based indices, which are derived from the first and second derivative curves of spectral reflectance. They have also found that these indices have highly significant correlation with crop physiological parameters such as chlorophyll content, nitrogen content, water potential etc. These indices are described below.

dg - Minimum of the first Derivative Reflectance in the green, at approximately 570 nm
dG – Maximum of first Derivative Reflectance in the green, at approximately 525 nm
GGFN - Normalized difference between dG and dg = (dG-dg)/(dG+dg)
dRE – Maximum of the first Derivative of the reflectance in the red edge, at approximately 700-710 nm
EGFN – Normalized Difference between dRE and dG = (dRE-dG)/(dRE+dG)
ddg - Minimum of the second Derivative of Reflectance in the green, at approximately 530 nm
ddRE - Maximum of the first Derivative of the reflectance in the red edge, at approximately 690 nm.

iv. Spectral Absorption Features Indices

This is another set of indices, which are based on the characteristics of absorption troughs in the spectral curves. Absorption features in reflectance spectra are characterized in terms of their wavelength position (μm), depth, area and asymmetry (relative value) with a spectral normalizing technique. The absorption position is defined as the wavelength position of minimum reflectance of an absorption feature. The absorption depth is the depth of the feature minimum relative to the hull. The width of the absorption is the full width in half maximum, whose unit is μm. The absorption area is the area of the absorption feature which is the product of the depth and width. The asymmetry of an absorption feature is derived as the ratio of the area left of the absorption centre to the area right of the absorption centre. The spectral absorption features in 1650-1850 nm has been used to study the crop water status by Tian et al. (2001)

3. Conclusion:

The above-mentioned narrow-band indices can be efficiently utilized to characterize ecophysical

status of crops. Most of these indices have been used to estimate pigment content (especially chlorophyll), crop water status, leaf nitrogen content, leaf area index, photosynthetic light use efficiency. Many plant biochemical compositions (e.g. lignin, pectin and cellulose) can also be estimated using the typical absorption features of the organic compounds (Table 1). Thus in near future the narrow-band indices will be extremely useful in crop management at field scale and thus leading towards precision agriculture.

Reference:

Campbell, J. B. (1996) Introduction to Remote Sensing. Taylor and Francis. London. 622p.

Demetriades-Shah,T.H., Steven, M.D. and Clarke, J.A. (1990) Remote Sensing Environ. 33: 55-64.

Gamon, J.A., Penuelas, and Field, C. B. (1992) Remote Sensing Environ., 41: 35-44.

Horler, D.N.H., Dockray, M. and Barber J. (1983) Int. J. Rem. Sens. 4:273-288.

Merzlyak, M.N., Gitelson, A.A., Chivkunova, O.B. and Rakitin, V.Y. (1999) Physiologia Plantarum. 106:135-141.

Penuelas, J., Baret, F. and Filella, I. (1995). Phtosynthetica. 31:221-230.

Penuelas, J., Filella, I., Biel, C., Serrano, L. and Save, R. (1993). Int. J. Rem. Sens. 14(10):1887-1905.

Penuelas, J., Gamon, J.A., Fredeen, A.L., Merino, J. and Field, C. B. (1994). Rem. Sens. Environ. 48: 135-146.

Pu, R., Ge, S., Kelly, N.M. anmd Gong, P. (2003) Int. J. Rem. Sens. 24:1799-1810.

Ray, S. S. and Dadhwal, V. K. (1995) Signatures (Newsletter of ISRS-AC), 9(1&2):5-9.

Sims, D.A. and Gamon, J.A. (2002) Remote Sensing Environ. 81:337-354.

Strachan, I.B., Pattey, E. and Boisvert, J.B.(2002) Remote Sensing Environ., 80: 213-214.

Thenkabail, P. S. (2002) Rem. Sens. Rev. 20:257-291.

Tian, Q., Tong, Q., Pu, R., Guo, X. and Zhao, C. (2001) Int. J. Rem. Sens. 22(12):2329-2338.

Yoder, B.J. (1992) Photosynthesis of conifer: influential factors and potentials for remote sensing. Ph.D. Thesis, Oregon State University.

Table 1. Absorption features of some key plant materials

Material	Wavelength (nm)
A-carotene	420-500
B-glucan (a hemicullulose)	1450, 1770, 1930 2090, 2330, 2500
Carnauba wax	930, 1040, 1210, 1390, 1410, 1540, 1730, 1820, 1930, 2010, 2050, 2140, 2310, 2350, 2390, 2430
Cellulose	1480, 1930, 2100, 2280, 2340, 2480
Chlorophyll-a	380-450, 675
Chlorophyll-b	410-470, 610
D-ribulose 1,5-diphosphate carboxylase	1500, 1680, 1740, 1940, 2050, 2170, 2290, 2470
Humic Acid	1500, 1680, 1740, 1940, 2050, 2170, 2290, 2470
Lignin	400-700, 1920, 2300, 2340
Lutein (a xanthophyll)	400-500
Pectin (apple)	1440, 1720, 1920, 2090, 2240, 2360, 2480
Pectin (citrus)	980, 1190, 1440, 1560, 1680, 1730, 1780, 1930, 2080, 2250,
Protochlorophyll	410-470, 580
Starch	990, 1220, 1450, 1560, 1700, 1770, 1930, 2100, 2320, 2480
Tannic Acid	990, 1120, 1460, 1660, 1930, 2130, 2260, 2320, 2500
Xylan (a hemicellulose	1210, 1450, 1720, 1790, 1930, 2090, 2260, 2330, 2500

2003 AN EVENTFUL YEAR FOR SPACE PROGRAMME IN INDIA

The year 2003 was an eventful one for Indian Space Programme. Not only did ISRO enhance the space services by launching follow on satellites in the communication and remote sensing series but also took up new initiatives. The commissioning of geo-synchronous Satellite Launch Vehicle (GSLV) after its successful second test flight and the announcement of India's first scientific mission to the moon, Chandrayaan 1, by the Prime Minister on Independence Day were important mile stone of ISRO. Four satellites were launched during the year, two of them by Indian Launch Vehicles

The applications of space systems for various developmental tasks continued during the year. The telemedicine network using INSAT was further expanded. Pilot projects were initiated to prepare for the utilization of EDUSAT, an exclusive satellite for educational use, planned for launch in 2004.

The major events for ISRO during 2003 were:

April 10, 2003 – INSAT-3A Launch:

The multipurpose satellite, INSAT-3A, was launched. The communication payloads of INSAT-3A include 120C band, six upper extended C- band and 6 Ku-band transponders and a Satellite Aided Search Rescue Transponder. The metrological instruments include Very High Resolution Radiometer, Charge Coupled Devise Camera and Metrological data Relay Transponder.

May 8, 2003-GSLV-D2 Launch:

Developmental test flight of India's Geo-Synchronous Satellite Launch Vehicle (GSLV) was successfully carried out from Satish Dhawan Space Centre, Shar, Shriharikota. With this second successful test, GSLV was commissioned into service for launching 2000 kg class satellites into Geo0synchrous transfer orbit.

August 15, 2003-Chandrayaan -1 Announced:

The Prime Minister Announced, in his Independence Day Address, that India will undertake Chandrayaan-1, a scientific mission to moon. Chandrayaa-1 envisages placing a 525 kg spacecraft in the 100 km polar orbit of the moon. ISRO's Polar Satellite Launch Vehicle, PSLV, will launch the spacecraft. Chandrayaan-1is expected to be a forerunner for more ambitious planetary missions in the years to come.

September 1, 2003 – Madhavan Nair takes over as ISRO Chairman:

Mr G. Madhavan Nair, Director Vikram Sarabhai Space Centre, took over as chairman, ISRO, Secretary, Department of Space and Chairman, Space Commission. He took over from Dr. K. Kasturirangan, who was nominated as Member, Rajya Sabha.

September 28, 2003 – INSAT 3E Launched: INSAT-3E, the fourth satellite in the INSAT- 3 series, was launched successfully. The 2775 kg communication satellite carries 24 C-Band transponders an d12 upper extended C- band transponders.

October 17, 2003-PSLV Launches RESOURCESAT -1: In its eighth flight conducted from Satish Dhavan Space Centre (SDSC) SHAR, Sriharikota, ISRO Polar Satellite Launched Vehicle PSLV–C5, successfully launched the Indian Remote Sensing Satellite, RESOURCSAT -1, precisely into the 820 km Polar Orbit. RESOURCESAT -1 is the most advanced remote sensing satellite built by ISRO so far. It carries a high resolution Linear Imaging Self Scanner (LISS 4) with 5.8 meter spatial resolution, LISS-3 with spatial resolution of 23.5 meter and an Advanced Wide Field Sensor (AWiFS) with spatial resolution of 56 meter.

December 5, 2003 – Cryogenic Engine Tested: the indigenous cryogenic engine successfully undergoes endurance test. The engine, along with two steering engines as used in actual flight, was tested for 1000 seconds while it is required to operate for 720 seconds. The test marked an important milestone in the development of the indigenous cryogenic stage for GSLV.

FOREST COVER IN THE COUNTRY

Forest Survey of India (FSI) has been monitoring the forest cover of the country on a two year cycle, using data from remote sensing satellites, and presenting the results of assessments in the State of Forest Reports (SFR). The SFR 2001 is the eighth report in this sequence. **This is the first time that forest cover of whole country has been assessed digitally at 1:50,000 scale.** This is also the first time that tree cover that can not be captured by the remote sensing satellites, has been estimated through field survey and inventory. This provides the nation with complete picture of the extent of forest and tree cover in the country.

The present assessment shows that forest cover (20.55 %) and tree cover (2.48 %) constitute a healthy 23.03 % of the country geographical area. A comparison of forest cover assessment of 2001 with that of 1999 reveals that there is an overall increase of 38,245 km or 6.0 percent. This constituent an increase of 1.16 percent of the country's geographical area.

(State of Forest Report 2001 (Forest Survey of India, Ministry of Environment and Forests, Dehradun)

Basket Search

NEWS

ASIA

Indonesia to launch micro-satellite in 2005

Indonesia is set to launch its first imagery viewer micro-satellite in 2005 to carry out remote sensing of its territory and natural resources. The micro-satellite will operate in a polar-orbiting system. It would measure climatic temperature and humidity, record topography (including forests), monitor cloud cover and water bodies. It would also have a capability to receive, measure, process and transmit data from around the world.

(Http:/www.xinhuanet.com)

Iran aims for satellite launch

Iran Defense Minister has vowed that the country will launch a satellite of its own whin 18 months. "Iran will be the first Islamic country to enter the stratosphere with its own satellite and its own indigenous launch System"

(http://news.abc.co.uk)

INDIA

Dedicated Satellite for Health Purposes

India Plans to launch **"Healthsat"** – a dedicated satellite for telemedicine and health purposes, using an indigenous geosynchronous launch vehicle rocket by the end of 2005. The dedicated satellite would cost between US$ 13,44 m and US $ 22.4 m.

India to provide Satellite Imaging to Maldives

India will provide satellite imaging and aerial services to the Maldives for creating digital mapping of the island country. ISRO will set up a remote sensing unit in the Maldives for analyzing and updating the data.

India, US plan to cooperate in space

India and US are exploring possibilities of strengthening co-operation in the space sector. Both the government has agreed to to hold joint a joint space conference in Bangalore in June 2004. According to ISRO officials the areas of collaboration could include satellite communication, remote sensing, satellite navigation, search and rescue operations, earth observation, health and tele-education and medicine.

ISRO provides Satellite data on Inter-linking of rivers

ISRO has started providing satellite imagery data on river basins and water resources in the country to a task force on inter-linking of major rivers.

Israeli telescope to ride on GSAT -4

The ISRO and the Israel Space Agency (ISA) have agreed to co-operate for including the Tel Aviv University Ultra Violet Experiment TAUVEX, on board ISRO's GSAT-4 satellite planned for launch by India's GSLV during 2005.

The Municipal Corporation of Delhi (MCD) has come up with the idea of using satellite maps of Delhi to check unauthorized buildings and commercial misuse of residential properties.

India develops first space Robot

India is all set to launch its first "Space Robot" (SR), with an in-built 'RUDUC' communication signal processor, will be used to capture damaged satellites and space debris from crashing to Earth according to CSRDC (Communication Services Research and Development Centre) – CSRL (Communication and Space Research Labs) and ISRDO (Indian Satellite Research Development organization).

Space Imaging Signs deal with Antrix

The Space Imaging announced that it has signed an agreement with Antrix Corporation, a division of the Indian Space Research Organization (ISRO), to extend its sale and marketing agreement through 2010. The agreement gives space imaging exclusive rights to market and sell data from ISRO's RESOURCESAT – 1 (IRS-P6) satellite worldwide outside of India. The agreement also includes the Indian Remote Sensing (IRS) 1-C and IRS-1D and CARTOSAT (P-5) satellites.

ERDAS Imagine V8.7 now available

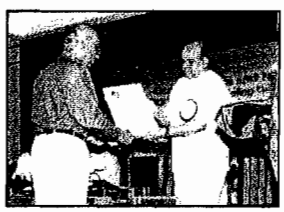
Leica Geosystems announced that ERDAS IMAGINE V8.7, a geographic imaging suite, is now shipping worldwide. The latest version of ERDAS IMAGINE features JPEG2000 support (including GeoJP2), improvements to its mosaic tool and a faster, smoother multi-threaded IMAGINE Geospatial Light Table (GLT) viewer, ERDA IMAGINE 8.7 is fully compatible with Leica Geosystem's new process-driven photogram metric software suite, the Leica Photogrammetry Suite.

Satellite images now in JPEG2000 FORMAT

WITH THE NEW Lurawave.jp2 GEO Edition, Aglo Vision LuraTech, a Germany based company, presents a new version of the proven JPEG2000 compression tool LuraWave.jp2 which is specially tailored to the requirements of the GIS sector. Developers and users of geoinformation systems now have access to a highly professional programme for the compression of aerial and satellite images in the JPEG2000 format.

Awards and Honours

- Dr. K. N. Shankara, Director, Space Applications Centre, Ahmedabad, has been honoured by Government of India with Padma Shree award for the year 2003 for his original contribution in the field of space applications.



- The Bhaskara Award for 2002 was awarded to Dr. A. K. S. Gopalan, former Director, Space Applications Centre, Ahmedabad during ISRS Annual Convention, 2003 at Thiruvananthapuram for his contribution in various areas of remote sensing such as data products and applications.

- Dr. Bhawani Singh Gohil, Scientist, OSD/MOG of Space Applications Centre, Ahmedabad has been awarded the prestigious "Shri Hari Om Ashram Prerit Dr. Vikram Sarabhai Research Award" for the year 2001 for his outstanding contributions in the field of Space Applications.

Chapter's Activities

The Chapter engaged itself in many productive and innovative activities to promote the cause of remote sensing and facilitate exchange of ideas among the remote sensing users and experts. Details of some of the major activities are highlighted for the benefit of the readers.

- **WORLD ENVIRONMENT DAY CELEBRATION**

ISRS-AC, Van Chetna Kendra, Vastrapur, Ahmedabad and Gujarat State Forest Department jointly organized an Exhibition on "Remote Sensing for National Development", at Van Chetna Kendra, Vastrapur, Ahmedabad on the occasion of "WORLD ENVIRONMENT DAY", on June 05, 2002. The exhibition was inaugurated by Director, Doordarshan Kendra, Ahmedabad. The exhibition was visited by large number of students, members and general public.

- **TREE PLANTATION PROGRAMME**

ISRS-AC, Gujarat State Forest Department and Ahmedabad Urban Development Authority (AUDA), jointly organized a tree plantation programme on July 19, 2003 to bring awareness regarding urban environment improvement among school children, parents, local people, and family of ISRS-AC members. Around 300 saplings were planted by students, members and local people in a AUDA plot at Vastrapur. The programme was inaugurated and graced by Dr. K.L. Majumdar, Dy. Director, RESIPA, Space Applications Centre (ISRO), Ahmedabad.

- **NATIONAL REMOTE SENSING DAY CELEBRATION**

ISRS-AC and Mount Carmel High School, Ahmedabad jointly organized a debate competition on "IS SPACE TECHNOLOGY USEFUL TO COMMON MAN" on August 13, 2003 for the students of XIth and XIIth standard and poster competition on theme of "MAN AND SPACE" for the students of VIIIth , IXth and Xth on August 11, 2003. Apart from Mount Carmel, 14 other schools of Ahmedabad took part in the programme.

(We provide a glimpse of al these events through some the photographs taken during the occasion on the following page)

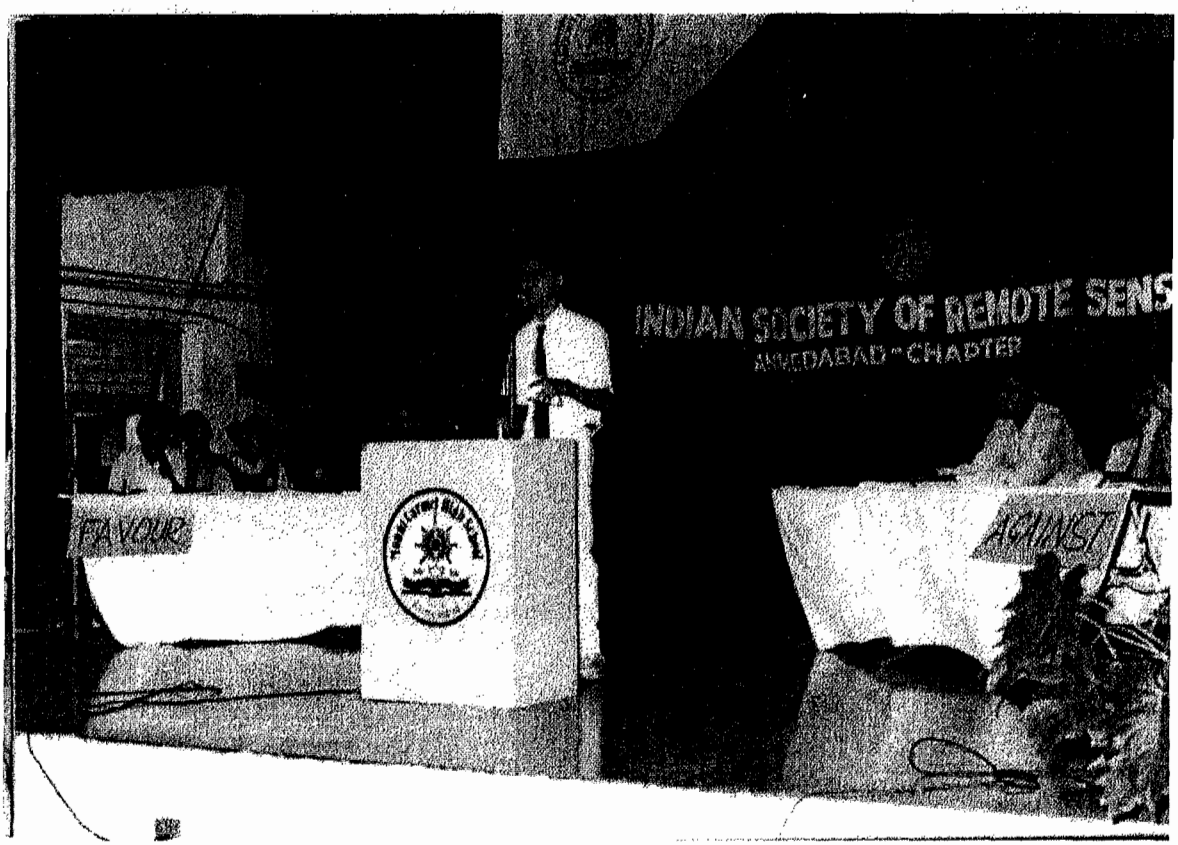
- **TECHNICAL INPUT FOR UPCOMING FOREST INFORMATION CENTRE**

Gujarat State Forest Department is planning to set up State level Forest Information Centre in Thaltej (near Centre for Environmental Education). On the request of State Forest Department ISRS-AC has provided technical inputs for formulating Forest Information Centre.

Tree plantation programme (July 19,2003)

Painting Competition on National Remote Sensing Day (August 11,2003)

Debate Competition on National Remote Sensing Day (August 11,2003)



- **SUPPORT TO ISRS /ISPRS COMMISSION VII WEBSITE**

Websites for ISPRS – Technical Commission VII and ISRS Nationals chapter are being maintained by ISRS-AC (Shri C. Patnaik and Dr S. S. Ray are webmasters for ISRS & ISPRS respectively).

- **ISRS-AC WEBSITE**

Website (http://www.isrs-ac.org) is maintained and updated by Shri K. K. Mohanty for disseminating information about chapter activities, notices, member's profiles, major events of main society and to increase professional interaction among the members and the remote sensing community at large. This has resulted in minimizing the postal expenses and immediate dissemination of information.

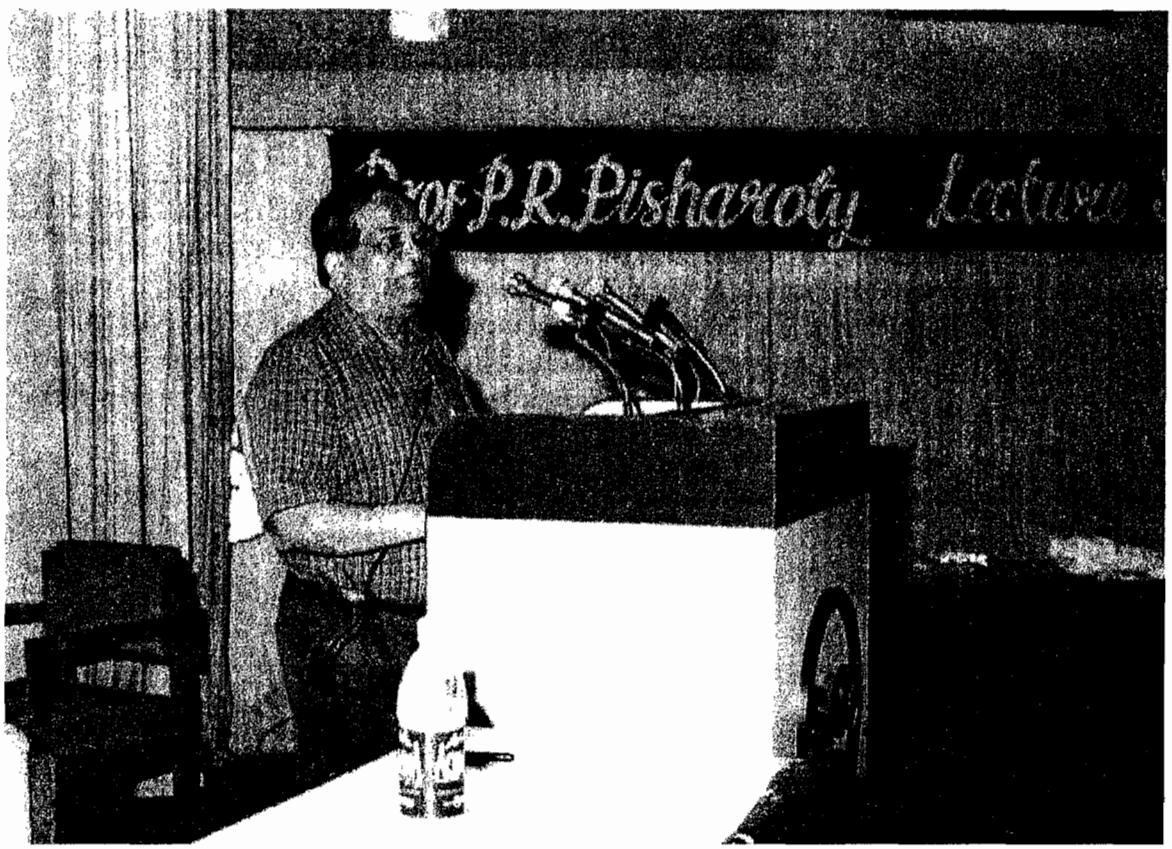
- **ISRS –AC NEWS LETTER**

During the year issue of **"SIGNATURE"**, the newsletter of ISRS-AC Volume 17 No.1, March-April has been brought out and is also available on Chapter's website.

- **PROF. P. R. PISHAROTY MEMORIAL LECTURE**

Prof P. R. Pisharoty Memorial Lecture (First) was organized on November 21, 2003 at Space Applications Centre (ISRO). The lecture was delivered by Dr. K. N. Shankara, Director, Space

Applications Centre (ISRO), Ahmedabad on "Space Inputs for Disaster Management". The lecture was attended by 300 members of the Society and scientists/students from SAC, PRL, CEPT and Gujarat University.



SAC Director Dr. K. N. Shankara delivering Prof P.R. Pisharoty Memorial Lecture

- **POPULAR LECTURES**

A popular lecture on "Remote Sensing of Environment" was organized at NIRMA UNIVERSITY AUDITORIUM, Ahmedabad on 6th June 2003. The lecture was delivered by Shri J. S. Parihar, Mission Director, RSAM and Chairman, ISRS-AC. The lecture was well attended by students (300) and faculty member of the Nirma Institute of Technology.

A special popular lecture on "Geomatics Education in Academic Institution" is being organized along with the AGM on March 30, 2004 at Space Applications Centre, Ahmedabad. The lecture is to be delivered by Shri T. P. Singh, Director, BISAG, Gandhinagar.

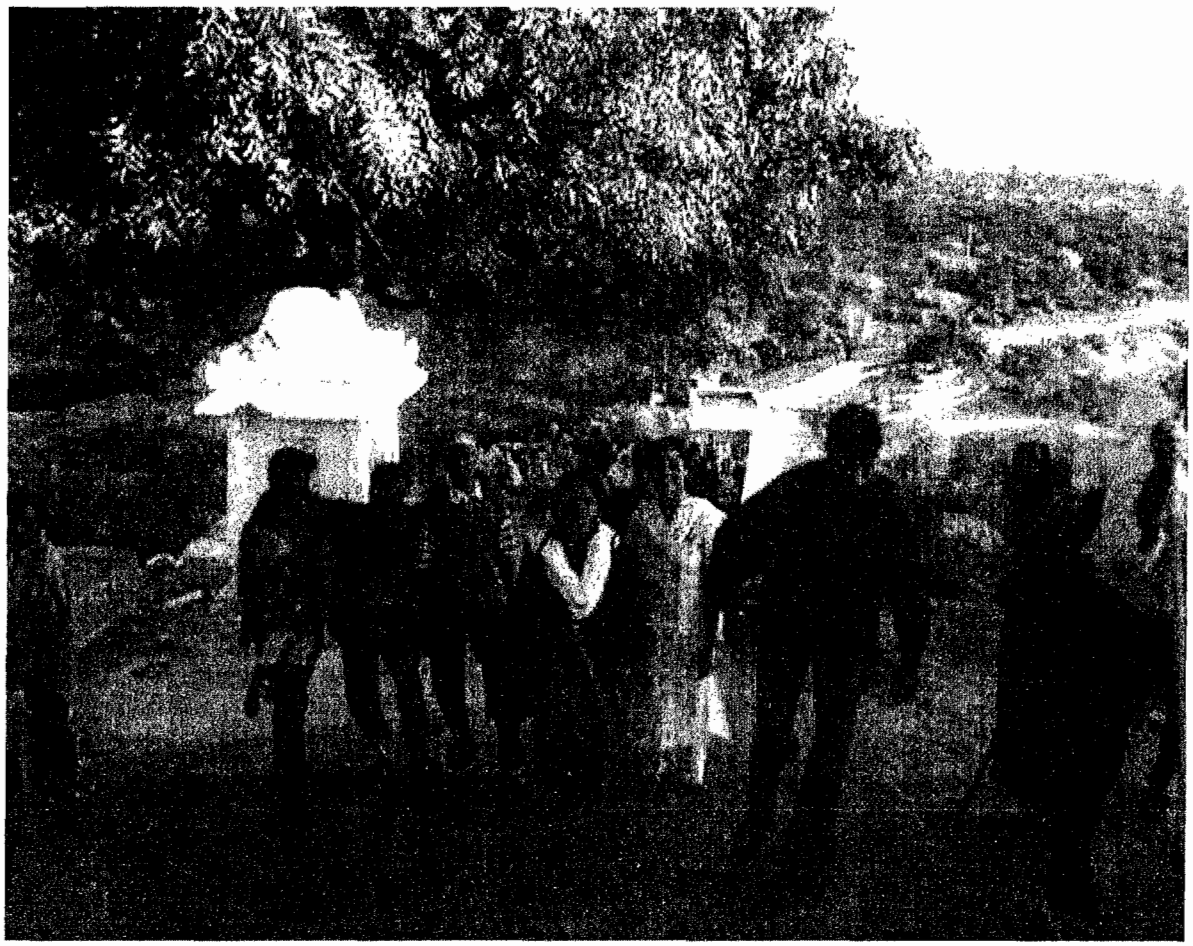
- **EXCURSION CUM EDUCATIONAL PROGRAMME**

ISRS-AC, jointly organized a one day excursion cum educational visit programme with "Santhigiri Ashram", Ahmedabad and Pranav Bharati Foundation on July 27, 2003. On this occasion seedling of Ayurvedic medicinal plants were planted near Goyal Water Park, Sanand Road, Ahmedabad. ISRS-AC members and their family members participated in this programme. The programme was inaugurated and graced by Dr. K.L. Majumdar, Dy. Director, RESIPA, Space Applications Centre (ISRO), Ahmedabad.

ISRS-AC, jointly with Indian Society of Geomatics (ISG-AC), Indian Meteorological Society-Ahmedabad (IMSA), Indian National Cartographic Association – Gujarat Branch (INCA-GB) organized two day Educational Excursion tour to Watershed Development Sites in Shetrunji Basin (Palitana), Archaeological site (Lothal), Coastal Environmental site (Alang) and Wildlife Sanctuary (Velavadar) on 17th and 18th January, 2004. Around 100 participants attended the programme. The scientific field excursion was extremely useful to understand and appreciate the importance of Harappan civilization, Wildlife management, watershed development and coastal environmental degradation.

Members and their Families at Lothal

Members and their Families at Palitana



- **DR. RAVI SHARMA BENEVOLENT FUND**

Late Ravi Sharma, Sr. Scientist, Remote Sensing Applications Centre. U.P was battling for the life against dreaded "BLOOD CANCER". In response to request from ISRS-Lucknow Chapter, ISRS-AC appealed to its members and non-members and collected Rs. Sixty thousand eight hundred and seventy three (Rs. 60, 873/-) as voluntary contributions towards Ravi Sharma Benevolent fund. The contributions were sent to ISRS-Lucknow Chapter. Rs. Fourty two thousand eight hundred and fifty four (Rs. 42, 854/-) was contribution from Ahmedabad and of Rupees Eighteen thousand nineteen (Rs. 18, 019/-) was received as a draft of Commonwealth Bank of Australia in favor of "Dr. Ravi Sharma Benevolent Fund", payable by Bank of America, Mumbai received by ISRS-AC from two members (ShriM. G. Shaikh & Shri Salim Vhora) from Australia and the same was sent to Lucknow.

A Visit to Antarctica

Dr. Satyendra M. Bhandari, Life Member ISRS and Member ISRC-AC Council, recently visited Antarctica during Nov. 10-27, 2003 to make observations of the unique Total Solar Eclipse on Nov. 23, 2003. The 5-member Indian Eclipse Expedition to Antarctica was a Special one – the Expedition Team traveled to Maitri, Antarctica and back, by air, for the first time. Usually, all Indian Expeditions to Antarctica travel to the icy continent by ship. The Eclipse Expedition was highly successful and has generated unprecedented record of long duration shadow-band activity as a result of the horizon grazing elevation of the Sun during eclipse. These shadow-band measurements would be used to study the turbulence structure of the lower atmosphere over Antarctica. The team also made a variety of measurements of the solar coronal structure. All measurements were made from a high glacial blue ice site, surveyed and selected a-priori, about 20 kms from the permanent Indian Antarctic Station Maitri (Lat.: 70°.75 S, Long.: 11°.74 E) under low (-10° C to -15 ° C) temperatures, high wind chill and fortunately cloud-free conditions. Both the eclipse and the expedition had several unique characteristics.

Spectacular Diamond Rings and the Solar Corona with prominent Coronal Streamers observed during Nov. 23, 2003 Total Solar Eclipse near Maitri, Antarctica by the Indian Antarctic Eclipse Team

New Members Enrolled By ISRS-AC During 2002-03

Life Members

1. Dr. M.B. Dholakia, A/402,Chinmay Crystal, Vastrapur, Ahmedabad
2. Dr. N.K. Sheraria, 301/A, Devpuja Apt., Nr. Rosewood Estate, Satellite, Ahmedabad.
3. Shri Ramanuj Banerjee, MWRG/RESIPA, Space Applications Centre(ISRO), Ahmedabad
4. Shri Ritesh K. Sharma, MSDD/MSG, Space Applications Centre(ISRO), Ahmedabad
5. Shri Akshay Sethia, AGM Projects, 11, Ishan Appt., Nr. Parimal Garden, Ahmedabad

Annual Members

1.Ms. Manali S. Shah, 6-Gandhi Baug, Nr. Law College, Ellisbridge, Ahmedabad

RELAX ZONE

C. Patnaik
Agricultural Resources Group
Space Applications Centre, Ahmedabad

Rearrange the letters to form meaningful words. Use the marked letters of each word to form a final word as suggested.

P S T E C R L A

M R U C E O P T

N D C T S A E I

R O C E T V

R U E F B F

M O R T L P A E

Does a chameleon influence the theme?

How many times is **FLOW** written here? Move in any direction but do not jump letters.

		W				
	L	O	W			
O	W	O	L	O		
W	O	L	F	O	O	W
	W	W	O	L	W	
		W	O	O		
			W			

BOOK POST

SIGNATURES

Newsletter of Indian Society of Remote Sensing – Ahmedabad Chapter

To,

_____

_____

_____

If undelivered please return to :

Shri A.S. Rajawat
Secretary, ISRS-Ahmedabad Chapter
Room No. 4140
Remote Sensing Applications & Image Processing Area (RESIPA)
Space Applications Centre (ISRO), Ahmedabad – 380 015

Published by

ISRS-AC

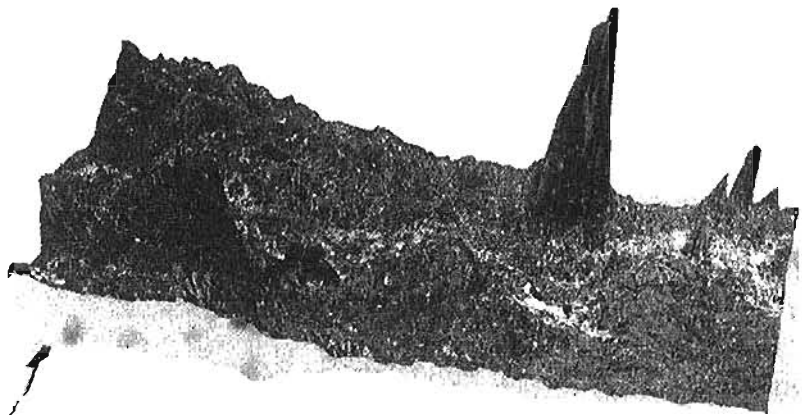
Printed by

Library
SAC,
Ahmedabad

SIGNATURES

ISRS *Newsletter of the Indian Society of Remote Sensing – Ahmedabad Chapter*

Volume- 17 No. 2 Month- July Year- 2004



A 3D view of Parasntha, Jharkhand through SAR Interferometry

In this Issue

	Page No.		Page No.
Editorial	2	Interesting reading	9
Society News	3-4	Web resources	10
Window to History	5	Science Article	10
Technology Corner	6	Tutorial	11
Forth Coming Events	7	Scramble	14
Satellite News	8	Cartoon	15

EDITORS COLUMN

Dear Members,

The first issue from the new committee is in your hand. As you would immediately discern, the effort is towards making the newsletter more news and column oriented than article oriented. There would be one or two lead articles but of short and popular nature. The idea is to leave the practice of publishing full-fledged research findings to the main journal of Society and other forums. We invite your comments on the structuring and modifications needed, if any. Please feel free to communicate by email. And of course contribute to any of the columns by interest and opportunity!

We look forward to your active involvement in dissemination of latest findings through a process of informal communication – like tipping any of the editorial members on the new developments worth reporting in the newsletter.

Wish you a happy browsing!

Editor

Contact email addresses :

Editorial communications: rpdubey@hotmail.com
prakash@sac.isro.org
kkmohanty@sac.isro.org
cpatnaik@sac.isro.org

ISRS-AC Communications: arup@sac.isro.org
asrajawat@sac.isro.org
krmanjunath@sac.isro.org

Executive Council

Chairman
Shri A.R. Dasgupta
Vice-Chairman
Shri P.K. Parchure
Secretary
Shri A.S. Rajawat
Jt. Secretary
Shri S.A. Sharma
Treasurer
Shri K.R.Manjunath
Members
Mrs. Pushpalata B. Shah
Shri C.R. Vaidya
Shri B.P. Rathore
Shri K.L.N. Sastry
Dr. S.P. Vyas

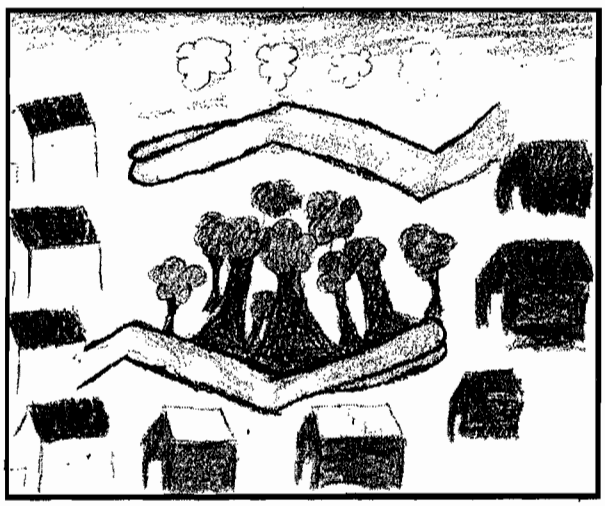
Editorial Board

Editor
Shri R.P. Dubey
Members
Shri K.K. Mohanty
Shri Prakash Chauhan
Shri C Patnaik

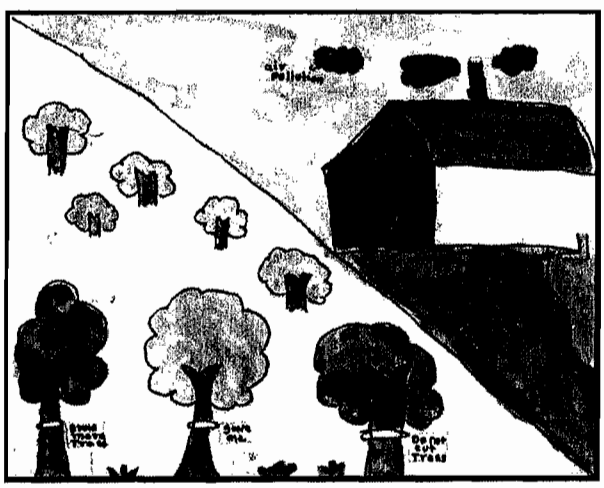
World Environment Day Celebration (June 05, 2004)
Painting Competition
Van Chetna Kendra, Vastrapur, Ahmedabad

6 – 10 years category

First Prize – Ivans Bharucha

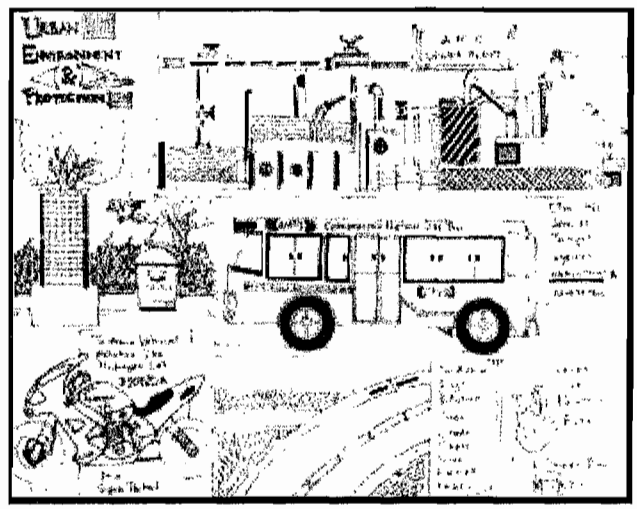


Second Prize – Shivani Avadodariya

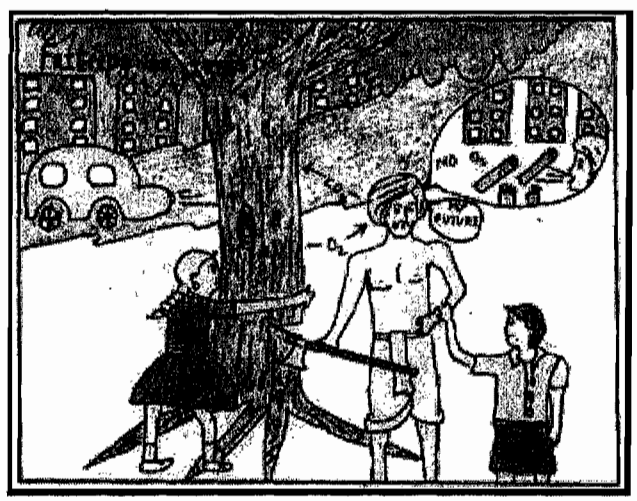


Above 10 years category

First Prize – Ashish Panchal

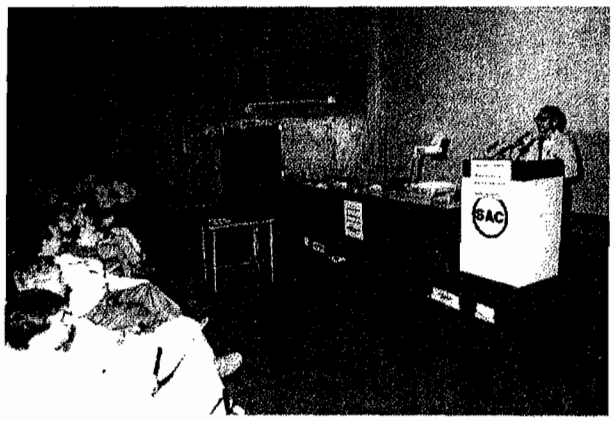


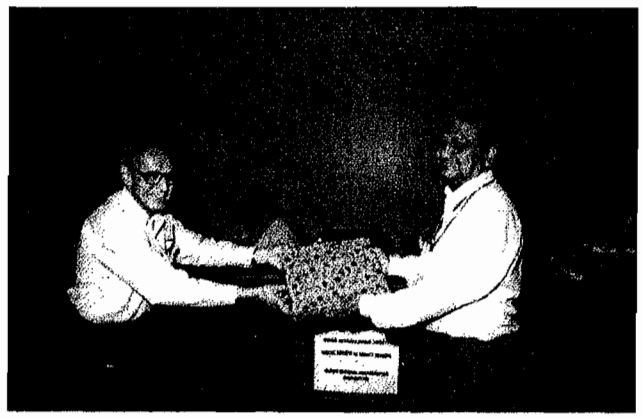
Second Prize – Aditi Rajawat



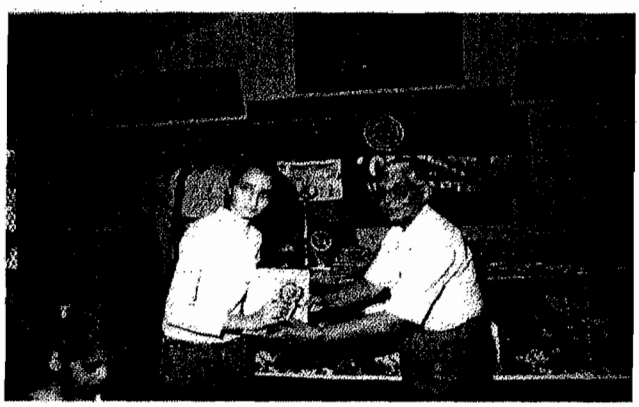
Glimpses of ISRS-AC Activities:

Popular Lecture by Dr. Pranav Desai at Vikram Hall, SAC (May 26, 2004) organized jointly by IMSA, ISG, INCA and ISRS-AC





World Environment Day Celebrations organized on June 05, 2004 at Van Chetna Kendra, Vastrapur, Ahmedabad



INTERVIEW

The grand old man granted us this interview with a smile. We met him in his PRL Office where he continues to lead an active life with no visible dent of years gone by. He spoke in his characteristic inimitable style of presentation with humourous touch, ample gesticulation and forceful, demystifying logic – the qualities which have endeared him to so many spell – bound audiences.

Q. Could you tell us how remote sensing technology was introduced in India ?

A. It began with a very small observation when the Indian Ocean Experiment was done _ we had a revelation in 1963-64 that the ocean surface temperature of the Arabian Sea off Bombay was about 30°C – sometimes higher than land temperature during the monsoon. This was subjected to a lot of doubt. I always believe that an observation is correct. There is a tendency amongst scientists to have an hypothesis and not accept anything that is not in confirmation with that hypothesis. That is wrong. So, we had the feeling that the monsoon had got a large dependence on the sea surface temperature (SST),. Particularly off the west coast of India. When I came to PRL, in 1966 after retirement, this was uppermost in my mind and Prof. Sarabhai asked as to what could be done in Monsoon studies. I said that the sea surface temperature has to be measured and it is not possible to make it using thermometers in ships. This has to be done using an aircraft making use of infrared (IR) techniques. That was the beginning.

Prof. Sarabhai said that's fine. Let us do it. I told him that the equipment for this will be costly and we have to develop it and it may cost $ 25,000. Please bear in mind that the total budget for space activities was less than a crore of rupees. He agreed readily and said if 8% returns can be invested. He found that a French Laboratory was taking an IR scanner for measuring SST from aircraft. He had contacts with those people and suggested that we make a similar one by doing a collaborative development effort based on the same lines. The technique was to duplicate the efforts on the scanner to have one ready for ourselves and thus a duplicate is being developed along with the original. Dr. T. A. Hariharan and one more Engineer was recruited and sent to Paris. They developed the scanner and brought it to India. This was all in 1971.

Q. That is all about the first technical development. How did the idea of land applications originate ?

A. It was around the same time (1968) that there was an UN Conference on "Peaceful Uses of Outer Space" in Vienna of which Prof. Sarabhai was the Scientific Chairman. In that conference there were 2 papers on Remote Sensing. That was mainly connected with aerial photographs of vegetative cover and to discriminate soldiers in green khakhi uniform moving about in the Vietnam green forests. The IR reflectance of the vegetation is different from the IR reflectance of green khakhi. Both are visibly green but the IR reflectances differ and thus are registered differently in IR photograph. The green khakhi has low reflectance and vegetation a high reflectance.

These two – IR for SST and IR for vegetation were found to be of use and we found that this could be applied in our country also.

From January 1, 1990 issue of ISRS-AC Newsletter

Did you know ?

Remote Sensing and the elephant trail

The following excerpt from OIL website aptly explains why oil companies were the first commercial users of remote sensing data:

"The discoverer of this Digboi oilfield was the Assam Railways & Trading Company Limited (AR&T Co. Ltd.), a registered company of London in 1881,with objectives to explore the rich natural resources of Upper Assam,

The earliest recorded reference of oil in Assam can be traced to Lieut. R Wilcox of the 46th Regiment Native Infantry who saw it as ***"... rising to the surface at Supkhong with great bubbling of gas and green petroleum..."*** *in* ***" Memoir of a survey of Assam and the Neighboring Countries executed in 1825-6-7-8." Asiatic Researches Vol.XVII, pp. 314–467.***

Legend has it that an elephant working for the AR&T Co. Ltd. returned with distinct traces of oil on its trail. The excited owners of the elephant tracked its footprints and found seepage of oil bubbling to the surface.

*" Dig! Boy! Dig! ", cried the Englishman to his men, hence the name "**Digboi**". Thus this day, a tiny hamlet tucked amidst lush greeneries over rolling hills found a place in the map of the world's petroleum industry. Albeit very low production, Digboi still retains the distinction of being the world's oldest continuously producing oilfield."*

Later on oil companies realized the need for eye in the sky to explore oil in vast areas – often inaccessible and difficult. No wonder that oil companies became the first commercial users of RS data.

Ref : http://www.oilindia.nic.in/lookback.htm

Technical advancements

Technology Corner

Interferometric Cartwheel: Interferometric Cartwheel is a concept involving a constellation of passive (receiver-only) micro satellites that will capture pulses transmitted by Envisat enabling single-pass SAR interferometry. This not only avoids scene decorrelation, but also supports flexible and selectable baseline- a feature that was not achieved even through SRTM (Shuttle Radar Topography Mission). Moreover, it provides an opportunity to detect forward scattering.

Gravity Recovery and Climate Experiment (GRACE) Mission: GRACE is a mission to Gravity comprising of a pair of satellites in low earth (300-500 km) near-polar orbit one following the other at a distance of 220 km. Both the satellites track the range to the other at accuracy better than 10 μm at a rate better than 0.1 Hz. The orbits of the satellite are measured at an absolute accuracy of 5 cm and relative accuracy of 0.2 mm. The range variation between the satellites is a result of both

gravitational and non-gravitational forces. The non-gravitational acceleration acting upon the satellite is measured precisely using accelerometers. The final products of GRACE mission are monthly average of Gravity with accuracy 100 times better than existing ones. The mission carters a wide range of application that includes Atmospheric, Hydrology, Geodesy and Oceanography.
GRACE is joint NASA and German programme. CHAMP (Challenging Minisatellite Payload) was a forerunner of GRACE, while European GOCE (Global Ocean Circulation Experiment) will be a follow-up of GRACE.

Geoscience Laser Altimeter System (GLAS): GLAS is the first polar-orbiting space Lidar on-board ICESat (Ice, Cloud, and Land Elevation Satellite) launched by NASA on Jan 12, 2003. GLAS has three lasers operating at 1064nm and 532nm wavelengths at a rate of 40 pulses per second. GLAS provides global information on ice sheet elevations, dynamic changes in elevation, height profiles of cloud and aerosols, land elevations and vegetation covers, and sea-ice thickness.

Galileo: Galileo will be Europe's own global navigation satellite system, which will interoperate with GLONASS and GPS. The system when fully deployed will comprise of 30 satellites (27 operational + 3 active spares) positioned in three circular medium orbit planes in 23616km altitude above earth at an inclination of 56°. The first experimental satellite of the system is scheduled for mid-2005 and full operational capability is targeted in 2008.

Forth-Coming Events

XXIV INCA International Congress, Science City, Kolkata, India, Oct. 6-9, 2004, Organised by National Atlas and Thematic Mapping Organisation (NATMO) and National Cartographic Association.
http://www.cartography.org.uk/Pages/Lates/circular.pdf

2nd International Conference on Microwaves, Antenna, Propagation and Remote Sensing (ICMARS-2004), 23-25 Nov. 2004 at Jodhpur. Organised by International Centre for Radio Science, Jodhpur. (email: icrs2003@sancharnet.in).

ISRS Annual Convention and National Symposium on Converging Space Technologies for National Development, Nov. 3-5, 2004, Birla Auditorium, Jaipur.
http://www.isrs2004.com

Twelfth International Conference on Advanced Computing & Communication (ADCOM 2004)
15-18 December 2004
Ahmedabad.

Map Asia 2004
26-29 August
Beijing International convention Centre, Beijing, China

24th ISRS Annual Convention and National Symposium
November 3-5, 2004, Jaipur

International Conference on Coastal Hazards
February 9-11, 2005
SASTRA Deemed University
Thanjavur-613 402

Satellite News

i) CNES Micro-satellite Series

The French Space Agency, CNES, is preparing to launch a new generation of micro satellites, the Myriade series. The first micro satellite, Demeter, was launched on 29 June 2004, and will study electromagnetic perturbations created by earthquakes. The second satellite, PARASOL, should be launched in October 2004. PARASOL will carry an instrument very similar to the POLDER-II. The PARASOL mission will focus on characterisation of clouds and aerosols and for ocean-colour use, as a follow on to POLDER-II.

ii) A "Swarm" Of Satellites for a Unique look Inside the Earth

ESA's will be launching an Earth Explorer Opportunity Mission called Swarm. This is a constellation of satellites which will study the Earth's magnetic field. The objective of the Swarm mission is to provide the best ever survey of the geomagnetic field and its temporal evolution, in order to gain new insights into the Earth system by improving our understanding of the Earth's interior and climate.

The mission is scheduled for launch in 2009. After release from a single launcher, a side-by-side flying lower pair of satellites at an initial altitude of 450 km and a single higher satellite at 530 km will form the Swarm constellation.

iii) Calipso climate monitoring satellite

A joint venture of CNES, NASA and NOAA the Calipso mission will use a laser radar, or Lidar, for studying t he interaction of aerosols and clouds in the atmosphere. This will be accompanying the US/CANADA joint venture called CloudSat.

iv) Aura satellite to study air quality

NASA's next EOS generation satellite Aura also being called as a "Chemistry Lab in space" likely to be launched in July 2004. This will provide valuable inputs on air quality including observations of smoke, aerosols and other pollutants that affect air quality.

v) GSLV launch in August 2004 will carry Edusat

Next GSLV flight is scheduled in first half of August 2004. The rocket will loft India's first educational communication satellite Edusat. The satellite will carry five Ku-band transponders for applications like linking class rooms across the country for interactive learning.

vi) CARTOSAT-I launch is likely in October 2004

Cartosat- I will be launched in early October 2004 using PSLV launch vehicle. Cartosat-I will take pictures to distinguish the ground object as small as 2.5 m and will have stereo capability to provide digital elevation information for Cartographic applications.

Scientists Look At Moon to Shed Light On Earth's Climate

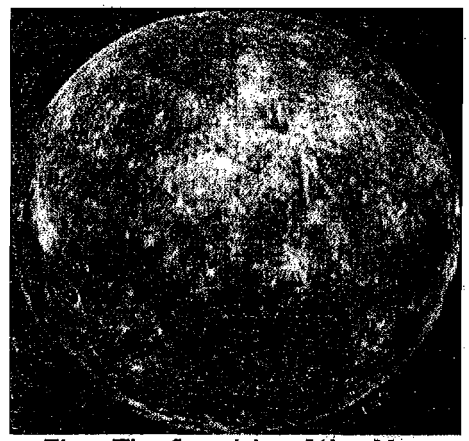


Fig: The far side of the Moon

According to a new NASA-funded study, insights into Earth's climate may come from an unlikely place: the moon. Scientists looked at the ghostly glow of light reflected from Earth onto the moon's dark side. During the 1980s and 1990s, Earth bounced less sunlight out to space. The trend reversed during the past three years, as the Earth appears to reflect more light toward space.

Though not fully understood, the shifts may indicate a natural variability of clouds, which can reflect the sun's heat and light away from Earth.

The apparent change in the amount of sunlight reaching Earth in the 1980s and 1990s is comparable to taking the effects of greenhouse gas warming since 1850 and doubling them. Increased reflectance since 2001 suggests change of a similar magnitude in the opposite direction.

Researchers from the New Jersey Institute of Technology and California Institute of Technology (Caltech), combined NASA cloud data from satellites with records of Earth's reflectance off the moon, called earthshine. The study, funded by NASA's Living with a Star Program, appears May 28, 2004 in the journal *Science*.

Recent news reports suggested sunshine reaching Earth declined from the late 1950s to the early 1990s. This new study suggests the opposite. Earth's surface may have been sunnier, or less cloudy, in the 1980s and 1990s. The research team improved upon an old method for monitoring earthshine. They compared earthshine measurements from 1999 to mid-2001 with overlapping satellite observations of global cloud properties.

The cloud satellite record from 1983 to 2001 came from the NASA-managed International Satellite Cloud Climatology Project. By matching these two records, the researchers used the cloud data to extend the record and construct a substitute measure of Earth's albedo, the fraction of light reflected by a body or surface.

The data showed a steady decrease in Earth's albedo from 1984 to 2000. Between 1995 and 1996, Earth dimmed even more sharply. The data were consistent with satellite measurements of changing global properties. From 1997 to 2000, Earth continued to dim.

The researchers suggest, during this time period, the decreases in Earth's reflectance may be related to an observed accelerated increase in mean global surface temperatures. From 2001 to 2003, Earth brightened to pre-1995 values. The researchers attributed the brightening to changes in cloud properties.

A few relevant websites related to Remote Sensing and Environment

http://www.spie.org/info/ae/

- Remote Sensing of the Atmosphere, Environment, and Space

http://ice.ucdavis.edu/echo/remote_sensing.html

- The Information Center for the Environment

http://www.frf.usace.army.mil/duck94/exp7.html

- Airborne Remote Sensing of the Environment in the Littoral Zone

http://rouge.engr.wisc.edu/cee/courses/cee352.html

- Remote Sensing and Forest Monitoring

Disaster Management Support (DMS) Programme

ISRO/DOS Centers have been providing valuable inputs to the disaster management support activity in the country for more than a decade. This was achieved by providing information on different disasters to user agencies in the country besides participation in many high level committees of central government. Realizing the need for perusing such an important activity the disaster management support (DMS) has been identified as one of the programme in the 10th Five Year Plan of ISRO. The activities under DMSP were revamped through collaborative arrangements of ISRO across the DOS Centres in March 2003.

The DMS Programme (DMSP) will address (1) creation of data base at appropriate scale for hazard zonation, damage assessment in disaster prone area/ s; (ii) development of remote sensing and GIS based decision support tools and techniques and demonstrations catering to the information needs at different levels; (iii) acquisition of close-contour information and (iv) strengthening the communications backbone for addressing the issues for the real time/ near real time information transfer needs. One of the key elements identified as the capacity building measure for operational handling support of disasters under DMS is establishment of a Decision Support Center (DSC) within ISRO DOS as a single window service provider interfacing with national/state disaster management agencies. This is getting established at NRSA and will act as the main hub for providing services in disaster management. SAC has been entrusted with technology development and R&D support. Similarly RRSSC, Nagpur will be responsible for data base creation/ updating information on critically hazard prone areas and in association with Advanced Data Processing Research Institute (ADRIN) will be carrying out the decision support tool development. This will be jointly implemented at the DSC. As part of R&D support, SAC will be responsible for development of concept towards disaster management support, conducting pilot scale studies and its validation. The work will be done in close liaison with DSC so that the

development effort could be subsequently used for operational purposes. Besides the other capacity building measures is development of an improvised airborne SAR system for Disaster Management (DM-SAR), acquisition of an Airborne Laser Terrain Mapping (ALTM) System at NRSA for close contour terrain mapping for use in flood control/ planning measure. Similarly the various communication systems developed at SAC namely Mobile communication terminal, VSATs-, WLL, CWDS will help in handling the requirement of on the site 'Communication Support/ Backbone' in the event of disaster. The efficacy of such systems in the recent years has been effectively demonstrated.

ISRO is also a signatory to the International Charter on "Space and Major Disasters" (http://www.disasterscharter.org/) besides other Space agencies/ organizations viz. CNES, ESA, NOAA, CSA and CONAE (Space Agency of Argentina). The main objective is to use the space technology in disaster management through a long term working relation between civil protection committee and concerned space agencies. In the event of a disaster the charter is activated by an authorized agency for providing the value added information to the concerned almost free of cost.

** A. Narain, PD (R&D), DMSP

Tutorial

Remote Sensing of Elevation

K.K. Mohanty

Elevation of earth commonly represented now-a-days in digital form, is a critical input for many applications. Remote Sensing has traditionally played a vital role in generating digital elevation models (DEM) of the earth. There have been a number of dedicated missions for this purpose, *e.g.* Topographic SAR (TOPSAR), Shuttle Radar Topography Mission (SRTM), Modular Opto-Mechanical Sensor (MOMS) *etc.* GTOPO30, a 1 km or 30 sec global DEM is currently the best freely available global DEM. Ready availability of larger scale and more accurate DEM are restricted to developed nations such as USA and Europe. A suite of remote sensing technologies *namely, Photogrammetry, Radargrammetry, Radar Interferometry* and *Lidar* have been deployed for generation of DEM. GPS (Global Positioning System) strictly doesn't qualify as a remote sensing technique as it requires physical measurement at the site of interest. Nevertheless, it is the most effective point measurement technique that can provide coordinates at unmatched accuracy anywhere on the earth. This column introduces a series of articles that will attempt to explain the remote sensing technologies for DEM generation in a lucid manner. This issue begins with Photogrammetry, which means "science of measuring of photos".

Concept of Photogrammetry: An optical remote sensing sensor is analogous to an unmanned telescope put in an orbiting satellite. Heart of a telescope is a powerful lens; of course we need a detection mechanism since our satellite is unmanned. Traditional aerial photography uses a film to

capture a complete frame in a single snap; the modern satellites deploy a series of detectors to image an elongated region of earth called 'scan line'. The detectors are placed at the focal plane of the lens. The projection of optical center of the lens on to the detector is called the focal point. Basic difference between a aerial photo and satellite image is that the entire aerial photo has a single focal point, while for a satellite scanner each scan line has a principal point and the satellite image has a principal line.

Consider a sensor looking absolutely in the nadir direction on to a perfectly flat terrain (*Fig. 1a*). The image formed by the sensor is free from any scale distortion and can use it as a map for any planimetric purpose. Once the sensor is tilted we get an image suffered by tilt distortion (*Fig. 1b*). Similarly, even in case of a nadir-looking sensor, terrain relief variation introduces a relief displacement (*Fig. 1c*). Photogammetry makes use of relief displacement captured by a pair of tilted or nadir-looking sensors to derive terrain relief.

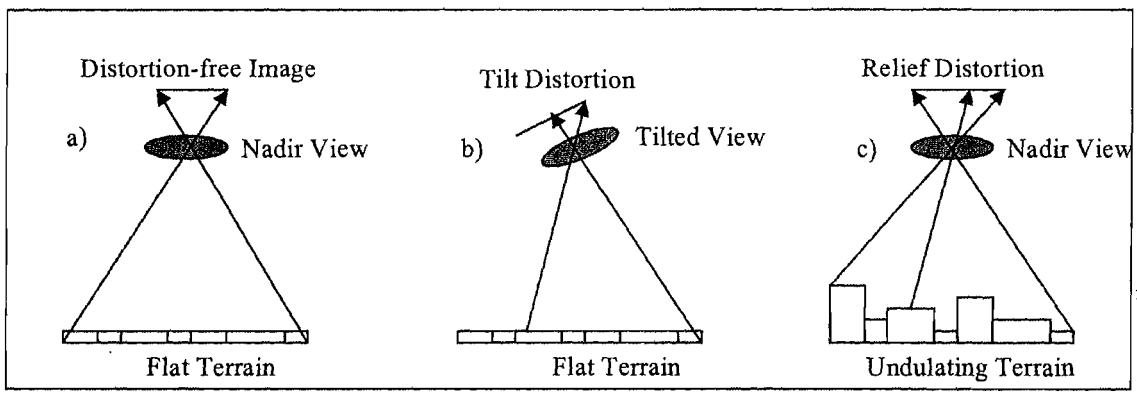


Figure 1: Effect of tilt and terrain undulation in an image

Figure 2. a) single oriented image, b) a pair of oriented images. A single oriented image can only give image coordinate for known object coordinates and direction of light for all image points. For a pair of oriented images, intersection of light rays from common object results in object coordinate.

Let's now try to construct a scaled-down model of our imaging system including the earth it is looking at. In order to do it, we will need to know exact coordinates and orientation of our sensor or lens. In 3D space, it amounts to determining six unknown parameters involving camera/sensor- three positional and three rotational. In theory, these can come from a precise satellite orbit and attitude parameters. If we succeed in creating such a model what can be its use! Well, using this model for any point on the earth, *say* P, we will able to compute its image coordinate (I) by extending a straight line from the object (P) through the optical centre (O) and making it intersect the image plane (*Fig. 2a*). However, we will not be able to predict the object / ground coordinate of any image point. All that we can say is the direction in which the object lies- a feature practically of no use, by extending a straight line from the image point through the optical centre. Suppose we have two independent images each of which have captured the common objects on ground, we

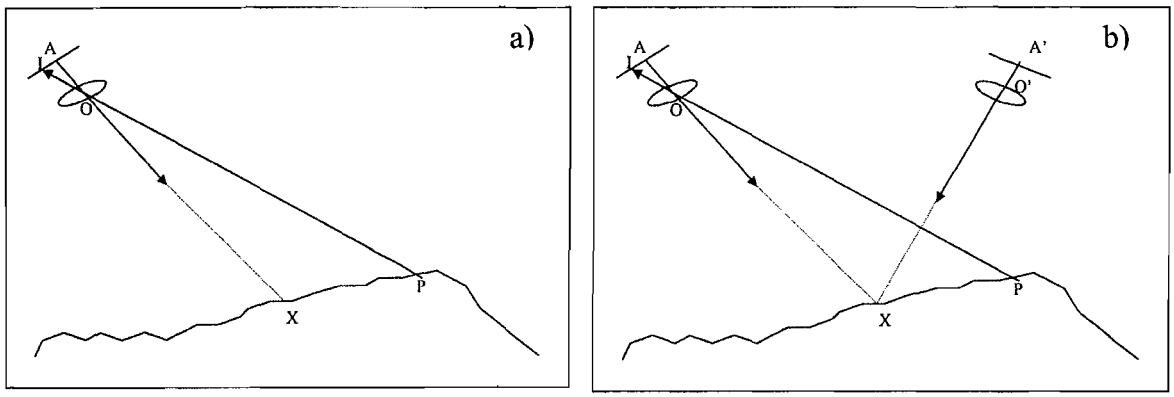


Figure 2. a) single oriented image, b) a pair of oriented images

can prepare geometrical models for both the imaging system (*Fig. 2b*). Now, we can extend the light rays from the two images (A and A′) of the common object (X) through their respective optical centers (O and O′). If our model is accurate enough, the two light rays AO and A′O′ will intersect at object X. This overall concept of deploying a pair of overlapping images to arrive at object coordinate is in essence photogammetry. The specific concept of making light rays of known orientation intersect is called *space intersection*, while the process of model formation using orbital data is termed as *space resection*. In our discussion, we have used a fundamental principle from physics of light traveling in a straight line, to conclude that AOX and A′O′X each form a straight line. The principle of image point, object point and optical centre forming a straight line is known as the *co-linearity condition*. Extending this further A, A′, O, O′ and X all fall on a single plane. The condition of image points, object point and optical centres lying on a plane is called *co-planarity condition*. Earlier, we talked of using orbit and attitude parameters for creating the geometric model. However, in reality, one may not get sufficiently accurate orbit-attitude parameter to arrive at such parameters. The approach in such situation is to use a minimum of three control points (GCP). Each of this control points work as a stand to support our image. Orientation of lens with respect to image is very well known from the knowledge of focal length. It is obvious that the GCPs can be judiciously chosen to work for both the images. Moreover, to get a stable model control points must be well-distributed in the image, preferably at image corners.

[To be continued]

SCRAMBLE

MLTROFAP

ERXREUTT

IASLNYSA

LGIDTIA

DARRA

(Arrange letters from shaded boxes to form the word as suggested. Answers at the end)

Is this what you are trying to create?

REDEFINITIONS

Image : What you analyze to create for yourself

Pixel : The tiniest unit which can seal your fate if addressed wrongly

SAR : Simply Anonymous Reflectance

FCC : Faulty Concoction of Colours

PCA : Partial Cheating of Analysis

GIS : Grumpy Instructional Software

MXL : Master eXterminator of Loopholes

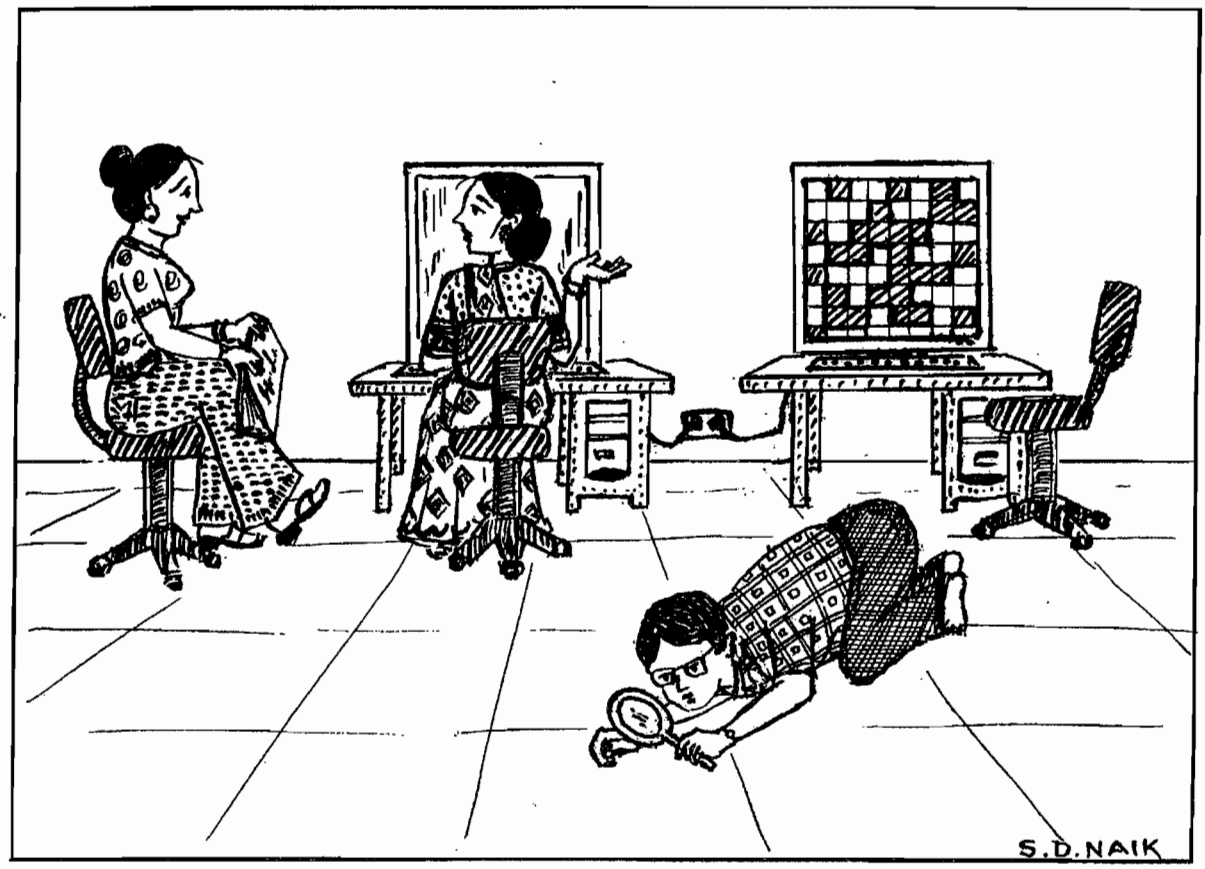
CCD : Charged Couple's Disenchantment

GPS : Goofing Position System

PLATFORM TEXTURE ANALYSIS DIGITAL RADAR IMAGE

Lighter moment

(By Dr. S.D. Naik, MWRG, Space Applications Centre)



I THINK HE IS SEARCHING FOR ONE PIXEL HE LOST DURING IMAGE ANALYSIS

BOOK POST

SIGNATURES

Newsletter of the Indian Society of Remote Sensing – Ahmedabad Chapter

To,

_____

_____

_____

If undelivered please return to :

Shri A.S. Rajawat
Secretary, ISRS-Ahmedabad Chapter
Room No. 4140
Remote Sensing Applications & Image Processing Area (RESIPA)
Space Applications Centre (ISRO), Ahmedabad – 380 015

Published by

ISRS-AC

Printed by

Library
SAC,
Ahmedabad

ISRS

SIGNATURES

Newsletter of the Indian Society of Remote Sensing - Ahmedabad Chapter

Volume – 18 *No.1* *Month – September* *Year - 2006*

In this issue

Editorial	1
New ISRS-AC	1
ISPRS and ISRS	1
News & Snippets	2
Educational Excursion	2
World Environments Day	3
Awards	3
National Remote Sensing Day & Award of Excellence	4

New ISRS-AC Executive Council

Office Bearers

Chairman	Dr. S.S.Rana
Vice-Chairman	Prof. R.D.Shah
Secretary	Dr.A.S.Rajawat
Joint Secretary	Mr. C.R.Vaidya
Treasurer	Mr. N.S.Mehta

Memebers

Dr.S.M.Bhandari	Mr.V.K. Jain
Mr.Ramesh Sojitra	Dr.S.P. Vyas
Dr.Abha Chhabra	

Contact e-mail addresses

ISRS-AC Communications

ssrana@sac.isro.gov.in
asrajawat@sac.isro.gov.in
nsmehta@sac.isro.gov.in

Editorial Communications

krmanjunath@sac.isro.gov.in
cpsingh@sac.isro.gov.in
cmd@scanpointindia.com
abha@sac.isro.gov.in

Editorial

Dear Members,

This first issue from the new committee is in your hand. The current issue is being brought out after a long gap. As you would notice, the emphasis is on news and events oriented rather than article oriented. I feel this keeps the members update with ISRS-AC activities, at least Quarterly. I feel that the practice of publishing full-fledged research findings must be left to the main Journal of the Society and other forums. At the same time I welcome one or two lead articles but of short and popular nature. I invite your comments on the structuring and modifications needed, if any. Please feel free to communicate by email. You are welcome to contribute to any of the columns of interest. I look forward to your active involvement in dissemination of latest findings through a process of informal communication – like tipping any of the editorial members on the new developments worth reporting in the newsletter.

Wish you a happy browsing!
Editor

New ISRS-AC Executive takes Charge

The new executive council (EC) of ISRS-AC has been reconstituted with effect from April 2006. The Chairman of ISRS-AC EC is Dr. S.S.Rana, Deputy Director, Microwave Remote Sensor Area and consists of 10 executive members drawn from different disciplines. There are five office bearers and five members for effective functioning of the society.

ISPRS AND ISRS International Symposium

Two International Symposiums along with two Pre-Symposium Tutorials and a workshop on GEOSS have been scheduled during 25-30 September 2006 jointly by ISPRS TC-IV and ISRS. Members of ISRS-AC are actively contributing towards organization of these Symposiums, Tutorials and Workshop.

New ISRS-AC Newsletter Editorial Committee

The ISRS-AC Newsletter Editorial Committee Executive has been reconstituted as follows.
Chief Editor: Mr. K.R.Manjunath
Editorial members:
Mr.C.P.Singh, Mr.Ramesh Sojitra and Dr.Abha Chhabra

NEWS & SNIPPETS

INDIA WEATHER WATCH

Weather Information from about 200 locations & 5-day forecasts for almost 20 cities spread over the country is now available online. Its contents are sourced from two bodies- Indian Meteorological Department (IMD) and National Centre Fore Medium Range Weather Forecasting (NCMRWF) under Department of Science and Technology. This portal also provides general and zone-wise weather bulletins with an exclusive page for severe weather events. Weekly agro-advisories are provided for different agro-climatic zones. Website: www.indiaweatherwatch.org

Green.Tv on air

The world's first broadband channel dedicated to environmental issues is now on air and is also available online. The brainchild of film director/producer Ade Thomas has been developed with support from United Nations Environment Programme (UNEP), Green.Tv is an innovative project: a "one-stop shop", with a searchable database of programmes made by NGOs, Community filmmakers, public and commercial organizations
Website: www.green.tv

A GENIUS PIECE OF VOCABULARY

Read the sentence below carefully:

"I donot know where family doctors acquired illegibly perplexing handwriting nevertheless, extraordinary pharmaceutical intellectuality counterbalancing indecipherability, transcendentalizes intercommunications incomprehensibleness".

This is a sentence where the nth word is n letters long eg: 5th word is 5 letters long, 8th word is 8 letters long and so on.....

INSPIRATION

Many of life's failures are people who did not realize how close they were to success when they gave up ----Thomas Edison

"Take up one idea. Make that idea your life-think of it, dream of it, live on idea. Let the brain, muscles, nerves, every part of your body, be full of that idea, and just leave every other idea alone. This is the way to Success".

----Swami Vivekananda

"We are what our thoughts made us; so take care about you think. Words are secondary. Thoughts live, they travel far....."

----Swami Vivekananda

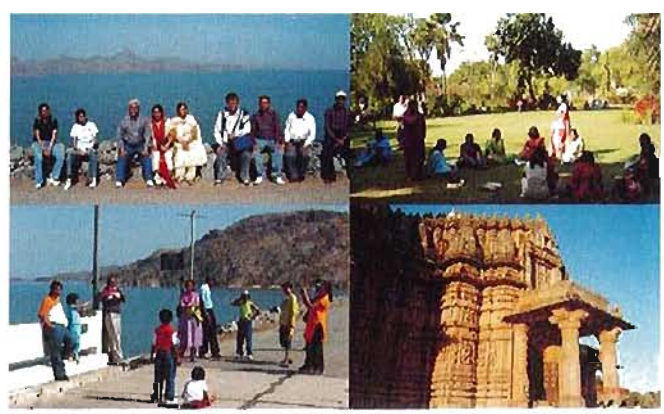
WORLD NEWS

DLR and Astrium sign contract for building Earth-observing radar satellite system

The TanDEM-X satellite together with the almost identical satellite TerraSAR-X, scheduled for launch in October 2006 from the Baikonur space centre.

EDUCATIONAL EXCURSION

Indian Society of Geomatics - Ahmedabad Chapter (ISG-AC), Indian Society of Remote Sensing - Ahmedabad Chapter (ISRS-AC), Indian Meteorological Society - Ahmedabad Chapter (IMSA-AC) and Indian National Cartographic Association-Gujarat Branch (INCA-GB) jointly organized one-day environmental education camp to Dharoi dam and Taranga hill range for members and their families on 21 January, 2006. More than 100 members with their families participated in the programme (glimpses given below).



ISRS-AC -The Largest Chapter

ISRS-AC facilitates new membership enrolment. The ISRS-AC continues to be the largest Chapter of the ISRS. Eight new members have been added this year. The current strength is as follows.

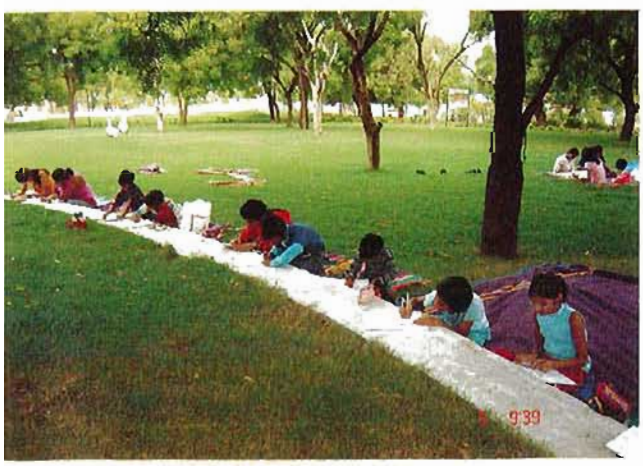
Fellows	: 4	Patron	: 4
Sustaining	: 3	Life	: 328
Annual	: 1	Total Members	: 338

An electronic database is being prepared. The members are requested to air their opinions to ISRS-AC executive Council

WORLD ENVIRONMENT DAY

ISRS-AC and Gujarat State Forest Department jointly organized an environment awareness programme for school students on June 05, 2006 at Bodakdev Forestry Information Centre, Ahmedabad to mark the World Environmental Day. A poster painting competition on the theme "Urban Environment and Protection" was organized. A lecture on, "Global Warming & Climate Change" by Dr. S.M. Bhandari, Scientist, SAC and an interactive popular talk on "Role of Remote Sensing in Environmental Monitoring" by Dr. Abha Chhabra, Scientist, SAC were also delivered.

Prize distribution during World Environment Day



Poster Painting Competition

ASTRONAUTICAL SOCEITY OF INDIA AWARD

Shri.J.S.Parihar, Group Director, Agricultural Resources Group, SAC was conferred with ISRO-ASI Award 2004 in recognition of his significant contribution to Space Sciences and Applications.

Shri.J.S.Parihar, Group Director, ARG, Space Applications Centre receiving ASI award

In the last three decades, Shri.J.S.Parihar has been associated with remote sensing applications in agriculture making outstanding contributions to bring the benefits of space applications to the users. He has been associated with major aerial survey missions and in guiding the use of space-borne remote sensing data for crop production forecasting. Shri.J.S.Parihar has been instrumental in developing new application methodologies for meeting the specific needs of users as well as to optimally use the capabilities of remote sensing sensors. Shri. Parihar has led the team which first devised the various technical elements of FASAL. He was first director of North Eastern-Space Applications Centre. *Mr.Parihar was the earlier chairman of ISRS-AC.*

Hari Om Ashram Prerit Dr. Vikram Sarabhai Research Award

Dr. Shibendu Shankar Ray of Agro-Ecology & Management Division, Space Applications Centre, Ahmedabad was awarded "Hari Om Ashram Prerit Dr. Vikram Sarabhai Research Award" for the year 2005 in the field of "Space Applications" for his contributions towards development and application of remote sensing techniques for various aspects of cropping system analysis. *Dr. Ray has been a member of the Editorial Board of the ISRS-AC Newsletter.*

NATIONAL REMOTE SENSING DAY

National Remote Sensing Day (NRS day) is celebrated to mark the birthday of the eminent Indian Scientist and Educationist Dr. Vikram Sarabhai on August 12th.

Dr.S.S.Rana, Chairman,ISRS-AC presenting awards to winners

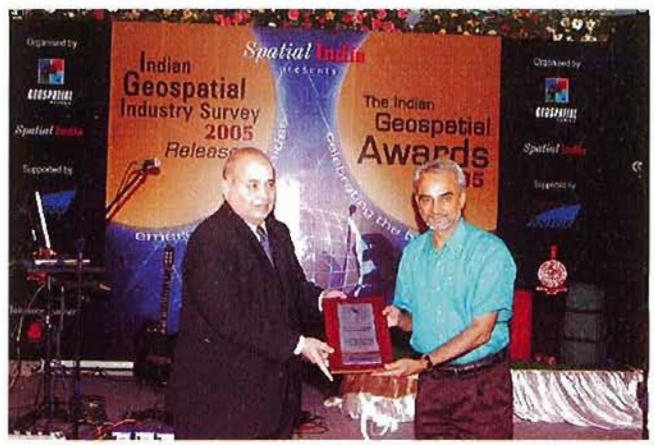
ISRS-AC and Minnie CAMA Secondary and Higher Secondary School for the Blind, Blind People's Association, Ahmedabad jointly celebrated NRS day. Speech Competition for Children on topics related to Dr. Vikram Sarabhai, Space Applications, Environment and Education was organized. Prizes to winners and certificate of participation to children were given.

Memento to the speaker Shri.R.P. Dubey

Shri R.P. Dubey, Head, RESPOND and Research Coordination Division, Space Applications Centre (ISRO), Ahmedabad delivered popular Lecture on "Space and Society".

THE AWARD OF EXCELLENCE

The Space Applications Centre, Ahmedabad was conferred with "The Award of Excellence for Geospatial Usage" by Geospatial Today for infamous Crop Acreage and Production Estimation (CAPE) project. This Indian Geospatial Awards 2005 selection was made based on Industry Survey 2005. Shri.J.S.Parihar, the Project Director, CAPE and also Group Director, Agricultural resources Group, SAC received the award. The award comes in recognition of incorporating geospatial technologies in developing, implementing and successfully running the mission mode CAPE project. Space Applications Centre was entrusted with the responsibility to undertake development of procedure as well as organise implementation of the project.



Shri.J.S.Parihar, Group Director, ARG, Space Applications Centre receiving "The Award of Excellence for Geospatial Usage"

CAPE project was taken up as a part of Remote Sensing Applications Mission and sponsored by Department of Agriculture and Cooperation, Govt. of India,. It aimed at developing procedure for crop area estimation at district level using remote sensing data, forecasting the crop yield using weather and remote sensing data and transfer of technology to user agencies. CAPE has significantly contributed to the institutionalization, capacity building and proven technology development in the field of remote sensing applications for agriculture in the country.

The comments may please be sent to the editorial board
Editor: Mr. K.R.Manjunath
Members: Mr.C.P.Singh, Mr.Ramesh Sojitra and Dr.Abha Chhabra

Printing sponsored by: Scanpoint Graphics Ltd, Ahmedabad

SIGNATURES

Newsletter of the Indian Society of Remote Sensing - Ahmedabad Chapter

ISRS

Volume – 19 No.1 *March 2007*

In this issue

Editorial	1
ISRS-ISPRS Symposium	2
News & Snippets	4
ISRO Achieves New heights	5
Educational Excursion	5
ISRS-AC Activities	6
ISRS-AC members superannuated	6
Awards	6

ISRS-AC Executive Council

Office Bearers

Chairman	Mr. S.S.Rana
Vice-Chairman	Prof. R.D.Shah
Secretary	Dr.A.S.Rajawat
Joint Secretary	Mr. C.R.Vaidya
Treasurer	Mr. N.S.Mehta

Members

Dr.S.M.Bhandari	Mr.V.K.Jain
Mr.Ramesh Sojitra	Dr.S.P.Vyas
Dr.Abha Chhabra	

Contact e-mail addresses

ISRS-AC Communications
ssrana@sac.isro.gov.in
asrajawat@sac.isro.gov.in
nsmehta@sac.isro.gov.in

Editorial Communications
krmanjunath@sac.isro.gov.in
cpsingh@sac.isro.gov.in
cmd@scanpointindia.com
abha@sac.isro.gov.in

Editorial

Dear Members,

I am thankful to the members for their overwhelming appreciations for the previous issue of Signatures. At the same time I would like to express my regrets for the few mistakes which were committed inadvertently. The ISRS-AC is the largest chapter and has grown further during the last year. The growing membership of ISRS-AC and demand from members has made the editorial committee to deliver the Signature issue on time. The current issue highlights the memories and achievements of ISRS-AC and its members.

I would like to congratulate the ISRS-AC and its Executive Council and members who have contributed to the grand success of ISPRS TC-IV Symposium at Goa. Members of ISRS-AC have actively contributed towards organization of the Symposium, Tutorials and Workshops. This has made us feel proud and shows not just the professionalism but also the dedication and commitment to the cause of dissemination of remote sensing information. As suggested in the last issue, I welcome one or two lead articles but of short and popular nature which would interest the members.

Wish you a happy browsing!

NEW ISRS-AC MEMBERS

ISRS-AC facilitates new membership enrolment. 15 new Life members have been included during October 2006-March, 2007. The ISRS-AC continues to be the largest Chapter of the ISRS with its total strength of 353 members.

FORTHCOMING EVENTS

Astronautical Society of India (ASI) and Indian Space Research Organization (ISRO) will host 58th International Astronautical Congress at Hyderabad during September 24-28, 2007.

ISRS-AC Newsletter Editorial Committee

Chief Editor: Mr. K.R.Manjunath
Editorial members:
Mr.C.P.Singh, Mr.Ramesh Sojitra and Dr.Abha Chhabra

ISRS-ISPRS International Symposium on "Geospatial Databases for Sustainable Development" (September 25 - 30, 2006), Goa, India

The ISPRS Technical Commission (TC) IV on Geo-databases and Digital Mapping along with the Indian Society of Remote Sensing (ISRS) has organized an International Symposium on 'Geospatial databases for Sustainable Development' during September 27-30, 2006 along with two pre-symposium tutorials and two pre-symposium conferences during Sep. 25-26, 2006. ISRS-AC played a key role in the symposium.

Dr. R.R. Navalgund, Director, Space Applications Centre (ISRO), Ahmedabad welcomed the delegates and made his opening remarks. He said that since the inception of ISPRS, ISRS has been working closely with it on a variety of issues concerning remote sensing and Photogrammetry and hoped to continue the association and organize the ISPRS congress sometime in future.

Dr. Shailesh Nayak, President, ISPRS TC-IV and Director, INCOIS, Govt. of India, Hyderabad gave a detailed account of the activities of ISPRS TC-IV.

Dr. K. Radhakrishnan, President, Indian Society of Remote Sensing (ISRS) and Director, National Remote Sensing Agency (NRSA), Hyderabad gave an account of ISRS activities in the country. He said that ISRS is a dynamic and strong society of 3000 life members, 50 fellows and 22 chapters spread across the country and members are doing extremely good work in promoting remote sensing among the student and scientific community of their respective regions.

GLOBAL WARMING IMPACT ON POLAR ICE SHEETS CONFIRMED

NASA scientists have confirmed a net loss of ice from the combined polar ice sheets between 1992 and 2002 and a corresponding rise in sea level. This is the most comprehensive survey ever undertaken of the enormous ice sheets covering both Greenland and Antarctica shows a net loss of ice to the sea. This survey was carried out by a team of researchers lead by Dr. H. Jay Zwally of NASA's Goddard Space Flight Center in Greenbelt, Maryland. Researchers used nine years of elevation mapping over much of Antarctica and 10.5 years of data over Greenland from the European Remote Sensing Satellites 1 and 2. (Source: Environment News Service, March 15, 2007)

NEW REMOTE SENSING JOURNALS

Journal of Applied Remote Sensing (JARS) published by the International Society for Optical Engineering (SPIE) has started from January 2007 as a peer-reviewed electronic-only journal ("e-journal"). This online journal would cover the concepts, information, and progress of the remote sensing community, including past, current, and future remote sensing programs and experiments; coverage of remote sensing user requirements for programs and experiments; methodologies for the optimal utilization of remote sensing data; measurement characterization; satellite mission requirements and implementation etc. Website: *http://spie.org/app/Publications*

The first issue of peer-reviewed Journal of Geomatics (JOG) published by the Indian Society of Geomatics would be released in April' 2007. This journal would cover the recent research and progress of the geomatics community. The contributions may be sent to cej@isgindia.org. Website: *http://isgindia.org*

"Logic will get you from A to B. Imagination will take you everywhere."

-Albert Einstein

DISASTER WARNING SYSTEM BY ISRO

An advanced national disaster warning system is being developed by ISRO which will be in place in a year's time. Under this system a data-base would be created about flood-prone areas and its vulnerability to other disasters banking on its past history. This was declared by Shri G. Madhavan Nair, Chairman ISRO on November 13, 2006, while participating in the Asia-Pacific Remote Sensing Conference held at Panaji, Goa.

GloNASS may become commercial

The Russian Minister for Defence is planning to lift restrictions on the Global'naya Navigatsionnaya Sputnikovaya Sistema (GloNASS), the 24-satellite Russian global positioning system. This would enable accurate and unlimited commercial use of this global positioning system. Source: *http://www.asmmag.com/ASM/content/2006/ASM_039/main_news_3.html*

The Next Radarsat

Canada is planning a follow-on mission to the Radarsat series, the world's oldest C-band space based synthetic aperture radar. The new constellation is expected to be in orbit somewhere between 2012 and 2015. *Source: http://www.asmmag.com/ASM/content/2006/ASM_039/main_news_2.html*

Mars Express scientists find a different Mars underneath the surface

Mars is showing scientists that it has an older, craggier face buried beneath its surface. The results were obtained by MARSIS, the pioneering sounding radar onboard European Space Agency's (ESA) Mars Express orbiter. It has found evidence that these buried impact craters – ranging from about 130 to 470 kms in diameter are present under much of the northern lowlands. Giovanni Picardi, of the University of Rome 'La Sapienza', Principal Investigator of the Mars Express MARSIS radar described these findings as unprecedented. *Source: Nature, December 14, 2006.*

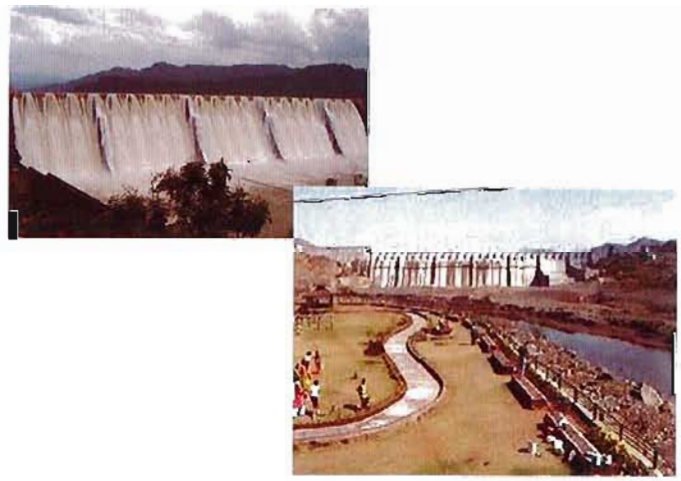
ISRO ACHIEVES NEW HEIGHTS

ISRO's Polar Satellite Launch Vehicle, PSLV-C7, successfully launched four satellites- India's CARTOSAT-2 and Space capsule Recovery Experiment (SRE-1), Indonesia's LAPAN-TUBSAT and Argentina's PEHUENSAT-1 into a 635 km high polar orbit on January 10, 2007. For the first time, a Dual Launch Adopter was used in PSLV to accommodate two primary satellites in tandem. CARTOSAT-2, the twelfth in the IRS satellite series, is an advanced remote sensing satellite capable of providing scene-specific spot imagery. It carries a Panchromatic camera (PAN) to provide imagerics with a spatial resolution of better than 1 metre and a swath of 9.6 km. The satellite can be steered up to 45 deg along as well as across the track. CARTOSAT-2 data will be used for cartographic applications, urban and rural infrastructure development and management, as well as applications in Land Information System and GIS. SRE-1 was successfully recovered on January 22, 2007 after being maneuvered to reenter the earth's atmosphere and descend over Bay of Bengal about 140 km East of Sriharikota. The successful launch, in-orbit operation of the on board experiments and re-entry and recovery of SRE-1 has demonstrated India's capability in important technologies like aero-thermo structures, deceleration and flotation systems, navigation, guidance and control. SRE-1 is an important beginning for providing a low cost platform for micro-gravity experiments in space science and technology and return specimen from space.

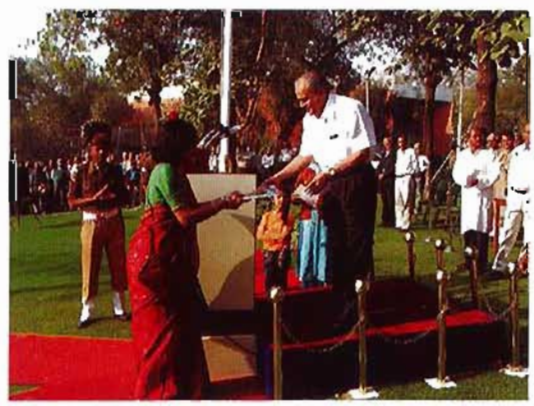
INSAT-4B, was successfully launched by the European Ariane-5 ECA launch vehicle of Arianespace on March 12, 2007. The 3,025 kg INSAT-4B is the second satellite in the INSAT-4 series. With 12 high power Ku-band transponders and 12 C-band transponders, INSAT-4B will further augment the INSAT capacity for Direct-To-Home television services and other communication services.

EDUCATIONAL EXCURSION

Indian Society of Remote Sensing - Ahmedabad Chapter, Indian Society of Geomatics- Ahmedabad Chapter, Indian Meteorological Society - Ahmedabad Chapter and Indian National Cartographic Association-Gujarat Branch jointly organized one-day environmental education camp to Narmada dam and nearby environs for members and their families on February 17, 2007. About 110 members with their families participated and enjoyed this trip.



CONGRATULATIONS !!!



हिन्दी केन्द्र सैक द्वारा 'विश्व हिन्दी दिवस' के उपलक्ष्य पर जनवरी 10 2007 को आयोजित निबंध प्रतियोगिता में डा. आभा छाबडा ने तृतीय पुरस्कार प्राप्त किया। सैक निदेशक डा नवलगुंद ने गणतंत्र दिवस समारोह में उन्हें यह पुरस्कार प्रदान किया ।

Arinjay Vyas son of Dr S.P. Vyas, ISRS-AC Executive member stood amongst the Top Four at the All- India Nat Geo Junior Hunt conducted by National Geographic Channel.

ISRS-AC ACTIVITIES

Shri R.M. Pandya delivered L. N. Calla Memorial lecture on "Space Science Technology and Applications", on November 18, 2006 at M.G. Science College, Ahmedabad.

ISRS-AC MEMBERS SUPERANNUATED

Shri R.M. Pandya, former Manager, Remote Sensing Area Facility, superannuated in November, 2006.

Dr Aishwarya Narain, former Project Director (R&D), Disaster Management Support Programme superannuated in December, 2006.

Dr. K. L. Majumder, former Deputy Director Remote Sensing Applications and Image Processing Area superannuated in January, 2007.

On behalf of all ISRS-AC members, we wish them a healthy and prosperous life ahead!!

"You can't do anything about the length of your life, but you can do something about its width and depth"

-Henry Louis Mencken

"And in the end, it's not the years in your life that count. It's the life in your years."

--Abraham Lincoln

ISRS MEMBERS AWARDED DURING ISRS-ISPRS SYMPOSIUM - 2006

Shri A. R. Dasgupta was awarded with National Geo-spatial award for excellence - 2005 by ISRS in recognition of his outstanding lifetime contributions to the development and extension of geospatial systems, and promotion of related activities in the country.

Shri Shashikant A. Sharma was awarded with Indian National Geospatial Award - 2006 by ISRS in recognition of his significant contribution in developmental work on geospatial utility software for cost effective e-governance.

Shri K.R. Manjunath was awarded with P.R. Pisharoty Award - 2006 by ISRS in recognition of his significant research contribution in newer areas of applications of remote sensing in agriculture.The award was shared with Dr. Rajkumar of MOG,SAC

Prof. John Trinder, the First Vice President, ISPRS talked about ISPRS. He said that restructuring of ISPRS commissions in 2002 has brought the applications of digital databases under the purview of TC-IV and the present symposium offers the opportunity to all the working group chairs to get together and interact. He has also inaugurated the "Industry Exhibition" and opened to the delegates.

Dr. S.K. Saha, Secretary, ISRS has organized a ceremony of presentation of ISRS awards viz. Bhaskara award, Geospatial award, Geospatial awards, PR Pisharoty Memorial award and Best paper award in ISRS journal to the winners for their excellent contributions in the field of Remote Sensing and Geoinformatics.

The Symposium was inaugurated by Dr. P. S. Goel, Secretary, Ministry of Earth Sciences, Govt. of India. In his keynote address, he emphasized that creation of "Synergy between Science and Application of Geospatial Databases" is the need of the hour for sustainable development.

In all 325 scientists including 125 scientists from 23 countries attended the symposium and participated in deliberations. Three plenary sessions, highlighting the main theme of the symposium was organized. On the first day, ten invited talks were delivered by eminent scientists and working group chair/co-chairs of the ISPRS TC-IV. Twenty-four technical sessions, two poster session s and one special session on 'Digital Asia' were organized. All technical sessions were initiated by a lead talk. In all, 211 papers were presented in both oral (161 papers) and poster (50 papers) presentations. Symposium proceedings (two volumes) have been brought out. Soft copy of both abstract and proceedings volume were brought out and distributed to all the participants.

In addition to the main symposium, two pre-symposiums, two tutorials and a popular lecture were also organized during September 25-27, 2006:

1. Geoinformation for Disaster Management (Gi4DM): A two day symposium was organized during September 25-26, 2006 for monitoring and prediction of disasters. The symposium was attended by about 60 participants. The symposium was inaugurated by Dr. Irvin Itzkovitch and delivered the keynote address.

2. ISRO-ISPRS-IEEE-GEOSS Workshop: was organized on 26th September, 2006 addressing i) The User and the GEOSS Architecture VI and ii) Applications in 'Public Health for the Indian Ocean Region'. Dr. Shailesh Nayak, President, ISPRS TC-IV inaugurated the symposiu m. J.S. Pearlman of the Boeing Company gave a brief overview of GEOOS. About 40 delegates participated and held round table discussions on various aspects of GEOSS architecture and its application in public health.

3. Urban Planning and Infrastructure Development: A two day tutorial on "Urban Planning and Infrastructure Development" was conducted during September 25-26, 2006 addressing RS and GIS concepts as well as applicat ion of Geospatial data for urban planning.

Dr. Shailesh Nayak, President, ISPRS TC-IV inaugurated the tutorial. Ex plaining the relevance of the tutorial, he pointed out that the Union Government had undertaken mapping of over 500 cities and towns in the country using RS and GIS technologies.

Dr. S.K. Pathan along with eminent experts in the field of urban planning conducted the tutorials. The experts dealt with fundamental of RS, creation of geospatial databases using GIS techniques and application of these techniques. The tutorial comprised both theory classes as well as hands-on exercises. 18 candidates (lecturers, professors, research scholars and students) participated in the tutorials. An examination was conducted at the end of two day tutorial.

4. Extraction of features from High Resolution data: A one day tutorial was also organized on September 26, 2006 emphasing the need of high resolution data for grass root level applications. Dr. Shailesh Nayak inaugurated the tutorial and said the main purpose of the tutorial is to train young minds on extraction of information from high spatial resolution data. Later Dr. E. Baltsavais introduced students to the world of high spatial resolution and explained various methods involved in high resolution imagery. Dr. P.K. Srivastava co-ordinated the tutorials and emphasized the significance of Cartosat-1 data. 10 students from Ajmer University attended the tutorials.

5. Popular Vikram Sarabhai Memorial lecture on "Mission to Moon, Chandrayan-1 ": It was organized on 27th September, 2006 and was delivered by Dr. J.N. Goswami, Director, Physical Research Laboratory, Ahmedabad. He informed that The Chadrayan-1 is planned to complete lunar mapping using RS technology in one and half years and hoped to answer many questions related to the depth of lunar crust, presence water, minerals etc.

The ISPRS TC-IV symposium with all above mentioned activities concluded on September 30, 2006 with the distribution of prizes to all best presentations in both 'Oral' and 'Poster' by Prof. Ian Dowman, President, ISPRS.

"Some people dream of success
While other wake up and work hard at it !"

--anonymous

ENVIRONMENTAL WATCH

2007 ozone hole 'smaller than usual'

The ozone hole over Antarctica has shrunk 30% as compared to last year's record size. According to measurements made by ESA's Envisat satellite, this year's ozone loss peaked at 27.7 million tonnes, compared to the 2006 record ozone loss of 40 million tonnes. Over the last decade the ozone layer has thinned by about 0.3% per year on a global scale,increasing the risk of skin cancer, cataracts and harm to marine life. Envisat can localize ozone depletion and track its changes, enabling the rapid estimation of UV radiation as well as providing forecasting. The three atmospheric instruments aboard Envisat are SCIAMACHY, the global ozone monitoring by occultation of stars (GOMOS) sensor and the Michelson interferometer for passive atmospheric sounding (MIPAS). Source: http://www.esa.int/esaEO/SEM6MD7H07F_index_0.html. However, WMO has denied it saying it might be due to mild temperatures in the region's stratosphere this winter and is not a sign of recovery.

Noble Peace Prize 2007

The Norwegian Nobel Committee has conferred this year Noble PeacePrize in two equal parts, between the Intergovernmental Panel on Climate Change (IPCC) and Albert Arnold (Al) Gore Jr. *'for their efforts to build up and disseminate greater knowledge about man-made climate change, and to lay the foundations for the easures that are needed to counteract such change'*. IPCC was founded in 1988, with its headquarter in Geneva, Switzerland. Rajendra Kumar Pachauri, an eminent Indian scientist has been the IPCC- elected chief since 1992. The IPCC aims to evaluate the scientific, technical and socio-economic information needed to understand the risks to climate change induced by humans. The 4th United Nations Climate Report on global climate change that appeared in three parts in January, February and May 2007 revealed new facts and has been a large contributor to raising the awareness of climate change. It includes a total of 2500 experts collaborating over the course of six years.

The former US president Al Gore has for a long time been one of the world's leading environmentalist politicians. He became aware at an early stage of the climatic challenges the world is facing. His strong commitment, reflected in political activity, lectures, films and books, has strengthened the struggle against climate change. He is probably the single individual who has done most to create greater worldwide understanding of the measures that need to be adopted.

ISRS Members Awarded During ISRO-Excellence Awards - 2007

Crop Acreage and Production Estimation (CAPE) team received the ISRO-Excellence team award from, Dr A.P.J. Abdul Kalam, then President of India

Dr. J.S. Parihar, Project Director CAPE receiving the award from Dr A.P.J. Abdul Kalam, then President of India

Which is India's first artificial satellite?

On which spacecraft did Rakesh Sharma make his historic trip to Space?

Which is India's first Defence satellite?

The experimental satellite SROSS abbreviation means?

Escape velocity for the Space Shuttle to fly to the moon is _____ ?

What shape does water form when floating in space on the shuttle?

A line connecting points of equal precipitation is known as ?

Which remote sensing technique uses sound?

Which four satellites were launched on January 10, 2007 by ISRO's PSLV-C7?

Which is India' first exclusive meteorological satellite and when it was launched?

[Note: Children (below 18 years) of ISRS-AC members are encouraged to send their answers to the editorial board latest by December 31st, 2007. The names of children with correct answers will be published in the next issue of Signature]

"Nothing is too high for a Man to reach but he must climb with planning, determination and confidence to succeed-

Goethe

Print Courtesy: Scanpoint Graphics Limited, Ahmedabad

Space Exhibition at Rajkot

Indian Society of Remote Sensing, Ahmedabad Chapter in collaboration with Space Applications Centre (ISRO) Ahmedabad and Shri Odhavji Velji Sheth Regional Community Science Centre, Rajkot organized a Space Exhibition on, "*Space Science, Technology and Applications*", during October 9-17, 2007 at Rajkot. This exhibition was inaugurated by Prof. Madhavan Nair, Chairman ISRO. School children, teachers, parents and public at large showed keen interest in understanding various aspects of Space Science.

National Remote Sensing Day Celebration

ISRS-AC in collaboration with Sanskar Dham, Sanand, Ahmedabad jointly organized National Remote Sensing Day celebration to mark the birth anniversary of eminent Indian Scientist Dr. Vikram Sarabhai on August 12, 2007.

Following activities were carried out on this occasion on August 11

1. Drawing and Coloring/Painting Competition

Themes: Natural Scenary, Save Water, Changing Rural Environment

2. Debate Competition

Topics – Should India venture mission to moon/ Can Education Satellites replace schools and colleges

3. Speech Competition

Topic: Life Sketch of Vikram Sarabhai

Dr. J.S. Parihar, Deputy Director RESA (SAC) and Chief Guest of the occasion distributed prizes and certificates to the winners.

3

SIGNATURES

Newsletter of the Indian Society of Remote Sensing - Ahmedabad Chapter

ISRS

Volume – 19 No.3 *December 2007*

In this issue

Editorial	1
ISRS-AC Activities	2
Annual General Body Meeting ISRS-AC	4
Book Review	5
Forthcoming Events	5
Environmental Watch	6
Quiz Time	6
ISRS-AC members felicitated	7
Superannuation	7
Obituary	7

ISRS-AC Executive Council

Office Bearers

Chairman	Mr. S.S.Rana
Vice-Chairman	Prof. R.D.Shah
Secretary	Dr.A.S.Rajawat
Joint Secretary	Mr. C.R.Vaidya
Treasurer	Mr. N.S.Mehta

Members

Dr.S.M.Bhandari	Mr.V.K.Jain
Mr.Ramesh Sojitra	Dr.S.P. Vyas
Dr.Abha Chhabra	

Contact e-mail addresses

ISRS-AC Communications
ssrana@sac.isro.gov.in
asrajawat@sac.isro.gov.in
nsmehta@sac.isro.gov.in

Editorial Communications
krmanjunath@sac.isro.gov.in
cpsingh@sac.isro.gov.in
cmd@scanpointindia.com
abha@sac.isro.gov.in

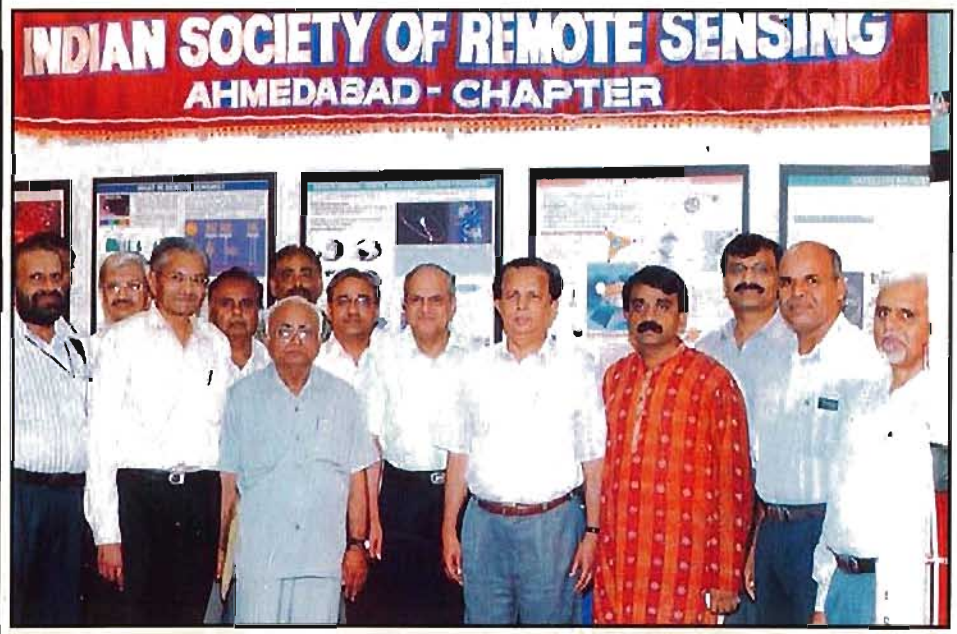
Editorial

Dear Members,

The second Signatures issue brings out various but relevant events. The ISRS-AC has been active throughout and has conducted many events. I was happy to get lot of event related inputs from Executive Council. The efforts have been made to widen the topics of coverage. The activities on lectures, World Environmental Day and National Remote Sensing Day, Space Exhibition at Rajkot are covered in this issue. The Climate Change was always high on the agenda of space scientists. Hence the Intergovernmental Panel on Climate Change (IPCC) winning the Noble Peace Prize for the current year has been aptly added and environmental watch box as a regular feature has been initiated. The highlights of 23rd Annual General Body Meeting of ISRS-AC has been included.

The book review and quiz components are additions in this issue. Your inputs and comments would make the Signatures much more interesting.

Wish you a Happy New Year ! !



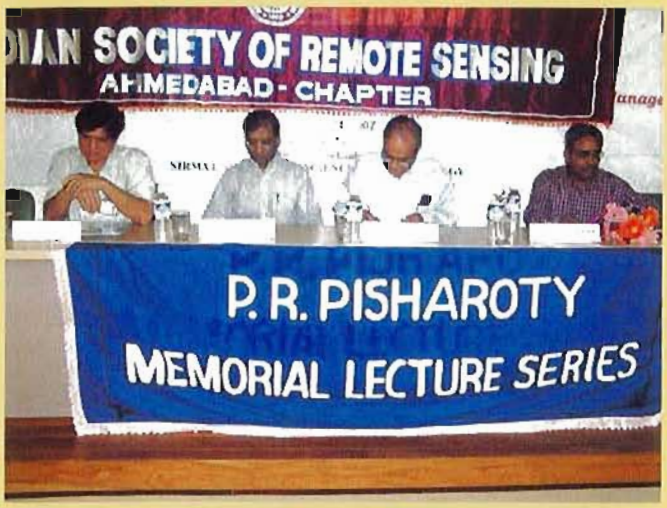
Chairman ISRO, Director SAC and other dignitaries at the inaugural function of Space Exhibition organized by ISRS-AC in collaboration with Space Applications Centre (ISRO) Ahmedabad and Shri Odhavji Velji Sheth Regional Community Science Centre, Rajkot on October 9, 2007 at Rajkot

ISRS-AC continues to be the largest Chapter of ISRS with total strength of 363 members
09 new Life members included since March 2007

ISRS-AC ACTIVITIES

P. R. Pisharoty Memorial Lecture

P. R. Pisharoty Memorial Lecture on "*Indian Earth Observation Programme: an Overview*" was delivered by Dr. Rangnath R. Navalgund, Director, SAC (ISRO), Ahmedabad on March 19, 2007 at Nirma University, Ahmedabad.



World Environment Day Celebration

Gujarat State Forest Department and Indian Society of Remote Sensing, Ahmedabad Chapter jointly organized World Environment Day on June 5th 2007 at Bodakdev Forestry Information Centre (BFIC), Ahmedabad. Following activities were carried out:

1. Drawing and Coloring/Painting Competition

Themes: *Mother Earth*; *Save Water* and *Man & Space*.

2. Lecture on '*Global Warming and its Impacts*' by Dr. S.M. Bhandari, Senior Scientist, SAC (ISRO), Ahmedabad.

3. Screening of Movie on: Changing Climates and PSLV/GSLV Launch

4. Prize Distribution

Prizes and certificates were distributed to the winners.

ISRS-AC is thankful to Deputy Conservator of Forests and staff, State Forest Department, Ahmedabad for taking keen interest in jointly organizing these events.

23rd Annual General Body Meeting (AGM) of ISRS-AC

The 23rd ISRS-AC AGM was organized on May 04, 2007 at SAC. Total 52 members attended this meeting. AGM started with welcome remarks from Shri S.S. Rana, Chairman, ISRS-AC. He remarked that ISRS-AC continues to be the largest and most active Chapter. He briefly mentioned about some of the significant activities carried out during the year 2006-2007. He informed that most of the activities of the Chapter were organized jointly with the active participation and support of Gujarat State Forest Department, Van Chetna Kendra & Forestry Information Centre, Bodakdev, Minnie CAMA Secondary and Higher Secondary School for the Blind, Blind People's Association, Ahmedabad, M.G. Science College, Gujarat University, Institute of Technology, Nirma University, Sardar Sarovar Narmada Nigam Limited, Scientific Societies (ISG-AC, IMSA, INCA-GB), ISRS-HQ, ISPRS-Commission-IV and SAC. He announced that the proposal submitted by ISRS-AC to Main body to organize a National Symposium on a tentative topic "*Advances in Remote Sensing Technology and Applications with Special Emphasis on Microwave Remote Sensing*", during Nov.-Dec., 2008 with Space Applications Centre, Ahmedabad as host on the occasion of the silver jubilee of the Ahmedabad chapter has been accepted. After the opening remarks, the items as per agenda circulated were taken up one by one.

Dr. A.S. Rajawat, Secretary, ISRS-AC informed the House about the 22nd AGM Minutes and the House approved the 22nd AGM Minutes by voice vote.

The 23rd Annual Report was presented by Secretary, ISRS-AC about the activities taken up during the year 2006-07. It was informed that during the year 2006-07 all mandatory as well other planned activities were organized. The details of the activities presented included:

- Dissemination of information and knowledge which included Membership drive/status, World Environment Day Celebration, National Remote Sensing Day Celebration, Support for ISPRS Commission-IV and ISRS websites maintenance and updation and ISRS-AC Newsletter "*SIGNATURES*".

- Scientific meetings, which included: Providing support for organizing two International Symposiums along with pre-symposium tutorials under ISPRS Commission-IV and ISRS, L.N. Calla Memorial Lecture, educational excursion and P.R. Pisharoty Memorial Lecture Series.

- Chapter management activities such as ISRS-AC EC meetings and ISRS-AC Accounts and Audit.

Shri N.S. Mehta, Treasurer presented the audited account of FY 2005-2006 as well as FY 2006-2007. The house passed the Audit Reports 2005-2006 as well 2006-07 by voice vote.

The presentation and contents of *Signatures* was well appreciated. It was also suggested that efforts should be made towards transforming it to a National Newsletter, and its soft copy should also be circulated. Dr. J.S. Parihar suggested that yearly earning of 10% or more must be kept as F.D. as a revenue raising effort. He also suggested that the electronic submission should be started for the Journal of the Society. Shri V. Tamilarasan suggested that the National Symposium planned for the year 2008 should be made as International Symposium. Dr. Prakash Chauhan suggested that student membership concept should be started to popularize remote sensing in student community. Shri S.S. Rana, Chairman thanked all members for their overwhelming participation in the proceedings of the AGM.

OBITUARY

ISRS-AC records with profound grief the sad demise of Dr. M.V. Muley, Scientist RESA (SAC) and Life member ISRS-AC on August 29, 2007. We express our heartfelt condolences to the breaved family.

May his soul rest in peace!

BOOK REVIEW

Book: "Highlights of the Space Age", Author : Dr. P. N. Pathak (PRISM Books Pvt. Ltd., Bangalore-2006, pp 169, Rs. 240/-, ISBN: 81-7286-504-X). Review by: Dr. S.M. Bhandari

As we approach the Golden Jubilee of the advent of Space Age on Oct. 4, 2007, there is bound to be an upsurge in the interest about the innumerable achievements in the area of space science and technology. In bringing the excitement of space to the general reader, Dr. Pathak has taken the lead. Being himself directly associated with the development of space activities in the country since inception, he has been able to provide a ring-side close-up view of all the aspects of space research. The book also separately chronicles, in brief, the space related developments in India from the very initial stages to the present.

It is a remarkable book describing the development of various aspects of space science and technology. The book is written in a simple, smooth, sincere, systematic and scientific style. The author has a tremendous capacity to express scientific concepts and ideas in carefully crafted language without taking recourse to any mathematical formulas or expressions. In less than 200 pages, the author has covered each and every aspect of space age developments, with nuggets of information scattered everywhere. He has terrific control on the narration.

The book, a welcome addition to the literature on popular science books in India, is highly readable and a must for anyone interested in a fleeting overview of the the development of Space Science and Technology and how it contributes to our knowledge about the Earth, the Solar System and the Universe at large. The author, as well as the Publisher, deserves hearty congratulations on their effort in bringing out the book in a timely manner and in a size and binding that is very convenient to hold and read. It is also priced reasonably.

Published in the 50th year of the advent of Space Age, this celebrates the Golden Jubilee of Space age quite appropriately.

[Note: Dr. P. N. Pathak is a Life Member of ISRS and Indian Meteorological Society. He has participated and contributed significantly in the activities of their Ahmedabad Chapters. He has been actively involved in the popularization of space and has written books and articles in Gujarati- his mother tongue. During his active service, he has contributed to R &D at different ISRO Centres, including PRL (Ahmedabad), ISAC (Bangalore), SAC (Ahmedabad) etc. Post-retirement, he continues his active interest in these areas.His e-mail : parantap@icenet.net

FORTHCOMING EVENTS

ISPRS International Symposium

The XXI Congress of the International Society for Photogrameetry and Remote Sensing (ISPRS) on *'Silk Road from Information to Imagery'* is scheduled to be held in Beijing China during July 03-11, 2008. For details: *http://www.isprs2008-beijing.org*

Abstract submission: September 30, 2007
Full paper: March 31, 2008

IEEE International Symposium

IEEE International Geoscience and Remote Sensing Symposium on *'Geoscience and Remote Sensing: The next generation'* is scheduled to be held during July 6-11, 2008 at Boston, USA. For details: *http://www.igarss08.org*

ISRS National Conference

Indian Society of Remote Sensing is organizing a National Conference on *'High Resolution Remote Sensing and Thematic Applications'* during December 18-20, 2007 at Eastern Zonal Cultural Centre, Salt Lake Kolkata. This conference would be hosted by National Atlas & Thematic Mapping Organization (NATMO).

Address for Correspondence:

Dr. B.P SINGH, Organizing Secretary, National Atlas & Thematic Mapping Organization, Government of India, CGO Complex (7thfloor), DF - Block, Salt Lake, Kolkata - 700 064. Tel: (033) 2334 6341, 2334 6331, 2334 5006, Fax: (033) 2334 6460, email: bp_singh31@ rediffmail.com

SUPERANNUATED

Dr. S.M. Bhandari, Scientist MOG (SAC) and ISRS-AC executive committee member superannuated in July, 2007.

On behalf of all ISRS-AC members we wish him a very healthy and prosperous life ahead !!

SIGNATURES

Newsletter of the Indian Society of Remote Sensing - Ahmedabad Chapter

ISRS

Volume – 20 No.1 *August 2008*

In this issue

Editorial, Congratulations	1
ISRS-AC Activities-World Environment Day	2
Educational Excursion	2
Exhibition, Superannuated, ISRS-AC AGM, ISPRS-XXI Congress	3
In Conversation with ISRS-AC Chairman	4
Technical Brief	5
Environmental Watch	6
News and Snippets	6

ISRS-AC-EC Office Bearers

Chairman	Shri. A. S. Kiran Kumar
Vice Chairman	Prof. M. B. Dholakia
Secretary	Shri N.S. Mehta
Joint Secretary	Dr. Anupam K. Singh
Treasurer	Shri K. P. Bharucha

ISRS-AC-EC Members

Mrs. Arundhati Misra
Shri B. N. Mankad
Shri B. P. Rathore
Mrs. Parul Patel
Dr. R. Nanda Kumar

Editorial Board

Shri K. R. Manjunath
Shri C.P. Singh
Dr. Abha Chhabra
Mr. Ramesh Sojitra

Contact US

ISRS-AC Communications
nsmehta@sac.isro.gov.in
Editorial Communications
krmanjunath@sac.isro.gov.in
4006, AMD/AFEG/RESA
SAC (ISRO), Ahmedabad-38015

Editorial

Dear Members,

Continuous efforts are on to make the "Signatures" as presentable as possible. Initial efforts were aimed at bringing out publication regularly . Then we attempted to make issues colorful and wide coverage of activities of socie ty in detail. Emphasizing on technical issues was never out of our mind. We us ed to cover this in tit-bits. Now we have started review of remote sensing programmes, issues, techniques, concept., related hardware, softwares and applicatio ns. The first of this is a technical brief on "Microwave Remote Sensing –Part I" by Mrs. Arundhati Misra.

The new ISRS -AC Executive Council (2008 -2010) with Shri Kiran Kumar as Chairman has taken charge. The interview with the Chairman shows the road ahead for ISRS -AC. It is evident that we would witness sea -change and many new initiatives are likely. ISRS-AC activities are highlighted as usual.

I feel proud to bring to your notice achievements of ISRS -AC members. I wish every issue in future would carry an award/honour or recognition of our members.

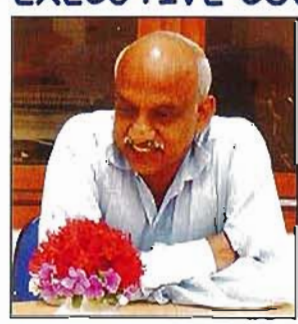
K.R.Manjunath

CONGRATULATIONS

Dr.K.Kasturirangan, *Honorable Member of* Parliament, Rajya Sabha and former Chairman, ISRO, felicitating Dr.R.R.Navalgund with Bhaskara Award at ISRS National Symposium-2007, Kolkata

Dr. R.R. Navalgund, Director, Space Applications Centre, Ahmedabad received 'Bhaskara Award', instituted by Indian Society of Remote Sensing in recognition of his significant contributions to the growth of remote sensing activities in the country. Recently he was also conferred with Vasvik Award, 2003. *ISRS-AC members convey heartiest congratulations and best wishes to Dr. Navalgund.*

NEW EXECUTIVE COUNCIL



Shri. A.S. Kiran Kumar, Deputy Director, SEDA, Space Applications Centre has taken charge as the Chairman of ISRS-AC for the term 2008-10. ISRS-AC members wish Shri Kiran Kumar all the success and support (details in page3,4).

ISRS-AC ACTIVITIES

World Environment Day Celebration

ISRS-AC has made World Environment Day as mandatory activity. Gujarat State Forest Department and Indian Society of Remote Sensing-Ahmedabad Chapter jointly organized World Environment Day on June 5th 2008 at Vanchetana Kendra, Ahmedabad. The drawing and painting competition on "*Climate change*" saw children of various age groups sketching their thoughts in colour.

Soon after the painting competition Dr.S.S.Ray, scientist, SAC engaged the students on *their perception* of climate change and World Environment Day celebrations. It was evident from the interaction that students are well aware of environmental issues. The prizes were distributed to the winners and certificates to all participants. In all 30, 22 and 65 students from Group-A,B and C participated in the competition.

Students engrossed in painting competition

Prize winners of Group-A
1.Dipti Agarwal
2.Abhishek Manjunath

Prize winners of Group-B
1. Shinjan Dutta
2. Harsh Bharucha

Prize winners of Group-C
1. Pualami Patra
2. Jasteeh Katti
3. Tridib Ray

A lecture on '*Climate Change* ' by Shri. R.P.Dubey, Group Director, PPG, SAC (ISRO), Ahmedabad was organized at L.D.Engineering College, Ahmedabad. The lecture created lot of curiosity on climate change among students, faculty and others. The lecture was followed by interactive session with audience.

Educational Excursion

February 09, 2008

An educational excursion to Champner, Jambugoda was jointly organized by Indian National Cartographic Association -Gujarat Branch (INCA -GB), Indian Society of Geomatics - Ahmedabad Chapter (ISG -AC), Indian Society of Remote Sensing - Ahmedabad Chapter (ISRS -AC), and Indian Meteorological Society - Ahmedabad Chapter (IMSA). The major attraction for the members and their families was exposure to Champaner Fort Complex, Ecotourism Centre in Jambugoda Wild Life Sanctuary and a quiz competition.

Champaner Fort Complex

Participants Locating the spot in Remote Sensing Images

Participants

In Conversation with ISRS-AC New Chairman, Shri. A. S. Kirankumar

ISRS-AC Editorial board members (EBM) in conversation with Shri. A. S. Kirankumar (ASK)

EBM : What is your vision for the ISRS Ahmedabad Chapter activities for this new-term?

ASK : For this new-term, one of the major activities of the Chapter would be to conduct the National Symposium during December 2008. Apart from this, the Chapter will continue to follow its traditional activities like World Environment Day, National Remote Sensing Day celebrations and popular/memorial lectures, educational excursions etc. As the Chapter is celebrating its Silver Jubilee year, few specific/special activities are also being planned.

EBM : Kindly elaborate the silver jubilee celebration activities....

ASK : Keeping the objectives of the society in view, this year we plan to emphasize on dissemination of information related to remote sensing technology to student community by way of making available small video modules, simple remote sensing experiments or tutorials through our ISRS website that would enable them to understand basic concepts or technology. Such efforts should not be very costly in terms of realization but informative to users.

EBM : What is your message to members?

ASK : At the outset, I convey my best wishes to all members and invite their more active participation and interest in Chapter activities. Few specific events are also being planned to arouse interest and involvement of members.

EBM : In what way ISRS-AC activities can be more coherent towards Indian Space Research Programme?

ASK : Being a professional body, our members can contribute by way of looking ahead - and identifying the observational demands of the society in general. In this regard, time bound specific programs may be formulated, get debated in seminars, symposiums and coming out with recommendations /suggestions in form of study reports which can coherently provide feedback to Indian Space Programme and its future directions. Apart from organizations, industry, academia and non-governmental organizations should also be involved to identify the societal problems where remote sensing technology may be helpful.

EBM : In what way the Chapter activities can be improved to attract more membership?

ASK : Indeed like every professional society, ISRS - AC also emphasizes on expanding its membership. With vast emergence and development of new technologies, the Chapter plans to invite experts and interested professionals from other institutes/ professional societies for conducting some specific talks that might be helpful for our members to enrich and update their knowledge apart from attracting new memberships. Such events may be initiated during this silver jubilee year celebrations. Membership drive may also be targeted at professionals from NGOs, university professors, lecturers, etc, who are involved in various aspects of remote sensing technology.

The editorial committee is thankful to Shri Kiran Kumar for sparing his valuable time in spite of busy schedule.

New concepts, innovative ideas, short write-up on remote sensing applications, sensors, software or hardware are welcome. Members are requested to send their contributions either hard or soft copies to the chief editor for the future issues of the newsletter.

"Education is an ornament in Prosperity and a refuge in adversity" - Aristotle

Technical Brief

Microwave Remote Sensing –Part I

Microwave remote sensing of the earth and its environment in public domain had started more than three decades ago. NASA's SeaSat satellite mission (1978) was the first spaceborne mission to cater to microwave remote sensing. This opened up a whole gamut of applications for microwave sensors. Since, the microwave sensors provide the unique capability of all weather, and day and night operation, it provides a valuable alternative to optical remote sensing data during cloudy period especially in tropical regions like India. The microwave interaction mechanisms provide new dimensions to study the targets. The potential applications of microwave remote sensing is vast and it took sometime for the global community to develop sensors and work upon its utilization. India 's tryst with microwave remote sensing sensor development dates back to the 1970s with the development of the SAMIR (SAtellite Microwave Imaging Radiometer) payload by SAC, Ahmedabad which was a multifrequency radiometer having the frequencies of 19.35,22.235 and 31.4GHz. In the 1980s. SAC took the initiative to develop its first X band SLAR (Side Looking Airborne Radar) sensor and an airborne SAR system called ASAR. This ASAR was a C band system flying at an altitude of about 8 Km and having the capability of operating either in VV or HH polarization mode. The subsequent requirement of larger swath at a smaller beamwidth called for high incidence angle of operation. This gave confidence to build an airborne SAR system for catering to disaster needs.

This project named as DMSAR (Disaster Management SAR) is at present catering mainly the needs of flood mapping during monsoon. It operates in 4 different modes: MRS (10m), FRS-2(5m), FRS-1(3m) and HRS (1m). The range swaths for the above modes are 75Km, 50Km, 25Km and 6Km respectively. The DMSAR NRTP (Near Real Time Processor) system has the capability to be shifted to a site near the disaster area for giving quick turnaround time data products for disaster monitoring. The ground based scatterometer studies for few applications was also carried out in the mean time. India also developed the MSMR (Multifrequency Scanning Microwave Radiometer) payload for the Oceansat-I satellite, which was launched in 1999. This radiometer had dual polarization channels at 6.6, 10.65,18 and 21GHz for retrieval of SST, sea surface wind speed, cloud liquid water, and integrated water vapour.

Currently India is involved in the development of microwave sensors for three major missions such as the Oceansat-II (scatterometer payload), RISAT -1 (SAR payload) and Megha-Tropiques (Imaging radiometer and microwave sounder). Radar Imaging Satellite (RISAT) will be available in 2008-09 timeframe to international SAR community as a source of multi resolution/multi -swath/multi-polarisation SAR data. RISAT is presently being developed in ISRO and is in an advanced stage of production. The first satellite RISAT -1 will carry a multi-mode Synthetic Aperture Radar (SAR) in C - band.

The SAR payload uses the state of the art Active Array Antenna technology, steerable on both sides and is a multimode one, which will operate from a sun synchronous orbit at a nominal altitude of 608.9 km. The different modes are Coarse Resolution ScanSAR Mode (CRS): 50 m resolution, 240 km swath, co and/or cross polarization, Medium Resolution ScanSAR Mode (MRS): 25 m resolution, 120 km swath, co and/or cross polarisation. Fine Resolution Stripmap Mode-1 (FRS-1): 3 m resolution, 30 km swath, co and/or cross polarization, Fine Resolution Stripmap Mode-2 (FRS-2): 12 m resolution, 30 km swath, Quad polarisation. High Resolution Spotlight Mode (HRS): 1 m resolution, 10 Km swath, co and/or cross polarisation. Apart from these standard modes two more modes are being envisaged. The experimental Sliding Spotlight Mode (100 Km X 10 Km swath) and the Circular Polarimetric Mode that is entirely new and first of its kind for LEO based SAR systems. The different modes of RISAT SAR will have tremendous application potential. Limited mode capability of repeat pass Interferometric SAR data acquisition will extend the utilization domain to digital elevation modeling. Polarimetric mode provides the capability for crop growth monitoring, crop discrimination, urban and agricultural area delineation, hydrology etc.

The Scatterometer on board the Oceansat II will carry a pencil beam dual polarized (VV and HH) Ku band scatterometer for global wind vector estimation which will feed into weather forecasting models. The Megha_Tropiques mission is a joint collaboration between ISRO and CNES, France is scheduled for launch around 2009. It carries two microwave payloads. MADRAS (Microwave Analysis and Detection of Rain and Atmospheric Systems) has five frequencies of 18.6, 23.8, 36.7, 89 and 157 GHz (dual polarized channels except 23 GHz) to monitor the tropical convective systems and provide data that can fit into the global circulation models. A six -channel mm-wave sounder in H polarization for humidity sounding of the tropical belt is another payload.

The complicated signal processing for SAR sensor 's data is also a technologically challenging job. The first SAR processor in India was developed at SAC in 1987 for processing the SeaSat L band SAR data. Subsequently processor was developed at SAC (and later operationalized at NRSA) for processing C band ERS data in 1990 -91, C band ASAR data during1989-96 and DMSAR data during 2003-2007.

Ms. Arundhati Misra has done BE in Electronics & Tele -Communication Engineering and ME in Computer Science & Engineering. She was involved in the development of SAR processing algorithm in SAC, Ahmedabad. She was part of the team that developed the Seasat and ERS-1 and ASAR data processor in ISRO. She contributed to the develo pment of a parallel processor based SAR processor, developed on PARAM machine of CDAC, India and was the member of the team to receive the '100 MFLOPS PARAM Award '. As a Guest Scientist at DLR, Oberpfaffenhofen, she developed the DInSAR processing algorithm and software for the ESAR data.

Exhibition

Exhibition on "Space Science, Technology and Applications was organized jointly by ISRS-AC and Indian Planetary Society from January 25 -31, 2008 at Kutch mitra Community Science Centre, Bhuj. Dr. R.R. Navalgund, Director SAC inaugurated the Exhibition. The students of different schools of Kutch region visited the exhibition.

ISRS-AC-AGM

The annual general body meeting (AGM) of ISRS -AC was held on March 28, 2008. The meeting started with welcome by Shri S.S.Rana, chaiman, ISRS-AC. Dr.A.S.Rajawat, Secretary, presented the activities of the society and the budget details were presented by Shri.N.S.Mehta, Treasurer. The election to the ISRS -AC Executive 2008 -10 was held prior to AGM. Dr.N.K.Patel, Head, CMD/RESA was the Election officer. The new office bearers are Shri A. S. Kiran Kumar, Deputy Director, SEDA, Chairman, Prof. M. B. Dholakia, L.D College of Engineering, Vice Chairman, Shri N.S. Mehta, Manager, RAF, Secretary, Dr. Anupam K. Singh, Professor, Nirma University, Joint Secretary and Shri K. P. Bharucha, Scientist, SEDA, Treasurer. The elected executive members are Mrs. Arundhati Misra, Shri B. N. Mankad, Shri B. P. Rathore, Mrs. Tsarul Patel and Dr. R. Nanda Kumar.

TRANSITIONS

Dr. J.K.Garg

Dr. M.M.Kimoti

Dr.J.K.Garg, Scientist, RESA joined as Professor in the School of Environment Management, Guru Govind Singh Indraprastha University, Delhi. Dr.M.M.Kimoti, Scientist, RESA joined as Director, Uttarkhand Space Applications Centre. ISRS -AC members wish them success in their new endeavors.

SUPERANNUATED

Sh.V.Tamilarasan

Dr.A.K.Kandya

Shri V. Tamilarasan and Dr.A.K.Kandya, Scientists of RESA superannuated in February 2008 and March 2008, respectively. *On behalf of all ISRS-AC members we wish them a healthy and prosperous life ahead.*

ISPRS XXI Congress Beijing - July 3-11, 2008

The XXI Congress of the International Society for Photogrameetry and Remote Sensing (ISPRS) on 'Silk Road from Information to Imagery' was held in Beijing, China during July 03-11, 2008. ISPRS, of which ISRS is a member-society from India, conducted its business through its eight technical commissions during the four-year period 2004-2008 and held its culminating event of this session at Beijing, China during July 3-11, 2008. The eight technical commissions are respectively: TC-I: Image data acquisition - sensors and platforms; TC-II: Theory and concepts of spatio-temporal data handling and information; TC-III: Photogrammetry, computer vision & image analysis; TC-IV: Geo databases and digital mapping; TC-V: Imaging and laser scanning for industrial and engineering meteorology and other applications; TC-VI: Education and outreach; TC-VII: Thematic processing, modelling and analysis of remotely sensed data; and TC-VIII: Remote sensing applications and policies.

The unique features of this 21st Congress were inclusion of technical papers which were both peer-reviewed & otherwise as part of TC-III and a Youth Forum as part of TC-VI, specially meant for students and young researchers. Maximum contribution of more than 50 technical papers for a specific working group, under the several commissions were for the following working groups: WG I/2: *SAR & LiDAR Systems* (65); WG III/3: *Processing of Point Clouds from Laser Scanners and Other Sensors* (54); WG IV/9: *Mapping from High Resolution Imagery* (53) & WG VII/5: *Processing of Multi-Temporal Data and Change Detection* (56). A total 2946 participants from 76 countries took part in this event, of which 1080 were from China. Maximum participants from a specific country after the hosts China were from Germany (187) followed by USA (136). Total 1776 full papers were received out of the 2815 abstracts originally submitted for this event which have been published in 10 physical printed volumes and in a single digital video diskette (DVD) medium. Total 655 oral presentations were held out of the listed 705 during this event. Exhibition of commercial industries & other agencies included 158 booths, which were visited by more than 10,000 persons, including general public. The next ISPRS Congress will be held in 2012 at Melbourne, Australia.

Shri. R. Nandakumar is working as Scientist in the Signal & Image Processing Area of Space Applications Centre (ISRO), Ahmedabad. He participated in this event representing ISRO/DOS along with a few others. He was the Coordinator of the ISRO-ISPRS Cartosat-1 Scientific Assessment Programme and Secretary to the ISPRS WG - IV/9 during 2004-2008.

Answers to the Quiz Time of Signatures, December 2008

(1). Aryabhatta, (2). Soyuz -T., (3).TES. (4). Stretched Rohini Satellite Series (5). 25,000 miles per hour , (6). perfect ball shape, (7). Isohyet, (8). SONAR, (9). India 's CARTOSAT -2 and Space capsule Recovery Experiment (SRE -1), Indonesia 's LAPAN - TUBSAT and Argentina 's PEHUENSAT -1 , (10). METSAT /KALPANA in 2002.

NEWS & SNIPPETS

I. National Symposium on "Advances in remote sensing technology and applications with special emphasis on Microwave remote sensing " and annual convention of ISRS.

December 18 - 20, 2008. Venue: Nirma University, Ahmedabad, Organized by : ISRS, Dehradun, Hosted by: SAC (ISRO), ISRS - AC, and Nirma University.

Pre-symposium Tutorials during December 16 -17, 2008 will be held at SAC, Ahmedabad on two themes: 1. Microwave and 2. Hyper - spectral data and Analysis Techniques. For details visit: *www.isrsindia.org*

Important Dates	
Abstract Submission	**August 22, 2008**
Full paper submission	**October 31, 2008**
Registration for Tutorials	**October 31, 2008**

II. XXVIII INCA International Congress on "Collaborative Mapping & Space Technology" November 4-6, 2008 at Gandhinagar, Gujarat, India

November 4 - 6, 2008, Venue: Cambay Resort and Spa, Gandhinagar, Gujarat, Organised by - INCA, Hosted by - SAC (ISRO), Ahmedabad

One day parallel workshops during Nov. 3, 2008 on 1.On Internet GIS, 2.Open Source GIS, and 3.Collaborative Mapping Using High Resolution Images. For details visit:*www.cmap.org.in*

Important Dates	
Abstract submission : Young Researcher (*Extended*)	**August 15, 2008**
Abstract Submission : General (*Extended*)	**August 23, 2008**
Full paper for Young Researcher	**September 15, 2008**
Full paper submission : General	**September 30, 2008**

III. Geomatics -2009 : National Conference on Geomatics and Impact of Climate Change with Specific reference to Mountain Ecosystem & Annual Convention of ISG.

4-6th February 2009. Organized by ISG, hosted by Uttarakhand Space Application Centre, Dehradun

Pre-Conference Tutorials on 2nd and 3rd February, 2009 will deal with Remote Sensing, GIS and GPS for Disaster Management.For details visit *www.geomatics2009.org*.

Important Dates	
Abstract Submission	**October 31, 2008**
Full paper submission	**December 31, 2008**

ENVIRONMENTAL WATCH

Satellite to study Climate Change

ISRO is planning to launch I-STAG (Indian Satellite for Aerosol and Gases) in a unique collaborative initiative with science institutes. "A small satellite weighing no more than 150 kg will most likely go as a co -passenger with one of the major launches scheduled for 2012 "- informed R. Sridharan, Programme director, Space Science Office, ISRO . I -STAG will be placed in a low Earth orbit at 600 km, with its two-year life span. It aims to collect data on the quantity and distribution of carbon monoxide, carbon dioxide, aerosols (suspended particulate matter), ozone, water vapour and the oxides of nitrogen and sulphur so that an estimate can be made on their impact on climate. The three experiments on I - STAG would measure and trace the distribution of greenhouse gases through an infrared spectrometer, and a multiwave radiometer would monitor the distribution and polarisation properties of aerosols. The experiments would also attempt to estimate the impact of biomass burning and forest fires on climate.

I-STAG will be developed jointly by the Indian Institute of Science, the Space Physics Laboratory in Thiruvananthapuram, the Physical Research Laboratory in Ahmedabad, and the National Atmospheric Research Laboratory in Tirupati.

Plotting Climate Change

The potential map of climate change has now been mapped. An animated map of the Earth from Space illustrating the impacts can be viewed on your desktop. The map is part of the project - '*Climate Change in Our World*' – a collaboration between web search engine Google, Britain 's environment ministry and country 's met office. Viewers can run a time lapse series to watch the Earth warm up to 2100 either from a planetary perspective or zeroing in on countries and even cities. The map is based on Google Earth and shows the world heating as years advance, with some of the greatest temperature increases at the ice -bound poles where vast areas turn red indicating rises well into double digits.

Scientists say global average temperature will rise by between 1.8°C-4°C this century due to carbon emissions from burning fossil fuels. But within this global average there will be vast regional and local variations. This new animated map makes the message vivid.

Source: Down To Earth, June1 -15, 2008