



# Summary Report

## ISPRS TC VIII Mid-Term Symposium

9-12 December, 2014 - Hyderabad, India



Organised by  
**Indian Society of Remote Sensing**

**P G Diwakar**  
Organising Secretary &  
Vice-President, ISRS

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## Executive Summary

*ISPRS Technical Commission VIII Mid-Term Symposium on "Operational Remote Sensing Applications: Opportunities, Progress and Challenges" was organised by Indian Society of Remote Sensing (ISRS), jointly with Indian Society of Geomatics (ISG). About 500 professionals from the Remote Sensing and Geospatial domain from India and 17 other foreign countries participated in this convention held at The Park Hotel, Hyderabad during 9-12 December, 2014. As part of this, the Annual Conventions of ISRS and ISG were also held.*



### Inaugural Session

*The symposium was inaugurated by Dr Shailesh Nayak, Secretary, Ministry of Earth Sciences, Government of India on 9<sup>th</sup> December, 2014 in the presence of Mr A S Kiran Kumar, President Indian Society of Remote Sensing (ISRS) and Indian Society of Geomatics (ISG) and Dr Chen Jun, President of International Society of Photogrammetry and Remote Sensing (ISPRS). While Dr PG Diwakar, Organising Secretary of the event, welcomed all the delegates to the symposium, Dr V K Dadhwal, President, Technical Commission VIII of ISPRS, in his opening remarks, talked about the importance of the symposium and specially greeted all delegates, dignitaries, speakers and exhibitors. This was followed by the Presidential Address by Mr A S Kiran Kumar. He introduced the ISRS and ISG to the delegates and also shared how in India increasingly more number of federal and state governments, academic agencies, NGOs as well as the private sectors are using space based services. Dr Chen Jun, President of ISPRS congratulated Indian colleagues on being an excellent support to ISPRS initiatives and also shared his appreciations for Tsunami Early Warning System, INCOIS, Hyderabad. He also shared details on the, recently released, GlobeLandCover30 that has been developed by China with the support of ISPRS as part of his talk. The Inaugural Address was delivered by Dr Shailesh Nayak, Chief Guest of the program, reiterated on the establishment of Sustainable Development Goals of Rio+ 20, and the emphasis on the important need for observing Earth systems more pertinently. Monitoring of changes caused to the Earth System and analysing the affect on each sub-system for sustainable socio-economic and human development was also stressed. He urged the symposium to work towards understanding and quantifying data on weather, climate, communication & navigation systems, land use and land cover that would have deeper impact on human life, in the days to come. He specially said that the scientific community should work towards solution-oriented science with an emphasis on institutional, economic, social and ecological change. As a part of the inaugural program, scientists & engineers were also falcitated by giving away specific awards of excellence under aegis of ISRS and ISG respectively. These were specially in recognition of their contribution in developing, promoting and popularising the use of Remote Sensing and Geospatial data in India.*



### Special Lectures

As part of the symposium, two special lectures were delivered. The “Vikram Sarabhai Memorial Lecture” of ISRS was delivered by Dr Shailesh Nayak, Secretary, Ministry of Earth Sciences on “India’s Global Engagement in Earth System Science”. The “Millennium Lecture” of ISG was delivered by Dr V K Dadhwal, Director, NRSC on “Unlocking the Potential of Geomatics for Disaster Management in India”. There were three plenary sessions on (i) Presentation by ISRS & ISG Awardees (9<sup>th</sup> December, 2014) (ii) Future Earth (10<sup>th</sup> December, 2014) and (iii) Operational RS Applications - Indian Scenario (11<sup>th</sup> December, 2014), wherein eminent speakers in the respective domain delivered lectures.

### Technical Sessions

A total of 26 parallel technical sessions, 3 poster sessions and 3 special interactive sessions covering various themes (Disaster and Risk Reduction; Health; Weather, Atmosphere and Climate Studies; Water Resources; Energy & Geological Applications; Cryosphere; Forestry, Natural Ecosystems & Biodiversity; Land Cover and its Dynamics, Including Agricultural & Urban Land Use; Coastal and Ocean Applications) were held, spread over three and half days. This also includes joint session of TC IV- Geospatial Databases and Location Based Services and TC VI- Education, Technology Transfer and Capacity Development; there were special sessions on Himalayan Mountain Challenges and Geospatial Solutions, conducted by ICIMOD and by ISG. This symposium witnessed an overwhelming response in respect of paper submissions. A total of 540 papers were accepted for oral, poster and special interactive session, of which, around 200 papers in oral, 43 in poster and more than 60 under special interactive session were presented, respectively. This symposium was attended by more than 450 registered delegates, with about 100 students / young researchers. Delegates from over 50 organisations and 18 countries.

### Exhibition & Pre-Symposium Tutorials

As part of this symposium, an exhibition was arranged showcasing the products and services of 18 organisations from government, academia and industry sectors. In addition to this 3 pre-symposium tutorials were held on recent advances in the geospatial technology, namely, 1. “Hyper Spectral Data Analysis and Applications”, 2. “Polarimetric SAR Data Processing & Applications” and 3. “Flood Monitoring & Modelling”. They were attended by more than 75 students and research scholars.

### Concluding Session

Concluding ceremony was held on 12<sup>th</sup> December 2014. Awards were given for 3 best papers each in oral and poster category for both general delegates and students respectively. ISPRS Young Author Award was also presented. All the sponsors and exhibitors were felicitated for their excellent support. Dr Christian Heipke, Secretary General, ISPRS Council in his concluding remarks appreciated the organisers for meticulous planning and successful organisation of the symposium with special remarks on Indian hospitality. Dr (Ms) Lena Halounova, Congress Director, ISPRS invited the delegates for the XXIII ISPRS Congress, to be held in Prague during 2016. Dr P G Diwakar, Organising Secretary, gave the vote of thanks to all who contributed for the successful conduct of the symposium. Geospatial Media and Communications Pvt Ltd provided media coverage of the event by bringing out daily reports of the symposium proceedings that was also published in their website.



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## 1 Pre-symposium Phase

### 1.1 Background

The International Society for Photogrammetry and Remote Sensing (ISPRS) is a non-governmental organization devoted to the development of international cooperation for the advancement of photogrammetry and remote sensing and their applications. The scientific and technical work of the ISPRS is accomplished by 8 Technical Commissions. Each Commission is entrusted to an Ordinary Member organization for the four-year term between Congresses.



Indian Society of Remote Sensing (ISRS) is the 'Ordinary member' of International Society of Photogrammetry and Remote Sensing (ISPRS). As an ordinary member of ISPRS, ISRS is entitled to take up any one of the Technical Commissions of ISPRS during the Congress hosted once in four years. Getting the Commission has always been prestigious for the country and the society. ISRS could successfully bid, at ISPRS 2012 Congress held in Melbourne, for the Technical Commission VIII on "Remote Sensing Applications and Policies", with Dr V K Dadhwal as the Commission President for the period 2012-2016. Thus, in the history of more than a century of ISPRS, India could host the Commission activity four times. Technical Commission VIII constitutes a bridge between the Earth Observation (EO) technology and users. The Commission comprises of nine working groups addressing various themes viz., Disaster Risk Reduction, Health, Weather, atmosphere and climate, Water Resources, Energy and Geological Applications, Cryosphere, Forestry, Natural Ecosystem and Biodiversity, Land cover and its dynamics, including Agricultural & Urban Land Use and Coastal and Ocean Applications. Technical Commissions are expected to host a Symposium between Congresses as per the responsibilities and the main tasks of a Technical Commission that are defined in Statute XIII and Bylaw XIII of ISPRS. Accordingly, it was decided to organise mid-term symposium in India by Technical Commission VIII after the due approval of ISPRS council. The Symposium, as one of the most important events of ISPRS Technical Commission VIII, is to provide an inter-disciplinary forum for scientists, researchers and practitioners in the field of remote sensing with the theme of the symposium on "Operational Remote Sensing Applications: Opportunities, Progress and Challenges". Technical Commission Presidents (TCPs) are encouraged to consider joint Symposia with other TCs and also to consider whether the Symposia can be organised together with a regional event. The Mid-term Symposium of TC VIII had accommodated one session each of TC IV and TC VI.

### 1.2 Host City and Symposium Venue

ISRS organises annual conventions ever alternate year in association with Indian Society of Geomatics (ISG). The host city is decided based on the proposals from different local chapters, spread across the country. Accordingly, it was decided by Executive Council of ISRS



to organise the annual convention for the year 2014 in Hyderabad, along with TC VIII mid-term symposium. ISRS EC also nominated Dr P G Diwakar, Vice-President, ISRS and Deputy Director (RSAA) of National Remote Sensing Centre (NRSC) as organising secretary for the symposium.

The symposium was expected to host more than 500 delegates, with three to four parallel technical sessions over four days and an exhibition showcasing the geospatial industry. Dr V



View of symposium venue lobby

K Dadhwal, President of TC VIII appointed a committee (headed by Organising Secretary) to choose an appropriate venue in Hyderabad for organising this event. The committee evaluated more than 10 hotels in the city, short listed 3 venues among them and conducted a detailed survey in terms of fulfilling the symposium requirements (like prominent location – easy access to city & other facilities, self-

contained venue for organising technical programme as well as for accommodating the delegates, main hall that is convertible to 3 parallel sessions, budget hotels and service apartments beside the venue, complementary rooms, etc). The committee submitted its recommendations based on the fulfilment of symposium requirements and the financial quotations provided by the short-listed venues. Accordingly, ISRS EC approved 'The Park Hotel' as the venue of the symposium.

### 1.3 Committees

In order to conduct the symposium efficiently, President-TC VIII, in consultation with ISRS EC, formed three committees namely, International Advisory Committee, Scientific Committee and National Organising Committee. Local organising committee was formed by Organising Secretary in consultation with President-TC VIII, to take care of day-to-day activities of the symposium. The details of the committees are given in Annexure 1.

### 1.4 Symposium Website and Paper Submissions

In order to disseminate the information about the symposium, a website was designed and hosted (<http://www.nrsc.gov.in/isprs/2014tc8symposium.html>). The website contained information on technical programme, themes of the symposium, paper submission & presentation details, registration details, exhibition information, venue details, host city information, committee details and other general information. In order to enable the delegates to register them for participating in the symposium, online registration form was designed and hosted in the symposium website.



Snapshot of symposium website

As per the agreement with ISPRS council, the symposium paper handling is done by M/s Copernicus. Accordingly, a MoU was entered between M/s Copernicus and Organising



Secretary for handling all the abstracts and full papers for both ISPRS Annals and Archives. M/s Copernicus handled entire process through their website, which includes online paper submission, anonymous review system, and communication with authors/contributors. At the end of this paper handling process, M/s Copernicus provided a consolidated symposium proceedings that contained finally accepted full papers organised separately under Annals and Archives. This was provided to all the delegates as part of their registration kit. M/s Copernicus also uploaded this in ISPRS website.

### 1.5 Preparatory Works

All the sub-committees of local organising committee met regularly under the guidance of Organising Secretary and made all necessary arrangements for smooth conduct of the symposium. The major activities by these sub-committees include the following.

- Scheduling & conduct of technical sessions, poster & special interactive sessions
- Arranging invited speakers, Chairperson and Co-Chairperson(s), proposing panels of judges for evaluation of papers
- Raising funds through exhibition and sponsorship
- Coordinating the layout of commercial exhibits
- Online registration of participants and carry out registration of participants at the venue
- Preparation and distribution of registration kits
- Posting of symposium circulars on the web; creation of online registration and positioning and maintenance of internet facility & WiFi at the venue during the Symposium
- Providing information on registration to the symposium secretariat from time to time
- Coordination with the venue authorities for enabling all necessary arrangements to ensure availability of audio / visual equipment
- Arrangement of photo and video coverage
- Make available requisite materials at the venue
- Bringing out a Souvenir and printing of circulars, posters, seminar program schedule, invitation cards, lunch cards, etc.
- Preparation of CDs of the proceedings, publicity during pre & post symposium period, prepare daily press releases
- Facilitating interactions with ISPRS council members, catering to specific interface requirements of foreign delegates
- Arranging accommodation to participants, reception at Airport/Railway Stations, arrange for participants' transport from their place of stay to venue and back
- Ensure necessary security protocol and other security arrangements at the venue
- Preparation of the budgetary estimates for all procurements, follow-up with funding agencies, authorize & approve purchase of requisite materials for Symposium, maintain record of expenditure and ensure audit of accounts
- Procuring all the relevant materials for the Symposium, as requested by different committees
- Organizing the pre-symposium tutorials including content design, identification of speakers/experts, preparation of lecture notes, etc.



## 2 Symposium Phase

The ISPRS Technical Commission VIII Mid-Term Symposium started with pre-symposium tutorials on 7-8 December, 2014, inaugural ceremony on 9<sup>th</sup> December, three plenary sessions each day, two special lectures, 32 parallel technical sessions and concluding ceremony on 12<sup>th</sup> December. This section describes in detail each of them.



### 2.1 Pre-symposium Tutorials

Three tutorials were conducted on recent advances in the geospatial technology as part of this symposium at National Remote Sensing Centre, Hyderabad during 7-8<sup>th</sup> December, 2014. The tutorials on “Hyper Spectral Data Analysis and Applications”, “Polarimetric SAR Data Processing & Applications” and “Flood Monitoring & Modelling” were attended by more than 75 students and research scholars. It was planned to train 25 students and young researchers for each tutorial. Among them, the tutorial on “Hyper Spectral Data Analysis and Applications” was the one sought after by many participants. As part of the tutorials, hand on activities on open / free and commercial software viz., HEC-GEORAS and HEC-RAS, HEC-GEOHMS, HEC-HMS for flood modeling and PolSARPro, NEST, ASF SARMAP for polarimetric data processing, were provided.

Special training on use of ENVI software for hyper spectral data analysis of the freely available data from HySI, HICO and Hyperion were undertaken. Collection of field spectra using hand held radiometer was also covered as part of the training.

#### 2.1.1 Hyper Spectral Data Analysis and Applications

Quantitative Remote Sensing is new mantra for remote detection and identification of surface features on Earth and other planetary bodies. Space and air-borne hyper spectral data from international and Indian sensors is now available for users. Applications of hyper spectral data in the fields of vegetation monitoring, mineral targeting, water quality, snow and glaciers and atmospheric sciences are now very popular. Hyper spectral data analysis is a very specialized field in itself involving



**Class room for the pre-symposium tutorials**

atmospheric correction process, extraction of surface reflectance, data dimensionality reduction and extraction of absorption features etc. The tutorial on “Hyper Spectral Data Analysis and Applications” provides technical knowledge related to analysis of hyper spectral data sets and collection of hyper spectral in-





situ data for different applications. This tutorial was coordinated by Ms. Rimjhim B Singh and Dr. Prakash Chauhan from Space Applications Centre (SAC), Ahmedabad. A total of 31 participants were present in this tutorial. The tutorial covered important areas on hyper spectral imaging systems, hyper spectral image processing techniques & advances, hyper spectral data applications for vegetation, atmosphere, geology, ocean colour, snow studies and planetary surfaces. Two hands-on sessions on Physical Basis & in-situ data collection and pre-processing of hyper spectral data & image analysis were also organised as part of this tutorial.

### 2.1.2 Polarimetric SAR Data Processing & Applications

The overall objective of this tutorial was to make awareness among users, researchers and professionals about the concept of Polarimetric SAR (PolSAR) Remote Sensing and disseminate knowledge and practical applications on use of Microwave data. The prime focus of the pre-symposium tutorial was to explore the potential of PolSAR technique for forest biophysical parameter estimation, retrieval of scattering responses from different features, agricultural mapping & monitoring and snow & glacier studies.



Conference hall with tutorial participants

Mr. Shashi Kumar and Dr. Praveen Kumar

Thakur from Indian Institute of Remote Sensing (IIRS), Dehradun coordinated this tutorial. A total of 23 participants attended this tutorial. It covered various topics on SAR data that includes SAR Remote sensing technology and applications, selection of SAR data product for different applications, SAR data calibration & processing, basics & advances of SAR polarimetry and its applications, SAR polarimetry (PolSAR) and polarimetric sar interferometry (PolInSAR) Applications and hybrid polarimetry and its applications. Four hands-on sessions on SAR Backscatter Response Retrieval for Different Features, Coherent Decomposition Modeling of SAR Data for Object Identification, Hybrid Polarimetric Decomposition for Identification of Land-Surface Features and PolSAR Data Processing (RISAT-1) for Scattering Information Retrieval for Natural & Man-Made Features were also organised as part of this tutorial.

### 2.1.3 Flood Monitoring & Modelling

Indian Space Research Organisation (ISRO) is playing a vital role in supporting the flood



Conference hall with tutorial participants

management activities, by providing space as well as aerial remote sensing based services and products. Using satellite data from Indian Remote Sensing Satellite (IRS) System and from foreign satellites, the impact of floods in the country is being assessed for the past one decade operationally. Apart from monitoring, ISRO is also using hydrological modelling techniques for flood forecasting and

inundation simulation for select river basins. This tutorial provided technical knowledge related to monitoring and modeling of floods using remote sensing and hydrological data. This tutorial was coordinated by Mr. G Srinivasa Rao and Mr. V Bhanumurthy from National Remote Sensing Centre, Hyderabad. A total of 23 students and young researchers participated in this tutorial. This tutorial covered various topics on ISRO-Disaster Management Support Programme (DMSP), remote sensing of floods – concepts, flood mapping & monitoring, hydrological modelling of floods and hydrodynamic modelling of floods. Sufficient hands-on training was imparted on near real time flood mapping, hydrological modelling of floods and hydrodynamic modelling of floods, as part of this tutorial.

### Snapshots during Pre-symposium Tutorials



Registration in progress



Inaugural function of pre-symposium tutorials



Tutorial participants listening to the lecture



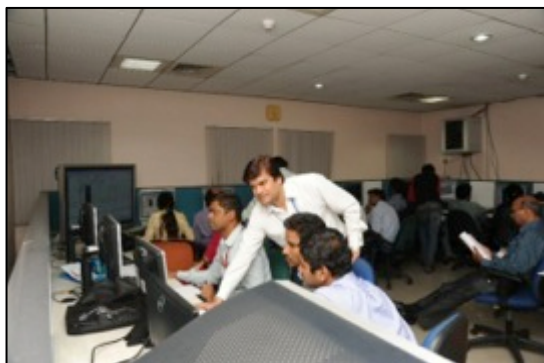
Parallel conference hall with participants



View of class room with participants



Practical demonstration is in progress



Hands-on exercise is in progress



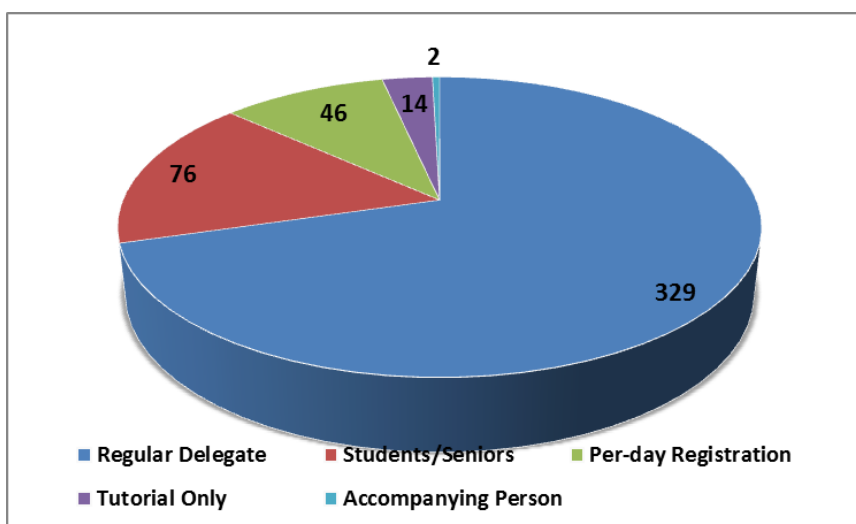
Concluding session of pre-symposium tutorials

## 2.2 Technical Programme

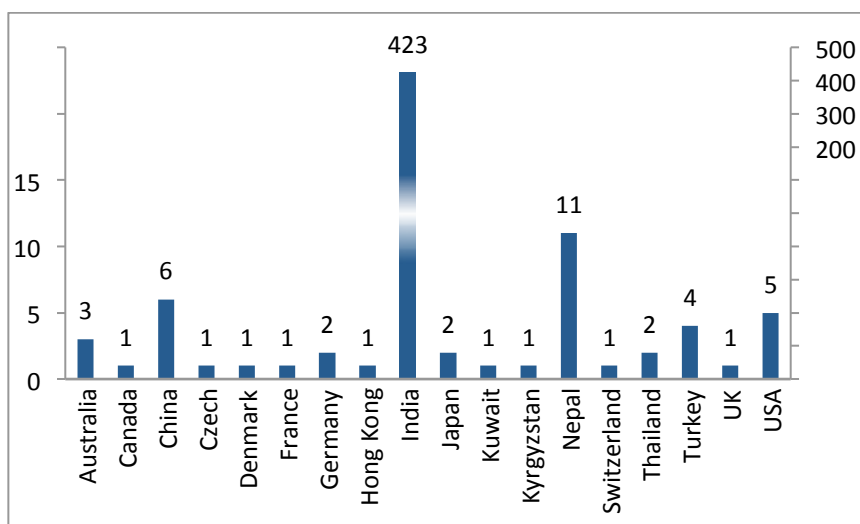
The main technical programme of the symposium consisted of inaugural session, 3 plenary sessions, 2 special talks, 26 parallel technical sessions, 3 poster sessions, 3 special interactive sessions, industrial session and a concluding session (Refer Annexure 2 for programme overview). A total of 467 delegates participated in this symposium spread over three and half days during December 9-12, 2014. The participants include scientists, engineers, academicians, young researchers, students and industry representatives from more than 50 organisations spread across 18 countries.



Enthusiastic delegates at registration desk



Distribution of registered participants



Country wise participants

### 2.3 Inaugural Ceremony

The symposium was inaugurated on 9<sup>th</sup> December, 2014 at The Park Hotel in the presence of Dr V K Dadhwal, President, Technical Commission VIII of ISPRS, Mr A S Kiran Kumar, President of Indian Society of Remote Sensing (ISRS) and Indian Society of Geomatics (ISG); Dr Chen Jun, President of International Society of Photogrammetry and Remote Sensing (ISPRS) and the Chief Guest - Dr Shailesh Nayak, Secretary, Ministry of Earth Sciences, Government of India. Dr P G Diwakar, Vice-President, ISRS and the Organising Secretary of the symposium in his speech welcomed all the delegates, dignitaries on the dais, ISPRS officials, distinguished invitees, representatives of sponsors and industries, ISRS/ISG awardees and young researchers/students. Dr V K Dadhwal, President, Technical Commission VIII of ISPRS, welcomed all delegates, dignitaries, speakers and exhibitors with the Opening Remarks. He also recalled the earlier ISPRS symposiums organised in India, provided the brief background about the theme of the conference and the way the symposium was planned including the special sessions arranged as part of the symposium. In



his Presidential Address, Mr A S Kiran Kumar introduced the ISRS and ISG to the delegates and also shared how in India increasingly more number of federal and state governments, academic agencies, NGOs as well as the private sector is using space based services. Dr Chen Jun, President of ISPRS congratulated Indian colleagues on being an excellent support to ISPRS initiatives and also shared his impressions on the exceptionally well run Tsunami Early Warning System that he visited in INCOIS, Hyderabad a day before. Dr Chen Jun shared details on the recently released Global Land Cover map in 30 meters resolution that has been developed by China with the support of ISPRS and has recently been presented to the United Nations.



View of delegates during inaugural session



Another view of delegates during inaugural session



Distinguished dignitaries during inaugural session



Some of the awardees witnessing inaugural session



A warm welcome to delegates for inaugural session



Lighting of lamp during inaugural session



Address by Dr P G Diwakar



Address by Dr V K Dadhwal



Address by Mr A S Kiran Kumar



Address by Prof Chen Jun

As part of the symposium, the Annual Conventions of ISRS and ISG were also held. During this, the ISRS and ISG Awards were also given to individual scientists and agencies working for developing, promoting and popularising use of Remote Sensing and Geospatial data in India. (Refer Annexure 3 for the list of awardees).

#### Awardees



Dr N C Gautham



Dr P Venkatachalam



Dr V K Dadhwal



Mr D R M Samudraiah





**Dr Gangalakunta Obi Reddy**



**Dr P K Joshi**



**Dr C Sudhakar Reddy**



**Mr P L N Raju**



**R N Sahoo, ISRS Delhi Chapter**



**Dr T Thangaradjou**



**Prof (Mrs) Parvatham Venkatachalam**



**Dr Baldev Sahai**



Dr Anjana Vyas



Dr P G Diwakar



Dr (Mrs) Dipanwita Haldar



Dr Sarvesh Palria

Prof Dr Marguerite Madden, Finance Officer Board of Trustees ISPRS Foundation introduced the ISPRS Foundation Grant Awardees to the audience. Following this, Dr Shailesh Nayak released a set of compact discs containing proceedings of ISPRS Annals & Archives and ISRS Technical Proceedings. He also released the souvenir, specially prepared to mark the occasion and distributed the copies to the dignitaries on the dais.

The inaugural address was delivered by the Chief Guest - Dr Shailesh Nayak, who clearly iterated that following the establishment of Sustainable Development Goals during Rio+ 20, need for observing Earth systems has become even more pertinent. Earth is constantly changing and monitoring this change and analysing the affect it has on each sub-system is crucial for sustainable socio-economic human development. Bettering our understanding and quantifying data on weather, climate change, communication systems, navigation systems, land use and land cover will have deep impact on human life. He urged the scientific community to work towards solution oriented science with an emphasis on institutional, economic, social, ecological change. The dignitaries on the dais were presented with memento and the inaugural session was concluded after Dr R Nagaraja, Chairman, ISRS Hyderabad Chapter proposed vote of thanks.





Release of technical proceedings &amp; souvenir



Address by Chief Guest



Address by Chief Guest - Dr Shailesh Nayak



Memento presented to Chief Guest

## 2.4 Plenary Sessions

There were three plenary sessions on (i) Presentation by ISRS & ISG Awardees, (ii) Future Earth and (iii) Operational RS Applications - Indian Scenario during this symposium, where eminent speakers in the respective domain delivered lectures. The first one held on 9<sup>th</sup> December had a series of presentations by ISRS and ISG awardees, highlighting their contribution towards use of Remote Sensing and Geospatial data in India.

### 2.4.1 Plenary on “Future Earth”

The Future Earth project took centre stage at the ISPRS TC VIII Symposium on 10<sup>th</sup> December as the plenary session focused on the initiative of International Council for Scientific Unions (ICSU). Chaired by Dr Shailesh Nayak, Secretary, Ministry of Earth Sciences, Government of India, the Plenary was addressed by Prof Orhan Altan, 1<sup>st</sup> Vice President of ISPRS and Dr Chen Jun, President, ISPRS. Introducing ICSU, Dr Nayak said that the main agenda for the international NGO is to connect scientists from different disciplines and geographies to strengthen international science for the benefit of society by undertaking solution-oriented projects. As per the present trends of resource utilization, Earth will not be able to provide resources for sustainable development and this is the major challenge to be addressed by the international comity of scientists. The recent project of ICSU, which will become fully operational by early 2015, is the Future Earth Project. This is a 10-year international research initiative that will develop the knowledge for responding effectively to the risks and opportunities of global environmental change and for supporting transformation towards global sustainability in the coming decades. Future Earth would mobilize thousands of scientists while strengthening partnerships with policy-makers and other stakeholders to provide sustainability options and solutions in the wake of Rio+20.

In his address, Prof Orhan Altan explained the role of ICSU and introduced some of the new upcoming projects, with a focus on Future Earth. He explained the role of ISPRS in ICSU as a core member of GeoUnions (GUs), which is a network of representatives dealing with Earth System studies and space sciences, including International Geographical Union (IGU), ISPRS, International Union of Geodesy and Geophysics (IUGG), International Union of Geological Sciences (IUGS) and others. He further elaborated upon to describe in some detail projects that started in the 1980s which have acted as the precursor for Future Earth Project, including WCRP, IGBP, Diversitas and IHDP programmes.

Prof Chen Jun made a presentation on supporting Future Earth with global geo-information, wherein he highlighted how human survival is facing a crisis in many forms. He explained



**Plenary Session on "Future Earth"**

how deliberations held at Rio+ 20, developed the Sustainable Development Goals and preparations were initiated for Post 2015 Development Agenda by the UN. In addition, he described how China has contributed to the Future Earth Programme by developing and making available the Global Land Cover map in 30 m resolution. The initiative of China is being utilised by almost 80 countries since

its launch in September 2014 and is expected to grow manifold. Soon facilities like tagging, updating the map will be provided online, which will add greater value and relevance for users. He displayed some key statistical analysis that has already been made using the Global Land Cover Map. Despite some obvious challenges that this project faces, for example, devising fast and effective ways to refine, update and validate the data, there clearly seems a lot of potential opportunities for users, including providing services like big data analysis. He shared the future plans for the project include linking all global, national and regional land cover websites to provide one-stop service or to add a feature of historic land cover map etc. Addressing issues of collaboration, Prof Chen Jun said China would like to work closely with agencies like UNGGIM, GEO and other data producers to add on to the data and also collaborate with agencies such as OSGEO, GEO BON, UNOOSA etc. to provide better platforms and services on this data and to work with UN and international NGOs for increased application of the data towards the sustainable Future Earth.

#### **2.4.2 Plenary on "Operational RS Applications - Indian Scenario"**

At the plenary focusing on Operational Remote Sensing Applications on 11<sup>th</sup> December, senior officials of from various user organisations shared the innovative applications created using satellite data provided by National Remote Sensing Centre (NRSC) for a variety of purposes. The Plenary, chaired by Dr V Jayaraman, former Director of NRSC, had user experiences from domains like ocean monitoring, agriculture, state remote sensing agency, forest management and weather and climate domains.

Dr Jayaraman set the stage for the discussions by stating that rather than talking about operational applications, we have indeed institutionalised applications. He said that the significance of this session is to hear perspectives from users rather than remote sensing specialists. Applauding the efforts undertaken by professionals in ISRO and NRSC, Dr



Jayaraman said that these professionals work hard to create data of good quality, but when this data is put in human context, it becomes knowledge and finally when the knowledge is applied in the field, it becomes wisdom. This process of evolving data to wisdom adds value to efforts of professionals from ISRO and NRSC.

Dr Satish Shenoi, Director, Indian National Centre for Ocean Information Services (INCOIS) elucidated the role of remote sensing in operational ocean information services. In India, about 7 million people living along the coastline and Lakshadweep and Andaman & Nicobar depend on fishing for their livelihood, besides its strong influence on weather and climate change / variability. Hence, understanding ocean and its state attains greater significance. In this regard, INCOIS uses RS data for measuring a number of ocean parameters like sea surface temperature, chlorophyll content, sea surface height and their respective



**Dr V Jayaraman addressing during the plenary session "Operational RS Applications - Indian Scenario"**

anomalies in addition to bathymetry, temperature, wind velocity / direction etc. Private entrepreneurs have come forward to develop mobile applications and presently a majority of fishermen use them in India. This information is being disseminated in the local languages of fishermen. A survey of the economic benefits of the potential fishing zones, as carried out by the NCAER, NAIP-ICAR and MSSRF, revealed high benefit cost ratio. As per one estimate by NCAER the total profit of using this application is in the range of INR 34,000-50,000 crores. INCOIS is now in a position to share its knowledge and expertise with other countries and is undertaking a number of collaborations.

Dr M Rajeevan, Advisor, Ministry of Earth Sciences, shared the experience of Ministry of Earth Sciences in using satellite data as one of the main sources for prediction of weather and climate change. RS data is used for a number of weather/climate measurements like dry microdust index, sea surface temperature, aerosol levels, upper troposphere temperature, cyclone prediction, monsoon monitoring etc. Dr Rajeevan shared that since the year 2000, accuracies of prediction have been on the significant increase both in the northern and the southern hemispheres, mainly due to the derivatives from satellite data. He expressed the need for higher spatial and vertical resolution data, better data assimilation methods and new observing systems that would improve the understanding of Physics for initialising models as well as for model validation purposes.

## 2.5 Special Lectures

During the symposium, two special lectures were arranged. The "Vikram Sarabhai Memorial Lecture" was delivered by Dr Shailesh Nayak, Secretary, Ministry of Earth Sciences and the "Millennium Lecture" was delivered by Dr V K Dadhwal, Director, NRSC.

### 2.5.1 Vikram Sarabhai Memorial Lecture

Dr Shailesh Nayak, Secretary Ministry of Earth Sciences, Government of India delivered the Vikram Sarabhai Memorial Lecture titled "India's Global Engagement in Earth System Science" during the ISPRS TC VIII Mid Term Symposium and the Annual ISPRS and ISG



Conventions in Hyderabad. In his talk, Dr Shailesh Nayak emphasised the importance of understanding the dynamics of interactions between human systems with Earth systems in order to develop processes that are capable of adding value to human life. He had elucidated a number of programmes, where India is taking a lead role in supplying Remote Sensing data to international and national institutes/universities. Over a period of time, India has contributed significantly to improve weather forecasts, cyclone prediction, farming related forecasts and many more with collaborations with international government and non-government agencies. These forecast data are available not only in the country, but to its neighbours and other countries as well.

He elaborated how India changed the perception about the Indian Ocean, which was previously considered to be a dead ocean (implying not contributing to global climate) into a



**Dr Shailesh Nayak delivering the Vikram Sarabhai Memorial Lecture**

dynamic and integrated part of global ecosystem using remote sensing technologies. The Fishery Zone programme that guides fishermen on where to fish, provides data to over 32 countries in the region and to India that contributes almost USD 7 million to its GDP. Dr Shailesh Nayak also spoke about the famous Indian Tsunami Warning System, developed by INCOIS that could transmit information about Tsunami within 5-6 minutes to all

relevant agencies in 21 countries without any human intervention. Dr Shailesh Nayak reiterated on the need to collaborate with all countries, not only the developed ones, to ensure that the science and knowledge generated is taken to larger society. He emphasised on developing a unified indexing system or standardisation in data generation, production and use. He concluded by saying that the most important contribution of Remote Sensing community is observation on how Earth has changed or is changing. In this process, it is time that we increasingly involve the social scientists so that we ensure the technology has a direct benign impact on the society.

### 2.5.2 Millennium Lecture

While delivering the Millennium Lecture on “Unlocking the Potential of Geomatics for Disaster Management in India” during the Symposium, Dr V K Dadhwal made an extensive presentation outlining the gamut of data and services provided by NRSC for disaster management and response in India. He iterated that information does not manage disaster, but people on ground do, and they can be supported by information. He said the main challenge for disaster response is to provide usable information in timely fashion. ISRO manages this task by setting up the Disaster Management Support Programme providing communication, weather and EO satellites data. India also contributes at the global level by sharing data with International Charter, Sentinel Asia, UNESCAP etc.

Dr Dadhwal mainly covered three major disasters viz., floods, landslides and open fires in his presentation. He explained in great detail contribution of NRSC to various disaster management initiatives that India conducts each year, including flood management, for which NRSC produces duration and depth class inundation maps. NRSC has provided



multiyear inundation satellite based cumulative flooded area map, which shows that more than 11 million hectares land has been flooded between 1998 and 2013. NRSC is now attempting to produce flood hazard zonation map and providing flood prediction and forecast of rain using models. Dr Dadhwal said that in case of flooding, within 12 hours flood inundation maps are made available to all relevant agencies automatically and updates are shared on Bhuvan, the geo-portal of ISRO, as well. NRSC will also provide flood prone assessment maps using historical observations, integration of flood level with DEMs and hydraulic modelling. NRSC has also developed mobile applications that push data on damage of assets to appropriate agency for quick restorative action.



Dr V K Dadhwal delivering the Millennium Lecture

Talking about landslides, Dr Dadhwal said that more than 5,000 landslides affecting 12,500 sqkm area is mapped. NRSC also provides a landslide early warning system to users and has developed a glacial lakes and water bodies monitoring system for the Himalayan region. In case of open fires (forest or agricultural), there is extensive use of remotely sensed satellite data for near real time fire detection (around 30 min of acquisition of MODIS, 4 times/ 24 hr). This data is disseminated rapidly to Forest Survey of India and field managers to avert life and property loss. Bhuvan again acts as a repository of rich data of open fires including density, duration and variability across years, he added.

Dr Dadhwal concluded his presentation by elucidating case of the three recent major disasters India experienced in the past two years including the Kedarnath 2013 flooding and landslide, which is considered the worst disaster since the 2004 Tsunami, the Srinagar floods of 2014 and the recent Hudhud Cyclone. He concluded that NRSC has been continuously striving to create tools for better disaster prediction and mitigation by merging a variety of spatio-temporal data sets and developing analytical and modelling techniques.

## 2.6 Parallel Technical Sessions

During the symposium, a total of 26 parallel technical sessions of oral presentations, 3 poster sessions and 3 special interactive sessions covering various themes of operational remote sensing applications were conducted. This also includes joint session of TC IV- Geospatial Databases and Location Based Services and TC VI- Education, Technology Transfer and Capacity Development; special session on "Himalayan Mountain Challenges and Geospatial Solutions", conducted by International Centre for Integrated Mountain Development (ICIMOD) and ISG Special Session.

### 2.6.1 Oral Presentations

This symposium witnessed an overwhelming response for paper submissions. A total of 540 papers were accepted for oral (288), poster (98) and special interactive session (144). The oral presentations were organised under various themes in 26 parallel sessions. The themes covered include disaster and risk reduction, health, weather, atmosphere & climate studies, water resources, energy & geological applications, cryosphere, forestry, natural ecosystems



& biodiversity, land cover and its dynamics, including agricultural & urban land use and coastal & ocean applications. This also includes joint session of Technical Commission IV- Geospatial Databases and Location Based Services and Technical Commission VI- Education, Technology Transfer and Capacity Development; special session on Himalayan Mountain Challenges and Geospatial Solutions, conducted by ICIMOD and ISG Special Session. Around 200 papers were presented in person in all these sessions.

### Disaster and Risk Reduction

Two sessions were conducted under this theme; both the sessions were chaired by Mr T Srinivasa Kumar, Chair of WG VIII/1 (Disaster and Risk Reduction) of TC VIII and co-chaired by Mr P K Champati Ray, Secretary of WG VIII/1. A total of 16 papers were presented and it generated very lively discussion and interaction among participants and paper presenters.

In the first session on hydro-meteorological disaster risk reduction, 8 papers were presented. The first paper was on 'Effective Drought Index (EDI)' using various parameters derived from EO data including database on 'India WRIS'. A paper on 'Multi-scale database



Session on "Disaster and Risk Reduction"

for emergency services' by NRSC highlighted role of such database in disaster response including evacuation. A paper on 'Diurnal Difference Vegetation Water Content' using AMSR-E data highlighted crop water stress at regional level. A paper on 'river erosion' highlighted the socio-economic aspects of riverine environment in active flood plain regions in eastern India. A paper on

'Agricultural Drought Vulnerability Index' highlighted various methods of vulnerability assessment including multiple dimensions of vulnerability that can be assessed at regional scale. A paper was presented on how EO data was used for damage assessment using pre and post-earthquake period data. The last paper was on 'use of satellite data from International charter for flood disaster management in India'. Overall all the papers highlighted the role of EO data from various platforms and wide variety of sensors (radar and optical) in mapping, monitoring and management of hydrometeorological hazards and risk mitigation.

In the second session on geological disaster risk reduction, 8 papers were presented on wide variety of topics. First paper was presented on detection of earthquake related deformation using DInSAR in China. In a very innovative application, it was demonstrated how UAV was used to monitor volcano in Japan using aerial photography. A paper on 'Sun Koshi landslide and its impact in India' by IIRS highlighted the role of EO in disaster management particularly in optimising evacuating plans based on scientific data. The need for cross border cooperation and data sharing between India and Nepal to avert disasters in India was also highlighted. In a study on rainfall threshold for landslide prediction, promising results were shown by NESAC using case examples from northeast India. Highlights of a major operational project on coastal erosion and vulnerability assessment in India were presented by SAC. In a very innovating attempt, PSInSAR was demonstrated to monitor slope stability in Himalaya for landslide related movement detection. In a paper on socio-economic vulnerability



assessment in Bhagirathi basin, it was demonstrated how GIS was used to derive social vulnerability index using ground based observation. Finally, a paper on dynamics of coastal erosion and deposition was presented from Sundarban delta, eastern India using temporal observations.

### Health

The papers presented under this theme were organised in two sessions, each focussing on “Diseases” and “Health GIS”. These sessions were chaired by Mr Fazlay S Faruque, Chair of WG VIII/2 (Health) of TC VIII. Mr K S Rajan from IIT, Hyderabad and Mr I V Muralikrishna co-chaired the first and second session respectively. Out of 20 papers planned, 17 papers were presented in these two sessions.

The seven presentations in the first session focused on mapping and understanding the spatio-temporal disease distribution of communicable diseases, mainly mosquito-borne diseases. In addition, one study on diarrheal disease and another study on mathematical modeling for spatial decision support systems were presented. In all papers, though the authors used different methods, the focus was largely on relating the disease causes to environmental and social variables. The use and importance of geospatial tools in understanding the disease distributions, disease clusters, hotspot detection and disease etiology were well-demonstrated. There were ten presentations in the second session that dealt with geospatial health research in diverse areas including groundwater quality modeling, E-surveillance, participatory public health initiative, big data in health information system, climate regionalization, ontology-driven healthcare system and healthcare infrastructure model, mold spore estimation, breast cancer, and tribal healthcare.



Delegates during a session on "Health"

### Weather, Atmosphere & Climate Studies

A total of 14 papers were presented in two sessions under this theme. First one mainly focussed on various platforms & sensors and the second mostly covered parameter retrieval. Both the sessions were chaired by Mr M Rajeevan from Ministry of Earth Sciences and co-chaired by Mr R K Nayak from National Remote Sensing Centre. A lead talk was delivered by Mr M Rajeevan on the extreme weather events over India and an invited talk by “Director, IMD” on INSAT-3D products and their use in operational forecast of weather over the Indian region.

Most of the presentations in the first session concentrated on geophysical data retrievals from Indian Geo-synchronous platforms, especially INSAT-3D and Kalpana satellites. Retrieval of aerosol optical depths over Indian regions and surrounding ocean using the INSAT-3D radiance data was the theme of the first presentation. The procedure of the retrieval algorithm in detailed along with validation with in situ aernet data and contemporary remote sensing satellites such as MODIS were discussed. In the corollary, it was said that the high frequency (sub-hourly) data coming from INSAT-3D platform could



help in enhancing our current understanding of various atmospheric phenomenon and predictability. The second presentation focused on validation of INSAT-3D upper



Session on “Weather, Atmosphere & Climate Studies”

troposphere humidity (UTH) products using Radiosonde, METEOSAT-7, and NCEP analysis. It seems that the UTH data were reasonable accurate. Availability of these data from INSAT-3D could enhance the scope for the modeller to examine the radiation and UTH and climate feedback at different temporal scales, starting from sub-hourly to seasonal, to inter-annual scales. The third presentation focused on

application of support vector machine (SVM) for accurate detection of rain area estimation from the KALPANA radiance data. This is based on supervised non-parametric binary classifier and blending procedures for multiple satellite observations. According to the presenter, this procedure probable the better procedure than any other contemporary procedures generally used for the purpose. The last two presentations were focused on establishment of procedure for Radiometric Quality Evaluation (RQE) and analysis system for the INSAT-3D on board system parameters. Present RQE procedure for INSAT-3D is semi-automatic and work is on progress to make the procedure/system fully automatic in future.

In the second session, the presented papers broadly covered different aspect of atmospheric phenomenon and variability using the data retrieved from in situ, satellite, and numerical modelling procedure. Examining the association between oscillations of the stratospheric aerosol layer peaks and different of clouds is the theme of the first presentation. Here the ground based observations of aerosol vertical profile in and around the Pune region was used to establish characteristic relation with visual based cloud property. The second presentation focused on “Evaluation of NOAA CO<sub>2</sub> global products using satellite observations such as AIRS and GOSAT”. This study has examined the coherences between model results with satellite observations at different temporal and spatial scales. They found NOAA CT is working well at seasonal and inter-annual scale, but lacks spatial patterns of long-term growth rate as observed in satellite observations. The theme of third presentation is “prediction of precipitation status over eastern region of India using Cmp5” where effort was mad to quantify errors associated with different/ensemble predictions over India. The last two presentations were based on ground based LIDAR observation for the study of regional climatology of thin cirrus cloud over the GADANKI (south-eastern India) and its optical characteristics and comparison with satellite observations.

### Water Resources

Two sessions were conducted under this theme; both the sessions were chaired by Mr M Sekhar from Indian Institute of Science, Co-Chair of WG VIII/4 (Water Resources) of TC VIII. The first session on ‘ground water’ was co-chaired S K Srivastav from IIRS. In this session, four papers (out of seven) were presented related to different aspects of ground water using remote sensing and GIS techniques. The presentations covered analysis of spatial distribution of ground water aspect in the State of Andhra Pradesh; use of GRACE data to identify spatial and temporal patterns of changes in terrestrial water storage (TWS) over



India; multi-criteria decision modeling (MCDM) approach to delineate the ground water recharge zones; and analysis of drainage morphometric parameters and land-use/ land-cover changes using satellite data.

The second session on 'surface water' was co-chaired by Mr V V Rao from NRSC. Nine out of ten papers scheduled were presented in this session. Most of the presentations addressed the challenges and gap areas in operational hydrology and discussed solutions towards this. The areas covered include satellite based estimation/retrieval and validation of important hydrologic variables (rainfall, soil moisture and Evapotranspiration), assessment of feasible river links using satellite derived inputs, evaluation of global moisture products with precipitation records in India, analysis of satellite based latent heat flux over different agro climatic regions of India and its correlation with evaporative fraction & soil moisture, open source tools for soil moisture estimation for drought monitoring, spatially disaggregated procedures for downscaling of spatial data inputs in models addressing Water Use Efficiency in irrigation project and use of hydrological model for reconstructing recent extreme flood events .



Session on "Water Resources" in progress

### Energy & Geological Applications

The papers presented under this theme were organised in two sessions, each focussing on "Advanced Sensors & Applications" and "Mapping". These sessions were chaired by Prof. Rao Divi from Kuwait University, Regional coordinator (Asia) of WG VIII/5 (Energy & Geological Applications) of TC VIII. Mr K Vinod Kumar from NRSC and Mr A S Rajawat from SAC co-chaired the first and second session respectively. Out of 16 papers planned, 14 papers were presented in these two sessions.

The papers presented in the first session addressed various topics such as sub-pixel mineral mapping, analysis of hyper spectral fingerprints to characterise Haematite, hyper spectral



"Energy & Geological Applications" session

analysis of clay minerals, potential of thermal emissivity for mapping of greenstone rocks, mineralogical characterization of Juventae Chasma, Mars and efficacy of StaMPS technique for monitoring surface deformation. The second session covered diverse areas under this theme. It includes spectral stratigraphy & clay minerals analysis, study on karst rock desertification by human-nature interaction and visualization of active tectonics signatures & subsurface and surface lineaments/faults. Two interesting presentations on origin of collapsed pits and branched valleys surrounding the Ius Chasma on Mars and evaluation of time series TanDEM-X digital elevation models were also part of this session.



## Cryosphere

This session was chaired by Mr Josefino Comiso from NASA and Chair of WG VIII/6 (Cryosphere) of TC VIII and co-chaired by Ms Rajashree V Bothale from NRSC. Out of 9 papers slated for the session, 8 papers were presented covering various aspects of cryosphere. Lead talk was delivered by Mr Josefino Comiso on increasing Antarctic sea ice extent and the record high observations made during 2014. The analysis was based on 35 years of passive microwave data.

A study on the status of melt/freeze over Amery and Ross Ice Shelf in Antarctic using OSCAT scatterometer during 2009-2014 was presented, bringing out no melt situation over Ross and highest melt over Amery during 2014.

Another study was presented on generation of an enhanced digital elevation model (eDEM) of the Schirmacher oasis region, east Antarctica, using Cartosat-1 stereo pair-derived photogrammetric DEM (CartoDEM)-based point elevation dataset and multi-temporal Radarsat Antarctic mapping project version 2 (RAMPv2) DEM-based



"Cryosphere" session in progress

point elevation dataset. The study showed that the newly constructed eDEM achieved a vertical accuracy of about 7 times better than RAMPv2 DEM and 1.5 times better than CartoDEM. Some more studies done over Himalayas glacier mapping & change analysis, snow grain size identification using snow grain index, Glacial lake outburst flood for Tawang basin and health status of Western Himalayas using Landsat TM, SRTM and ASTER data were also presented. In all the session was quite interactive with Chair participating in discussions.

## Forestry, Natural Ecosystems & Biodiversity

The deliberations under this theme were organised in two sessions. The first session on 'Forest Cover & Dynamics' was chaired by Mr Sarnam Singh from IIRS and co-chaired by Mr T



"Forestry, Natural Ecosystems & Biodiversity" Session

R Kiranchand from NRSC. Out of the 14 papers scheduled under this session, 9 papers were presented. The studies include rapid 3D feature extraction using airborne LIDAR & high resolution satellite data, cadastral level forest information system, decadal forest cover loss analysis over Indian forests, improved classification of mangroves health status, spatio-temporal trends of fire in slash and burn

agriculture landscape, automated burned area delineation and spatial dynamics of deforestation and forest fragmentation in Eastern Ghats of India. Multispectral and hyper spectral data from different remote sensing satellites were in these studies for forest cover mapping.

The second session on 'Biospheric Processes' was chaired by Mr C S Jha from NRSC and co-chaired by Mr C Sudhakar Reddy from NRSC. Research works carried out using different sensors were presented in this session. Some of them include assessment of Net Primary Productivity (NPP) using INSAT-3A and MODIS data, terrestrial biospheric carbon flux study over India using GOSAT data, PolInSAR coherence-based regression analysis of forest biomass using Radarsat-2 data and integration of multispectral satellite and hyper spectral field data for aquatic macrophyte studies. In addition to this, there were few case studies used IRS High Resolution data and multiple echoes laser scanner data.

### **Land Cover and its Dynamics, including Agricultural & Urban Land Use**

This theme had an overwhelming submission of papers that resulted in six sessions covering various aspects of land processes. Based on the papers received, a total of 61 papers were organised under different sub-themes namely Soils & Land Use, Crop Inventory, Crop Monitoring, Techniques Development, Change Analysis and Urban Studies.

The first session was chaired by Mr Y V N Krishna Murthy from IIRS and co-chaired by Mr S V C Kameswara Rao from NRSC. During the session, 8 out of 10 papers scheduled were presented, in addition to the lead talk by chair. The lead talk highlighted the need for studying the spatio-temporal variations occurring in the land cover/land use of our country during the past few decades, in view of burgeoning population and increased demand for goods and services from natural resources. The other presentations covered utilisation of geo-spatial techniques in understanding the spatial



**One of the session on "Land Cover and its Dynamics, including Agricultural & Urban Land Use" in progress**

variability of soil nutrients, classification of various land cover features, using dual-polarised RISAT-1 data, comparative analysis of LULC classification results derived using single-classifier approach vis-à-vis Multi-classifier system and development of a soil moisture model, using multi-angle, multi-polarised RISAT-1 data. Some more studies addressed cadastral level data preparation using high resolution satellite data.

In the second and third sessions, focussed on 'Crop Inventory' and 'Crop Monitoring' respectively, 18 out of 20 papers scheduled were presented. Both the sessions was chaired by Mr S S Ray from MNCFC, New Delhi. Under the 'Crop Inventory' session, co-chaired by Mr K R Manjunath from SAC, various studies on crop related issues were presented that include site suitability analysis for dissemination of salt-tolerant rice varieties, polarimetric SAR data for crop cover classification, operational crop forecasting programme of India, semi-physical spectral-spatial wheat yield model development, hyper spectral remote sensing of paddy crop and wheat phenomics for water deficit stress using hyper spectral data. The session on 'Crop Monitoring' was co-chaired by Mr Abhishek Chakraborty from NRSC. Papers presented under this session covered wide range of topics that include real time monitoring of leaf retention in natural rubber plantations affected by abnormal leaf fall disease, study of discrimination between plantation and dense scrub based on backscattering behaviour of C band SAR data, assessment of rabi crop progression and condition, development of precise



crop spectra for hyper spectral data analysis, use of SAR data techniques for land features classification and discrimination/ biophysical parameters of crops and anisotropicity and radiative transfer modelling of mustard crop for biophysical parameter estimation.

Another session on 'Techniques Development' was chaired by Mr I V Muralikrishna and co-chaired by Mr C S Murthy from NRSC. Out of 13 papers scheduled, eight papers representing



**Session on "Land Cover and its Dynamics, including Agricultural & Urban Land Use"**

diverse themes were presented. Four papers discussed on various techniques development for hyper-spectral image classification. The other papers covered atmospheric correction of AWiFS data, urban area boundary delineation, registration of terrain laser scan images and DEM generation with SAR interferometry. The session on 'Change Analysis' was chaired by Mr S K Saha from IIRS and co-chaired by Mr T Ravi Sankar

from NRSC. Only 4 out of 9 papers scheduled were presented. New change detection techniques to monitor land cover dynamics in mine environment, ensemble classification approach for improved Land use/cover change detection, land degradation and forest health monitoring using hyper spectral data and polarimetric SAR data for crop cover classification are the papers presented in this session.

The last session under this theme was chaired by Mr J R Sharma from NRSC and co-chaired by Mr K Venugopala Rao from NRSC. During this session, 7 out of 10 papers scheduled were presented. The studies presented covered various aspects of urban planning and management using geospatial technology. All these studies used data from high resolution, hyper spectral and LIDAR sensors and few focused on generation of 3D model from high resolution images and anaglyph using single space borne image.

### Coastal & Ocean Applications

More than 30 papers were received under this theme, out of which 22 papers were accepted (11 each for oral & poster). The session was chaired by Mr Prakash Chauhan from SAC and Co-chair of WG VIII/9 (Coastal and Ocean Applications) of TC VIII and co-chaired by Mr Mehul Pandya from SAC.

The papers presented covered all the three major areas of oceanography - physical, geological and biological oceanography. Studies on propagation of monsoon using data from recently launched SARAL AltiKa, estimation of significant wave height from altimeter that is useful during cloudy conditions of cyclone period, oil spill monitoring using RISAT SAR data using polarimetric SAR techniques were presented in this session. Use of remote sensing data for mapping coastal processes such as



**"Coastal & Ocean Applications" Session**

coastal erosion and ocean colour data for phytoplankton studies were also demonstrated by few authors.

#### TC IV- Geospatial Databases and Location Based Services

A total of three sessions were organised under this theme covering 'geospatial technologies', 'mapping techniques' and 'geospatial data processing'. Out of the 29 papers planned in these sessions, 24 papers were presented. The first session was chaired by Mr B Karthikeyan from SAC and co-chaired by Mr S Muralikrishnan from NRSC. In this 8 papers were presented covering the topics on sharing & online analysis and processing of databases in internet domain, accuracies & uncertainties of spatial data and analysis, highly efficient real time satellite data acquisition system and state-of-art storage system, spatial data infrastructure and open source software for registration of images from different satellites.

In the second session 9 papers were presented. This session was chaired by Mr E Pattabhi Rama Rao from INCOIS and co-chaired by Mr Vinod M Bothale from NRSC. Techniques for



Joint Session of TC IV in progress

enhancement of multi-spectral and hyper spectral images, efficient image acquisition systems, automatic registration of satellite data from Indian satellites, and quality metrics of satellite images are the areas in which the presentations were made. The third session was chaired by Mr K V Kale from Dr Babasaheb Ambedkar Marathwada University and co-chaired by Mr Sameer Saran from IIRS. A total of 7

papers that include novel techniques for classification, enhancement and fusion of satellite images as well as extraction of 3D objects, performance evaluation of fusion methods and quality assessment of DEMs.

#### TC VI- Education, Technology Transfer and Capacity Development

This session was chaired by Mr Jianya Gong from China and President of Technical Commission VI (Education, Technology Transfer and Capacity Development) and co-chaired by Ms Anjana Vyas from CEPT and Chair of WG VI/2 (E-Delivery of Education Services) of TC VI. Out of 9 papers slated for the session, 5 papers were presented. The papers covered topics on IIRS outreach program, E-learning based distance education programme on remote sensing & geoinformation science, open & global education initiative to support and sustain



Joint Session of TC VI in progress

geospatial education and research and capacity building through geospatial education in planning and school curricula. The capacity building exercise carried out for collecting primary data through crowdsourcing was also presented.

### Himalayan Mountain Challenges and Geospatial Solutions

This session was chaired by Mr Josefino Comiso from NASA and Chair of WG VIII/6 (Cryosphere) of TC VIII and co-chaired by Mr K Abdul Hakeem from National Remote Sensing Centre. Mr Josefino Comiso, in his opening remarks, stressed the importance glaciers and the role they play in climate change. A total of 7 papers were presented in this session that



Session on "Himalayan Mountain Challenges and Geospatial Solutions"

was sponsored by ICIMOD. The presentations covered overview of ICIMOD activities, their regional programmes, thematic areas of geospatial applications in Hindu-Kush-Himalayas, SERVIR Himalaya, regional water security, Himalayan glacier dynamics, disaster risk reduction systems, crop and forest monitoring in this region.

Some of the case studies carried out by ICIMOD like monitoring of glaciers,

precipitation, river flow, and land cover change were also presented. Presentation also includes different assessment tools developed for water related issues in the region. Use of JASON data for water level monitoring in rivers was one of the interesting studies presented in this session. During the discussion, suggestion was made by a delegate to use data from SARAL AltiKa as a supplement to JASON data. Five papers were presented by ICIMOD officials and two papers on national crop and forest monitoring in Nepal were presented by the representative of the respective ministries.

#### 2.6.2 Poster Presentations

Parallel poster sessions were held spread over three days of the symposium. Out of the total 98 papers accepted under this session, 43 papers were presented by the delegates. Many enthusiastic participants interacted with the authors of these papers and exchanged their views and ideas.

#### Delegates interacting with authors during poster presentation





### 2.6.3 Special Interactive Sessions

To encourage young researchers and students, first time in the history of ISRS annual conventions, special interactive sessions were organised during this symposium. Out of the total 144 papers accepted under this session, more than 60 papers were presented in person across sessions spread over three days. These sessions saw active interactions among the delegates in understanding each other studies and exchanging the knowledge.

#### Special Interactive Sessions



## 2.7 Concluding Ceremony

During the concluding ceremony held on 12th December, 2014, awards were presented for three best papers each in oral and poster category for both general delegates and students respectively (Refer Annexure 4). In addition to this, ISPRS Young Author Award was also presented. All the sponsors and exhibitors were felicitated for their support during this event. Dr Christian Heipke, Secretary General, ISPRS Council and Professor for Photogrammetry and Remote Sensing at the Institute of Photogrammetry and GeoInformation, Germany addressed the Concluding Session by stating that India and ISRS are key players for ISPRS. He applauded India's seriousness in taking forward its remote sensing initiatives, citing the Indian space programme as a testimony of it. He reflected that geospatial data infrastructure is as important for India as any other infrastructure. Further, geospatial is not just about technology but also applications, both are being taken up in India. Congress Director, Dr (Ms) Lena Halounova invited the audience to XXIII ISPRS Congress to be held in July 2016 in Prague, Czech Republic.

The Concluding Session also witnessed presentations by various working groups who summarized their recent and future planned activities as well as the details of the respective sessions during this Symposium. The Best Oral and Poster Paper Awards, in two categories – students and general, were also given. Dr VK Dadhwal, President, TC VIII of ISPRS, expressed his appreciation to the ISPRS Council, the authors, Indian Society of Remote Sensing, Working Group of TC VIII and ISG. The symposium ended with a word of thanks by Dr P G Diwakar, Organising Secretary, to each and every individual those who have contributed for the successful conduct of this symposium.



View of delegates during concluding session



Another view of delegates during concluding session



Distribution of awards by Dr Christian Heipke



Organising team after concluding session



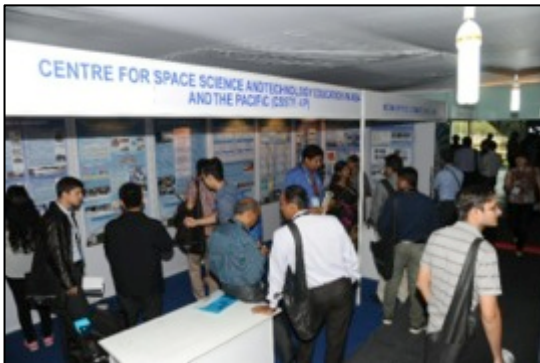
## 2.8 Exhibition Programme

As part of this symposium, an exhibition was arranged with 25 stalls, showcasing the products and services of 18 organisations from government, academia and industry sectors. The exhibition was inaugurated by Prof. Chen Jun, President, ISPRS Council on 9<sup>th</sup> December after the inaugural ceremony. The dignitaries and all the delegates visited these stalls after the inauguration and also during breaks on all the days of the symposium. The list of organisations participated in the exhibition is given below.

 INCOIS	 IIRS	 CSSTE-AP	 Skymap Global
 Excel Geomatics	 VizExperts	 Taashee	 NRSC
 Bhuvan	 India-WRIS	 Bhuvan Panchayats	 Intergraph
 SOI	 NESAC	 MAPCOST	 KRSAC
 MathWorks		 Trimble	

Snapshots of exhibition





### 3 Post-symposium Phase

Various activities after the symposium are listed below.

- The draft resolution presented in the concluding ceremony was uploaded in the symposium for inviting feedback and suggestions from the participants (Refer Annexure 5).
- All the presentations made during the technical sessions of the symposiums were organised and uploaded in PDF format in the symposium website.
- All the photographs taken during the symposium were organised for each day and made available in the symposium website with option to download.
- The important technical sessions like inaugural, plenary and concluding sessions were live webcast during the symposium and a copy of the video is made available in the symposium website.
- Most of the participants were provided with participation certificates during the symposium. However a large number of students and young researchers requested for paper presentation certificate from the organisers. Individually printed paper presentation certificates were prepared for more than 100 students and young researchers. Some of the certificates were handed over in person and the rest were posted to the individuals.



Sample certificate of participation

## Annexure 1 Symposium Committees

### A1.1 International Advisory Committee

K Radhakrishnan, ISRO, India  
 Orhan Altan, ITU, Turkey  
 Chen Jun, NGCC, China  
 Christian Heipke, LUH, Germany  
 Barbara J Ryan, GEO, Switzerland  
 George Joseph, President, ISPRS TC I (1996-2000), India  
 RR Navalgund, President, ISPRS TC VII (2000-2004), India  
 Shailesh Nayak, President, ISPRS TC IV (2004-2008), India  
 VS Hegde, Antrix Corporation Limited, India  
 VK Dadhwal, President, ISPRS TC VIII, India  
 PLN Raju, Secretary, ISPRS TC VIII, India

### A1.2 Scientific Committee

VK Dadhwal, President, ISPRS TC VIII, India  
 T Srinivasa Kumar, Chair, WG VIII/1, India  
 Fazlay S. Faruque, Chair, WG VIII/2, USA  
 Dev Niyogi, Chair, WG VIII/3, USA  
 Yann Kerr Chair, WG VIII/4, France  
 SM Ramasamy, Chair, WG VIII/5, India  
 Josefino Comiso, Chair, WG VIII/6, USA  
 YA (Yousif) Hussin, Chair, WG VIII/7, The Netherlands  
 Prasad S. Thenkabail, Chair, WG VIII/8, USA  
 Samanta Lavender, Chair, WG VIII/9, UK  
 Yifang Ban, Chair, ICWG IV/II/VIII, Sweden  
 Cees Van Westen, Co-Chair, WG VIII/1, The Netherlands  
 Fabio Giulio Tonolo, Co-Chair, WG VIII/1, Italy  
 David J Lary, Co-Chair, WG VIII/2, USA  
 Richard Kiang, Co-Chair, WG VIII/2, USA  
 Abdulkader A Murad, Regional Coordinator, WG VIII/2 S Arabia  
 Yves M Tourre, Regional Coordinator, WG VIII/2, France  
 Masami Onoda, Regional Coordinator, WG VIII/2, Japan  
 Ad De Roo, Chair, WG VIII/4, Italy  
 M Sekhar, Chair, WG VIII/4, India  
 Sanjeevi, Co-Chair, WG VIII/5, India  
 Derek Rust, Regional Coordinator, WG VIII/5, UK  
 Rao Divi, Regional Coordinator, WG VIII/5, Kuwait  
 CJ Kumanan, Regional Coordinator, WG VIII/5, India  
 Kohei Cho, Co-Chair, WG VIII/6, Japan  
 Beata Csatho, Co-Chair, WG VIII/6, USA  
 Snehmani, Regional Coordinator, WG VIII/6, India  
 Guoqing Zhou, Co-Chair, WG VIII/7, China  
 Jaime Hernández Palma, Co-Chair, WG VIII/7, Chile  
 Ramakrishna Nemani, Regional Coordinator, WG VIII/7, USA  
 Mutlu Ozdogan, Co-Chair, WG VIII/8, USA  
 Zeng Yongnian, Co-Chair, WG VIII/8, China  
 Barbara Koch, Regional Coordinator, WG VIII/8, Germany  
 Prakash Chauhan, Co-Chair, WG VIII/9, India  
 Tim Liu, Co-Chair, WG VIII/9, USA  
 Chandra Giri, Co-Chair, ICWG IV/II/VIII, USA



Lijun Chen, Co-Chair, ICWG IV/II/VIII, China

### **A1.3 National Organising Committee**

AS Kiran Kumar, Director, SAC & President, ISRS&ISG  
VK Dadhwal, Director, NRSC & President, ISPRS TC VIII  
Ashish Bahuguna, Secretary, Dept. of Agriculture & Cooperation  
S Ayyappan, Secretary, Dept. of Agricultural Research & Education  
Shankar Aggarwal, Secretary, Ministry of Urban Development  
LC Goyal, Secretary, Ministry of Rural Development  
V Rajagopalan, Secretary, Ministry of Environment, Forests & CC  
Swarna Subba Rao, Surveyor General of India, SOI  
V Jayaraman, Prof Satish Dhawan Professor, ISRO HQ  
Satheesh C Sheno, Director, INCOIS  
M Rajeevan, Adviser, MoES  
SS Ray, Director, MNCFC  
YJ Bhaskara Rao, Director, NGRI  
Bharti Sinha, Executive Director, AGI  
LS Rathore, Director General, IMD  
YVN Krishna Murthy, Director, IIRS  
KS Dasgupta, Director, IIST  
Harbans Singh, Director General, GSI  
AB Pandya, Chairman, CWC  
Bharat Lohani, Professor, IIT Kanpur  
RD Singh, Director, NIH  
Ashwagosh Ganju, Director, SASE  
Anmol Kumar, Director General, FSI  
Alok Kumar Sikka, Deputy Director General (NRM), ICAR  
JR Sharma, Chief General Manager (RC), NRSC  
Surendra Kumar Singh, Director, NBSS & LUP, ICAR  
Pramod K Verma, Director General, MPCOST  
SS Ramakrishnan, Director, IRS, Anna University  
SN Das, Director, MRSAC  
NS Mehta, Secretary (ISG), SAC  
SP Aggarwal, Secretary (ISRS), IIRS  
PG Diwakar, NRSC, Organising Secretary



## A1.4 Local Organising Committee



ISRS  
www.isrsindia.in

**INDIAN SOCIETY OF REMOTE SENSING**  
INDIAN INSTITUTE OF REMOTE SENSING CAMPUS  
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**Dr.P.G. Diwakar**  
Vice President, ISRS &  
Organizing Secretary, ISPRS TC VIII  
Mid-term Symposium - 2014

No. ISPRS/TC8MTS/01

October 16, 2014

**Sub:** ISPRS TC VIII Mid-Term Symposium - Local Organisational Arrangements

International Symposium on “Operational Remote Sensing Applications: Opportunities, Progress and Challenges” is being organised by the International Society for Photogrammetry and Remote Sensing (ISPRS) TC-VIII and the Indian Society of Remote Sensing (ISRS), jointly with Indian Society of Geomatics (ISG) in Hyderabad during 9<sup>th</sup> – 12<sup>th</sup> December, 2014. Prior to the Symposium, three tutorials are going to be organised during 7 - 8<sup>th</sup> December, 2014. It is expected that about 350 Indian and 75 foreign delegates are likely to be participating in this Symposium. To handle such a huge task, active cooperation and participation of technical and administrative personnel is essential. For the smooth conduct of this Symposium, the following committees have been formed with specific responsibilities. These committees will function in coordination with each other as part of the ISPRS TC VIII Mid-Term Symposium and work towards smooth conduct of the event.

### 1. Symposium Secretariat

Mr. K. Abdul Hakeem, NRSC	Secretariat-in-charge
Mr. A. Lesslie, NRSC	Member
Mr. Y. Bhaskar, NRSC	Member
Ms. Padma Venkateswaran, NRSC	Member
Ms. K. Sudha Rani, NRSC	Member

The Secretariat will coordinate/facilitate all activities and hence assist Organizing Secretary in conduct of the symposium in consultation with LOC. It will ensure functioning of all committees and necessary correspondence with various individuals and institutions, as required.

### 2. Technical & Exhibition Committee

Dr. R. Nagaraja, NRSC	Chairman
Dr. P.V.N. Rao, NRSC	Member
Mr P.L.N. Raju, IIRS	Member
Dr. Prakash Chauhan, SAC	Member
Dr. Uday Raj, GM, RC (South)	Member
Dr. K.P.R. Menon, NRSC	Member
Dr. S. Muralikrishnan, NRSC	Convener

Page 1 of 4



This Committee coordinates all the activities related to scheduling & conduct of sessions, Interactive Poster Sessions, arranging invited speakers, Chairperson and Co-Chairperson(s), proposing panels of judges for evaluation and for preparing draft resolution(s) for the Plenary Session etc.

This Committee will also undertake the responsibility of raising funds through exhibition and sponsorship, besides coordinating the layout of commercial exhibits with the other concerned teams. It will interact with potential exhibitors, negotiate, finalise allotment of spaces, provide necessary infrastructural facilities to exhibitors and ensure safety of exhibits etc.

### 3. Registration, Database & Web Committee

Dr. Vinod M Bothale, NRSC	Chairman
Dr. N. Aparna, NRSC	Member
Dr S.P. Aggarwal, IIRS	Member
Mr. Mehrul Pandya, SAC	Member
Ms. Vijaya Banu, RC	Member
Mr. Ch. Srikanth, NRSC	Member
Ms. P. Manjusree, NRSC	Convener

This Committee will be responsible for making all necessary arrangements for registration of participants and carry out registration of participants at the venue, as required. This committee is also responsible for preparation and distribution of registration kits, posting of symposium circulars on the web; creation of online registration and DBMS linkages; positioning and maintenance of internet facility & WiFi at the venue during the Symposium in coordination with Venue Management & Publications Committee. This committee will also provide information on registration to the symposium secretariat from time to time.

### 4. Venue Management & Publications Committee

Dr. G. Ravi Shankar, NRSC	Chairman
Mr. Rajiv Kumar, NRSC	Member
Mr Nitant Dubey, SAC	Member
Mr. E. Vijaya Sekhara Reddy, NRSC	Member
Ms. Reedhi Shukla, NRSC	Member
Mr. T.R. Narasimha Kumar, NRSC	Member
Mr. D. Vijayan, NRSC	Convener

This Committee will coordinate with the venue (hotel) authorities for enabling all necessary arrangements. The committee is responsible to ensure availability of audio / visual equipments, arrangement of photo and video coverage, maintenance of information desk at the venue, decide upon day to day menu for snacks/lunch in coordination with the Hotel Management, and make available requisite bouquets and mementoes as required for the symposium. The committee will facilitate all requirements of the other committees with regard to the venue for smooth conduct of symposium.



This Committee is also responsible for bringing out a Souvenir and printing of circulars, posters, seminar program schedule; invitation cards, lunch cards; abstract volume; proceedings, etc. It will also arrange for preparation of CDs/media of the proceedings, publicity during pre & post symposium period, prepare daily press releases and invitations to media people during important sessions. This committee will take the responsibility for organizing the social and cultural events during Symposium if required.

#### 5. International Facilitation Committee

Dr. Manoj Raj Saxena, NRSC	Chairman
Dr. G. Padmarani, NRSC	Member
Mr. B. Shyam Sundar, NRSC	Member

This Committee will facilitate interactions with ISPRS council members, cater to specific interface requirements of foreign delegates and ensure that their needs are addressed by the appropriate committees/officials.

#### 6. Accommodation, Transport & Security Committee

Mr. K. Lakshmana Kumar, NRSC	Chairman
Dr. S.K. Srivastava, IIRS	Member
Ms. J. Kamini, NRSC	Member
Mr. D.P. Shashikantha Rao, NRSC	Member
Mr. K. Vijaya Chandra, NRSC	Member
Mr. J. Subramonia Pillai, NRSC	Convener

This Committee is responsible for arranging accommodation to participants, reception at Airport/Railway Stations, arrange for participants' transport from their stay to Venue and back, provide a counter at the registration desk for ticketing arrangements and ensure necessary security protocol through NRSC/DOS administration and other security arrangements at the venue.

#### 7. Finance & Procurement Committee

Head, I&FA, NRSC	Chairman
Dr. A.S. Rajawat, SAC	Member
Dr. Sameer Saran, IIRS	Member
Mr. N. Sujan Kumar, NRSC	Member
Mr. R.V. Satyanarayana, NRSC	Member
Mr. B.S. Nageswara Rao, NRSC	Convener

This Committee is responsible for preparation of the budgetary estimates for all procurements, follow-up with funding agencies, authorize and approve purchase of requisite materials for Symposium, maintain record of expenditure and ensure audit of accounts. This committee is also responsible for procuring all the relevant materials for the

Symposium, as requested by different committees after obtaining approvals by the competent authority adhering to norms.

#### 8. Tutorial Committee

Mr. P.L.N. Raju, IIRS	Chairman
Mr. G. Srinivasa Rao, NRSC	Member
Dr. Prakash Chauhan, SAC	Member
Mr. Shashi Kumar, IIRS	Member
Mr. D. Vijayan, NRSC	Convener

This Committee is responsible for organizing the pre-symposium tutorials including content design, identification of speakers/experts, preparation of lecture notes, etc.

The Committees may propose additional members/volunteers, as required, in due consultation with Organizing Secretary. All committees will be functioning in close coordination with the Symposium Secretariat.

This is issued with the approval of Dr. V.K. Dadhwal, President, ISPRS TC-VIII.



(P G Diwakar)

Vice President, ISRS &

Organising Secretary, ISPRS TC VIII MTS

To: All concerned

CC: President, ISRS / ISG & Director, SAC  
Director, NRSC  
Director, IIRS  
Secretary, ISRS  
Secretary, ISG

## Annexure 2 Programme Schedule

### ISPRS TC VIII Mid-Term Symposium on "Operational Remote Sensing Applications: Opportunities, Progress and Challenges" 9-12 December, 2014 - Hyderabad, INDIA Programme Schedule

Date/Time	08:30-09:00	09:00-10:30	10:30-11:00	11:00-12:30	12:30-14:00	14:00-15:30	15:30-16:00	16:00-17:30	17:30-18:30	18:30-20:00
<b>Monday 8 December 2014</b>	Registration (Lobby at Symposium Venue)									
<b>Tuesday 9 December 2014</b>	Networking	Inaugural Session	Break	Vikram Sarabhai Memorial Lecture	Lunch	Hall1-D1 Hall2-H1 Hall3-L1	Break	Hall1-D2 Hall2-H2 Hall3-L2	Plenary Session (Awardees)	ISRS Annual GB Meeting (only for members)
	Registration (Lobby at Symposium Venue)		Exhibition		Registration (Lobby at Symposium Venue)					
<b>Wednesday 10 December 2014</b>	Networking	Plenary Session (Future Earth)	Break	Hall1-TC IV 1 Hall2-L3 Hall3-ISG	Lunch	Hall1-TC IV 2 Hall2-L4 Hall3-ICIMOD	Break	Hall1-TC IV 3 Hall2-L5 Hall3-TC VI 1	Millennium Lecture	ISG Annual GB Meeting (only for members)
	Registration (Office of Symposium Secretariat)		Exhibition		Registration (Office of Symposium Secretariat)					
<b>Thursday 11 December 2014</b>	Networking	Plenary Session (Operational RS Applications - Indian Scenario)	Break	Hall1-L6 Hall2-A1 Hall3-W1	Lunch	Hall1-G1 Hall2-A2 Hall3-W2	Break	Hall1-G2 Hall2-F1 Hall3-Break-Out	Industry Session	
	Registration (Office of Symposium Secretariat)		Exhibition		Registration (Office of Symposium Secretariat)					
<b>Friday 12 December 2014</b>	Networking	Hall1-F2 Hall2-Co1 Hall3-Cr1	Break	Concluding Session	Lunch					
	Registration (Office of Symposium Secretariat)		Exhibition		Registration (Office of Symposium Secretariat)					

Sessions Colour Scheme	Inaugural/Plenary/Concluding Sessions	Hall 1, 2 & 3	Parallel Technical Session	PPS Session	Parallel Poster Session	SIS Session	Special Interactive Session	Special Lectures/Meetings	Exhibition
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**Theme Legend**  
 D- Disaster and Risk Reduction; H-Health; A- Weather, Atmosphere and Climate Studies; W- Water Resources; G- Energy & Geological Applications; Cr- Cryosphere; F- Forestry, Natural Ecosystems & Biodiversity; L- Land Cover and its Dynamics, Including Agricultural & Urban Land Use; Co- Coastal and Ocean Applications; TC IV- Geospatial Databases and Location Based Services; TC VI- Education, Technology Transfer and Capacity Development; ICIMOD-Himalayan Mountain Challenges and Geospatial Solutions



## Annexure 3 List of ISRS & ISG Awardees

### ISRS Awards

**ISRS Fellows** - Dr N C Gautham, Dr P Venkatachalam, Dr V K Dadhwal

**Bhaskara Award 2012** - Dr S K Shivakumar

**Bhaskara Award 2013** - Dr V K Dadhwal

**Satish Dhawan Award 2013** - Mr D R M Samudraiah

**National Geospatial Award for Excellence 2013** - Dr Gangalakunta Obi Reddy

**P R Pisharoty Memorial Award 2014** - Dr C Sudhakar Reddy and Dr P K Joshi

**President's Appreciation Medal** - Mr P L N Raju

**Best Chapter** - Delhi Chapter

**Best Papers (2 nos.) RS Technology and applications**

*Understanding the Spatial Variability of Chlorophyll a and Total Suspended Matter Distribution Along the Southwest Bay of Bengal Using In-Situ and OCM-2 & MODIS-Aqua*

Measurements by D. Poornima, R. Shanthi, S. Raja, G. Vijayabaskara Sethubathi, T.

Thangaradjou, T. Balasubramanian, K. N. Babu and A. K. Shukla

*Genetic Algorithm Based Feature Subset Selection for Land Cover/ Land Use Mapping Using Wavelet Packet Transform*

S. Rajesh, S. Arivazhagan, K. Pratheep Moses and R. Abisekar

### ISG Awards

**ISG Fellows** - Prof (Mrs) Parvatham Venkatachalam

**National Geomatics Award for Excellence** - Dr Baldev Sahai

**National Geomatics Award: Applications** - Dr Anjana Vyas

**National Geomatics Award: Technology** - Dr P G Diwakar

**Young Achiever Award** - Dr (Mrs) Dipanwita Haldar

**Presidents Appreciation Medal for Contribution to Society** - Dr Sarvesh Palria

**Best Chapter** - Visakhapatnam Chapter



## Annexure 4 List of best paper awards

### Oral Presentations - General Category

1. *Evaluation of NOAA Carbon Tracker Carbon Dioxide Products*, R. K. Nayak, E.N. Deephi, M. Salim, G. Abhinav, C.B.S. Dutt, V.K. Dadhwal  
Awarded to Mr R K Nayak, National Remote Sensing Centre, India
2. *Landform monitoring in active volcano by UAV and SfM-MVS technique*, T. Nakano, I. Kamiya, M. Tobita, J. Iwahashi, H. Nakajima  
Awarded to Mr Takayuki Nakano, Geospatial Information Authority of Japan, Japan
3. *Evaluation of operational INSAT-3D UTH product, using Radiosonde, Meteosat-7 and NCEP Analysis*, I. Dey, M. V. Shukla, P. K. Thapliyal, C. M. Kishtawal  
Awarded to Ms Ipshita Dey, Space Applications Centre, India

### Oral Presentations - Student Category

1. *Evaluation of TRMM Precipitation Products over Indian Subcontinent*, I. Jayaluxmi, D. Nagesh Kumar  
Awarded to Ms Indu Jayaluxmi, Indian Institute of Science, India
2. *Wheat phenomics through hyperspectral remote sensing for water deficit stress*, B. Das, R N Sahoo, S Pargal, G Krishna, R Verma, R Tiwari, C Viswanathan, V K Sehgal, V K Gupta  
Awarded to Mr B Das, Indian Agricultural Research Institute, India
3. *Gaussian Kernel Based Classification Approach for Wheat Identification*, R. Aggarwal, A. Kumar, P.L.N. Raju, Y.V.N. Krishna Murthy  
Awarded to Ms Ridhik Aggarwal, Indian Institute of Remote Sensing, India

### Poster Presentations - General Category

1. *Retrieval of Land Surface Temperature Diurnal Cycle model parameters from Kalpana-1 VHRR data over India*, D. Shah, M. Pandya, A Gujrati, H. Trivedi, R. Singh  
Awarded to Mr D Shah, N.V. Patel Science college, India
2. *Retrieval of steady state chlorophyll fluorescence in groundnut and Safflower using ground based hyperspectral data*, K.K. Choudhary, P. Srikanth, K.V. Ramana, M.V.R. Sessa Sai, S.V.C. Kameshwara Rao  
Awarded to Mr K K Choudhary, National Remote Sensing Centre, India



3. *Design of Laser Based Monitoring Systems for Compliance Management of Odorous and Hazardous Air Pollutants in Selected Chemical Industrial Estates at Hyderabad, India*, P. Sudhakar, P Kalavathi, D Ramakrishna Rao, M Satyanarayna

Awarded to Mr P Sudhakar, Geethanjali College of Engineering & Technology, India

#### **Poster Presentations - Student Category**

1. *Time Series Analysis Of Primary Productivity Along The East Coast Of India Using Oceansat-2 Ocean Colour Monitor (OCM)*, E Lakshmi

Awarded to Ms E Lakshmi, National Institute of Technology Warangal, India

2. *Assessing Wheat Yellow Rust Disease through Hyperspectral Remote Sensing*, G. Krishna, R N Sahoo, S Pargal, V K Gupta, P Sinha, S Bhagat, M S Saharan, R Singh, C Chattopadhyay

Awarded to Mr G Krishna, Indian Agricultural Research Institute, India

3. *Climate change hazard to rainfed agriculture in India*, K. Ramachandran, S. Shubhasmita, V. Praveen Kumar

Awarded to Ms S Shubhasmita, Central Institute for Dry Land Agriculture, India

#### **ISPRS Young Author Award**

1. *SPCA Assisted Correlation Clustering of Hyperspectral Imagery*, A. Mehta, O. Dikshit

Awarded to Anand Mehta, Indian Institute of Technology, Kanpur, India



## Annexure 5 Draft Resolution

### Recognition

Efforts made by the International, Scientific Advisory, The National and the Local Organizing Committees for successful conduct of the event is highly rewarding. This was ably supported by the Government and Private Agencies, while the symposium had a large number of technical submissions by the research community that was systematically handled by Copernicus organization. All these are duly acknowledged for the successful completion of the event.

### Noting

The importance of the distribution of satellite based information for development, realization of varieties of applications in remote sensing vis-à-vis the gap areas, capacity building and institutionalization for wider use of technology by diverse user community. This, further coupled with better policies for access and use

Data policies on sharing, access and outreach, Collaborate with GEO tasks and other select international programmes on the Earth observation applications,

### Recognizing

The spectrum of remote sensing applications, including natural resources management, information support for disaster risk reduction, space based inputs for health services, studies on environmental pollution, improved geophysical products for climate change / variability studies and various, Earth science applications such as crop monitoring for growth and stress for sustainable agriculture, land use / cover dynamics, water resources, biodiversity, desertification and drought, bio-geo-chemical cycles, physical and biological oceanographic parameters and assimilation in coupled models, geophysical products for Cryospheric studies and so on,

### Recommends

- Realizing the synergy of collection and utilization of Earth observations from multiple platforms and providing sustained value-added services
- Developing information support for disaster and risk reduction: Early warning systems, short-term and long term impact assessment, near real-time monitoring, resilience and so on
- Space based inputs for health services: Disease epidemiology, predictive modelling and decision support systems
- Environmental pollution: Protocols for assessment and quantified impacts
- Improvements in space based geo-physical products: Radiative forcing, weather forecasting and climate change analyses
- Hydrological modelling: Improved parameterization, scaling from river basin to micro-watershed, water and energy cycle, including interactions
- Integration of remotely sensed inputs on Geology, Geomorphology and Pedology with the Earth Science Applications



- Multi-scale crop monitoring for growth and stress for sustainable agricultural production and Conservation agriculture
- Integration of spatio-temporal satellite data products for analyses of global data sets for climate change / variation
- Global and regional dynamics of land use / land cover, bio-diversity, nexus of degradation, desertification and drought, bio-geo-chemical cycles
- Carbon fluxes in soils, vegetation and inland, coastal and ocean waters
- Physical and biological oceanographic parameters and assimilation in coupled models
- Geophysical products for Cryospheric studies: Status, response and trends Data Policies on sharing, access and outreach,
- Capacity building up to the grass root level, involving stakeholders and deploying e-learning techniques and virtual classrooms
- Exploring crowd sourcing and location based services for different thematic applications
- Improved access to geospatial data through geo-portals such as Bhuvan
- Collaborate with GEO, CEO to enhance remote observing capabilities and tasks

