ISPRS TECHNICAL COMMISSION VIII Annual Report 2011
Remote Sensing Applications and Policies

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State of Science and Technology

Applications of remote sensing are rapidly expanding. In the early age of remote sensing, most of the applications were related to operational applications, e.g. land use mapping, geological applications, etc. However, these application areas were expanded to oceanic and atmospheric applications with the launches of new sensors. Now, the largest operational application area is meteorology. Most of the meteorological offices of developed countries use many remote sensing data for their numerical weather prediction. These remote sensing data have largely improved the accuracy of weather predictions. Other areas include fisheries, ship navigations, wild fire detections, etc.

Also, after the global change problems became apparent, global observations and analyses of obtained data occupies a large area. The Commission VIII covers all the areas of remote sensing applications from global change research to operational applications. These applications will support decision making, forecasting and monitoring of events. In these fields, recent researches are not only based on a single sensor data, but based on multiple sensor data as well as on models. This kind of new method reveals much deeper insight to the sciences.

Another point of view which should be considered is the establishment of GEOSS (Global Earth Observation System of Systems). GEO (Group on Earth Observation) has issued the 10 year implementation plan of GEOSS, and 9 societal benefit areas were established. The Commission VIII for 2008-2012 has set up total of 10 working groups to promote and clarify the role of ISPRS, and also to respond to the societal benefit areas of GEOSS.

Science and Technology of these areas are advancing, but still we need further advancement to understand the global change and develop new areas of operational applications. ISPRS Commission VIII will provide the answers to these requirements.

Accomplishments

One dedicated symposium (WG2 Symposium), several co-organized conference and workshops, (Gi4DM 2011 : WG1, UNOOSA 2nd Workshop : WG2, International Workshop on Earth Observation for Terrestrial Ecosystem : WG6, Pan-Oceanic Remote Sensing Conference (PORSEC), Workshop of Climate Change and Ocean Carbon : WG9) and several organized sessions in international symposiums (ISRSE : WG2, WG5, WG8, Pecora 18 : WG2, American Public Health Association (APHA) Annual Conference : WG2, ACRS : WG4) were held by Commission VIII working groups.

As for the coming Congress, over 270 abstracts were submitted to Commission VIII, and reviews of all abstracts were completed.

WG VIII/1: Disaster Management
Chair: Piero Boccardo (Italy)
Co-Chairs: T. Srinivasa Kumar (India), Robert Backhaus (Germany)
Secretary: Fabio Giulio Tonolo (Italy)
Web Master: Paolo Pasquali (Italy)

The mission of TC VIII/WG1 aims at informing and activating people involved in disaster monitoring, mitigation and damage assessment both from institutions and private companies. We are focused on promoting the goals of the WG as expressed in its terms of reference by means of various activities and events and in co-operation with ISPRS, other national and international organizations and satellite image-related firms. Right now, more than 100 scientists and researchers coming from more than 35 different countries are members of the WG.

State of Science and Technology
In recent years, advancements in technologies have made it possible for virtual communities such as OpenStreetMap, Ushahidi, Sahana, CrisisMappers, Virtual Disaster Viewer, Google MapMaker and INSTEDD to provide increasing support to disaster preparedness and emergency response efforts.
Important cornerstones of this virtual effort are the possibility to access and take advantage of post-disaster satellite imagery as well as the use of other space-based technologies such as telecommunications satellites and global navigation satellite systems.
Most of these initiatives are indeed relevant to the ISPRS WG VIII/1 focused on Disaster Management, that should establish a close interaction with the aforementioned communities trying to develop potential integrated novel applications and products that can support preparedness and emergency response.

Accomplishments
Organized Conferences
Title of the Conference: Gi4DM 2011 (Geo Information for Disaster Management)
Period: May, 2011
Venue: Antalya, Turkey
Report and future perspectives:
Geomatics technologies are able to support management and recovery in the aftermath of manmade and natural disasters. However, disaster management also poses big challenges in all aspects of the geo-information cycle, from data acquisition, processing, management and delivery. For the seventh

time, the International Symposium on Geo-information for Disaster Management (Gi4DM) brought in Antalya-Turkey, together researchers, developers, data providers and users from all over the world (155 participants from 33 countries discussed these challenges).
Papers that deal with any aspect of Geomatics technologies suitable for crisis management were presented. Authors focused on the methodologies, tools, functionality, and/or interfaces that are being or should be provided to National and/or International Organizations involved with crisis response and management.

Organized workshop

N/A

Publications/Reports

- Special Issue "Geo-Information for Disaster Management", Italian Journal of Remote Sensing, 42/3, March 2011
- Gi4DM: Geo-Information for Disaster Management (Part I), Applied Geomatics, Volume 3, Number 2, June 2011
- Gi4DM: Geo-Information for Disaster Management (Part II), Applied Geomatics, Volume 3, Number 4, December 2011
- Book chapter "Remote Sensing Techniques For Natural Disaster Impact Assessment" in the book "Advances in Mapping from Aerospace Imagery: Techniques and Applications" to be published by Taylor & Francis (in press)

Partecipation to Conferences

Title of the Conference: UN-SPIDER International expert meeting: Crowdsource mapping for preparedness and emergency response
Period: 5-6 July, 2010
Venue: Austria (Vienna)
Attendee: Piero Boccardo, WG VIII/1 Chair
Report:
The goal of the expert meeting was to discuss strategies that will contribute to supporting civil protection and emergency management agencies to make use of products generated by Crowd source mapping, space industry as well as the disaster management community in areas of preparedness and emergency response and provide a better understanding to these groups on the specific needs of the disaster management community.
Discussions included:

- feedback from experts from the disaster management community regarding how information has to be generated and/or tailored to ensure that it can be used effectively;

- novel potential applications and products which could be elaborated by the crowd-sourcing communities that can support preparedness and emergency response, and;
- how to build upon existing solutions to facilitate the sharing of information to the emergency management community.

An ISPRS/OGC joint project proposal was presented, with the aim to carry out the following tasks, based on real use case scenarios:

- define guidelines and specifications for data acquisition during emergencies;
- implement a web portal with viewing and editing capabilities;
- assess data quality

Title of the Conference: VALgEo 2011 – International workshop on Validation of geo-information products for crisis management
Period: 18-19 October, 2011
Venue: Ispra (Italy)
Attendee: Fabio Giulio Tonolo, WG VIII/1 Secretary
Report:
The annual VALgEO workshop aimed to act as an integrative agent between the needs of practitioners in situation centers and in the field guiding the Research and Development community, with a special focus on the quality of information. The objective of the first VALgEO workshop in 2009 was to uphold a platform that brings together annually scientists, service providers and end-users and to make them work alongside to discuss the elements of validation. The second edition of VALgEO in 2010 aimed at strengthening the value and the trust in knowledge within the crisis management landscape in which the information sources are extending beyond remote sensing and in which the community or the citizen is becoming increasingly engaged. The objective of the third edition of VALgEO was to affirm the commitment of the community operating in the field of crisis management to work towards more reliable and interoperable geo-information. The issues that the October 2011 workshop discussed are applicable to all services and products providing geo-information in support of international crisis management, from traditional paper maps to space and web technologies and volunteered (geo) information.
The workshop was designed to maximize the interaction among participants. A live exercise for field data collection and integration in the European Crisis Management Laboratory of the JRC allowed the participants to test several field assessment tools and witness the interoperability of the different systems. The exercise was organized in collaboration with the Critech team from the JRC (Tom de Groeve, Daniele Galliano, Beate Stollberg and Alessandro Annunziato) and the Space Research Centre in Poland (Michal Krupinski and Piotr Koza).

Working Group News

Participation in the Editorial board of the project "The Value of Geo-Information for Disaster and Risk Management (VALID) - Benefit Analysis and Stakeholder Assessment", a joint follow-on publication project to "Geoinformation for Disaster and Risk Management - Examples and Best Practices". The goal is to produce a publication to give evidence of the economic, humanitarian and organizational benefits which can be realized by applying geoinformation to disaster management, based on analyses of representative cases, and on an expert stakeholder assessment.

WG VIII/2 : Health

Chairs: Amelia Budge (USA)
Co-Chairs: Richard Kiang (USA)
Secretary: Stanley Morain (USA)

Status of Science and Technology:

Applying Earth observing models and products to routine practices in the public health community introduces scientific and technological challenges. Advancements are being made in using Earth observations to monitor environmental conditions that affect human health and well-being. New applications of LiDAR data are being explored and tested for use in modeling hazardous emissions along pipelines. Sensors such as NASA's CALIOP are being tested for applications in monitoring atmospheric conditions conducive to health issues. New methods for assimilating Earth observing data into atmospheric models are being researched and tested. Results from these efforts provide products and information to developers of early warning systems that are being implemented for monitoring malaria, meningitis, and respiratory diseases in many locations around the globe. These include MEWS, PHAiRS, MERIT, SDSWAS, among others. Another aspect of public health is the epidemiological studies, which require long-term data records and finer gridded geospatial datasets. Earth observing scientists and epidemiologists are coming together to understand, address, and hopefully bridge some of these technological gaps.

Accomplishments:

Website and membership:

The website continues to be maintained. Two people joined the WG in 2011, bringing the total to 55 members from eleven countries. Most are scientists and medical specialists from government and academic sectors, including medical facilities at universities and government hospitals.

Conferences, symposia, workshops, and committees:

GEO/GEOSS: WG members continue to serve on the Health Community of Practice committee. Several members have contributed to and reviewed the GEO 2012-2015 Work Plan, specifically in context of the HE-01 and HE02 tasks.

UNOOSA 2nd Workshop: ISPRS co-sponsored UNOOSA's 2nd Workshop on Space Technology Applications for Socio-Economic Benefits held in Hanoi, Vietnam, October 10-14, 2011. WG-2 played an active role in organizing Session 6 (*Earth Observation and Health*). Dr. Richard Kiang, Co-Chair of WG VIII-2 presented a paper on *Using Satellite Data for Estimating the Risks of Vectorborne Infectious Diseases and Acute Respiratory Infection.* Stan Morain, Technical Secretary of WG VIII/2 presented a paper on *Modelling Atmospheric Dust, Ozone, & Aerosols for Respiratory Health Surveillance*.

ISRSE34: Two oral technical sessions and one oral interactive session were organized and attended by several WG2 members.

WG2 Symposium: WG2 organized a two-day international symposium on *Advances in Geospatial Technologies for Health* which was held in Santa Fe, New Mexico USA on 12 and 13 September 2011. Co-located with NASA's annual program review for health projects, it was organized by a committee of eight people who assembled eight sessions on key topics that bridged the Earth observing and health communities of practice. Seventy (70) attendees from eleven countries (Belgium, Canada, Ethiopia, France, India, Italy, Japan, Nicaragua, Switzerland, Thailand, and the US) participated in the event. The Symposium was supported by nine sponsors: NASA, CNES, JAXA, ASPRS, Esri, JRCies, NMGIC, Bohannan-Huston, and EDAC. ISPRS Council was represented by Treasurer Mike Renslow. Many GEO-related tasks participated in this first symposium. Lively discussions were stimulated by 43 presentations over the two-day period. The final report was submitted to the ISPRS Archives where it can be viewed online.

Pecora 18: Amelia Budge, WG2 chair, served on the Pecora 18 Steering Committee, and with fellow WG2 members, organized a Special Session on *Applications of Earth Observing Data for Environmental and Human Health* (14-17 November 2011, Herndon, VA USA). Invited speakers were John Haynes (NASA), Pietro Ceccato (Columbia University), and Assaf Anyumba (NASA Goddard Space Flight Center). Discussions included descriptions of NASA sensors in use and those in the future that could apply to human and environmental health issues. Other topics included the state of knowledge for emerging, re-emerging, and under-reported diseases, as well as pandemic threats and applications of Earth observing data for coping with these diseases. The session was attended by approximately 30 people.

American Public Health Association (APHA) Annual Conference 6-10 November 2010): WG2 and NASA collaborated to organize a session on A Unique View of the Earth for the Study of the Environment and Possible Associations with Disease Occurrence.

Other relevant events in which WG2 members participated:

John B. Malone:

Presented Short Course on *Modeling of Neglected Tropical Diseases in Latin America and the Caribbean*, PAHO HQ, Washington DC. Part of a PAHO grant consultancy report, 1-4 December 2010.

Invited speaker at Thai Royal Garden Jubilee-Ph.D. Congress XII, Pattaya, Thailand, April 2011, serving as international advisory to Apiporn Suwannatrai's PHD Program

Organizing committee for the 5th International Symposium for Geospatial Health sponsored by the Global Network for Geospatial Health-GnosisGIS (www.gnosisgis.org), Cartagena, Colombia 30 September – 2 October 2011

Co-chairing Symposium *Approaches to Mapping and Modeling for Control Programs: From Neglected Tropical Diseases to Malaria*. Part of 60th Annual meeting of American Society of Tropical Medicine and Hygiene, Philadelphia, PA, USA 4-3 December 2011.

NASA-CDC Workshop on Climate and Influenza Circulation in Antigua, Guatemala (September 26-27, 2011). The workshop was attended by public health stakeholders from Guatemala, Panama and El Salvador. The goals of the workshop were to demonstrate the climatic and environmental effects on influenza transmission, and to work with the stakeholders to start developing influenza models for these three countries.

Collaborations:

Within ISPRS:

1. Invited working group members to contribute to GI4DM 2011 via individual presentations and/or organizing a session.
2. Reviewed ICSU Planning Group, Interdisciplinary Science Plan: Health and Wellbeing in the Changing Urban Environment: A Systems Analysis Approach
3. Amelia Budge, WG2 chair, participated on Commission VIII's committee to develop resolutions for the Commission's 2012-2015 term.

With Other Organizations:

1. *GEO/GEOSS*: Masami Onoda, GEO's contact for the Health Societal Benefit Area (SBA), is a member of WG2 and serves as the liaison between WG2 and the Heath SBA. WG2 members contributed to, and reviewed, the GEO 2012-2015 Work Plan, specifically in context of the HE-01 and HE-02 tasks. HE-01 focuses on "tools and information for health decision-making". HE-02 focuses on "tracking pollutants". The Health and Environment Community of Practice is included in the Work Plan's appendix. The GEO-VIII Plenary accepted the Work Plan, which is designed to address the 2015 GEOSS Strategic Targets. A Task List matrix has been designed and circulated to GEO member countries and

participating organizations. WG2 will assist in completing the matrix, which is due by 8 February 2012.

2. *IUGS/Dust Working Group*: Collaboration between ISPRS WG VIII/2 and IUGS/Dust Working Group is in the early stages of development. We are working to establish a formal web link between the two organizations. A small step forward was IUGS/DWG listing of WG2's symposium in their online calendar. At this time, there has not been active participation in conferences of either organization. One reason is the unfortunate relevant timings of events sponsored by both groups, such as the 34th International Geological Congress in Brisbane, Australia (5-10 August 2012) and the ISPRS 2012 Congress in Melbourne. A joint session on dust is being organized for the European Geological Union Conference that will be held in Vienna, Austria (22-27 April 2012).

3. *UNOOSA*: ISPRS co-sponsored UNOOSA's 2nd Workshop on Space Technology Applications for Socio-Economic Benefits held in Hanoi, Vietnam, October 10-14, 2011. President Altan, 1st Vice President Dowman, and representatives from two of Commission VIII's Working Groups (WG2 on Health; WG6 on Agriculture, Ecosystems and Bio-diversity) participated on the program. WG2 played an active role in organizing Session 6 (*Earth Observation and Health*). Dr. Richard Kiang, Co-Chair of WG VIII/2 presented a paper on *Using Satellite Data for Estimating the Risks of Vectorborne Infectious Diseases and Acute Respiratory Infection.* Stan Morain, Technical Secretary of WG VIII/2 presented a paper on *Modelling Atmospheric Dust, Ozone, & Aerosols for Respiratory Health Surveillance*. This session was most successful in context of UNOOSA's goal of addressing scientific and technical linkages between satellite monitoring of Earth environments and their resulting socio-economic benefits. One result of ISPRS's contribution was a joint agreement between UNOOSA and ISPRS to organize a tutorial on space applications for socio-economic benefits at the 3rd UNOOSA Workshop scheduled for Santiago, Chile in November 2012. A possible aim of the tutorial would be to describe process steps that begin with satellite observations and culminate in actionable social or economic decisions.

Publications, books, and articles:

- In progress: Environmental Tracking for Public Health Surveillance (ISPRS Book series)
- Report on Commission VIII/2 Symposium *Advances in Geospatial Technologies for Health* (e-Bulletin, Issue No.7 – 2011).

Papers published by working group members:

Malone J.B., Yang G.J., Leonardo L., Zhou X.N.. 2010. Ch. 4. Implementing a Geospatial Health Data Infrastructure in Southeast Asia. *IN:* Zhou X.N., Bergquist R., Olvedo R., Utzinger J. Important

Helminthic Infections in Southeast Asia: aspects, approaches and coordination of control activities B. Advances in Parasitology 73:100-125.

Dutra, L.H., Molento M.B., Naumann C.R., Biondo A.W., Fortes F.S., Savio D., **Malone J.B.**. 2010. Mapping risk of bovine fasciolosis in the South of Brazil using Geographic information systems. Veterinary Parasitology 169:76-81.

Enes, J.E., Wages A.J., **Malone J.B.**, Tesana S. 2010. Prevalence of *Opisthorchis viverrini* infection in canine and feline hosts in three villages, Khon Kaen Province, northeastern Thailand. Southeast Asian Journal of Tropical Medicine and Public Health. 41:36-42.

Yang G.J., Gao Q., Zhou S.S., **Malone J.B**., McCarroll J.C., Tanner M., Vounatsou P., Bergquist R., Utzinger J., Zhou X.N. 2010. Mapping and predicting malaria transmission in the People's Republic of China, using integrated biology-driven and statistical models. Geospatial Health. 5(1):11-22.

Suwannatrai A., Suwannatrai K., Haruay S., Piratae S., Thammasiri C., Khampoosa P., Kulsantiwong J., Prasopdee S., Tarbsripair P., Suwanwerakamtorn R., Sukchan S., Boonmars T., **Malone J.B**., Kearney M.T., Tesana S. 2011. Effect of soil surface salt on the density and distribution of the snail Bithynia siamensis goniomphalos in northeast Thailand. Geospatial Health. 5(2):183-90

Working Group News/Plans for Upcoming Activities:

- WG2 plans to continue collaborating with other organizations regarding health and the environment, including IUGS, GEO, ICSU, and UNOOSA.
- WG2 will organize 1 or 2 technical sessions for the 2012 Congress.
- One result of ISPRS's contribution was a joint agreement between UNOOSA and ISPRS to organize a tutorial on space applications for socio-economic benefits at the 3rd UNOOSA Workshop scheduled for Santiago, Chile in November 2012. WG2 plans to contribute to the tutorial which could describe process steps that begin with satellite observations and culminate in actionable social or economic decisions.

WG VIII/4: Water

Chair: Taikan Oki (Japan)
Co-Chair: Wesley Berg (USA)
Co-Chair: Peter Troch (USA)
Regional Coordinator: Christian D. Kummerow (USA)
Secretary: Shita Seto (Japan)

The Commission VIII Working Group 4 on "Water" aims at informing and activating people interested in utilizing remote sensing for Water. We are focused on promoting the goals of the WG as expressed in its terms of reference by means of various activities and events and in co-operation with ISPRS, other national and international organizations and Geo-informatics-related firms.

Status of Science and Technology

The WG relevant physical parameters expected to be monitored by satellite remote sensing are various to trace the whole history of global hydrological cycles: water vapor and cloud liquid water content in the atmosphere, precipitation, incoming radiation at ocean/land surfaces, sea surface temperature, sea surface wind, sea ice concentration, sea surface height, water table of large water bodies such as lakes and large rivers, soil moisture, snow depth, vegetation, land use/land cover, and the gravity field in order to estimate the change in total terrestrial water storage. Because other working groups cover atmosphere, ocean, land, and cryosphere, working group VIII/4 focuses mainly hydrological cycles over land in terms of water resources management, however, there are many cross-cutting issues and topics with other working groups particularly disaster management and agriculture.

Accomplishments

Website and membership:

The website (http://hydro.iis.u-tokyo.ac.jp/ISPRS/wg4/index.html) was prepared following the general format provided by ISPRS in order to disseminate the activities of ISPRS Commission VIII - Remote Sensing Applications and Policies Working Group VIII / 4 - Water. The web page was located under one of the web servers at Institute of Industrial Science, The University of Tokyo. IIS is one of the core centers of satellite remote sensing research in Japan, and the web server is one of the well-established servers dedicated to distribute information relevant for hydrological science since 1993.

Membership of the working group is currently limited, however, there are large potential members for the working group through various satellite missions such as GCOM-W (Global Change Observation Mission - Water), which the chair of WG VIII/4 is in charge of the science plan, and GPM (Global Precipitation Measurement) Mission, which the Regional Coordinator of WG VIII/4 chairs science program panel.

Conferences, symposia, workshops, and committees:

ISPRS WG VIII/4 Special Session on Water was held in ACRS in Taipei, October 2nd through 4th in 2011.

News/Plans for Upcoming Activities

Several members of the working group will be organizing a meeting at the occasion of GCOM PI Workshop to be held in January 2012 in Tokyo, which the chair of WG VIII/4 chairs most of the

GCOM-W related sessions. In addition to ISPRS, WG VIII/4 plans to work closely with IEEE, American Geophysical Union, and American Meteorological Society on hydrological sciences initiatives.

WG VIII/5: Energy and Solid Earth

Chair: Thomas Cudahy (Australia)
Co-chair: Yoshiki Ninomiya (Japan)
Co-chair: Carlos Roberto de Souza Filho (Brazil)
Secretary: Ian Lau (Australia)

The Working Group's vision for a *"new generation of remote sensing and derived geoscience information for improved mapping and monitoring of the Earth and its geo-resources"* progressed significantly this year through a number of developments. There has been a lack of suitable geoscience-tuned systems capable of delivering global mapping and monitoring (at high spatial resolution) the composition of the land surface, especially its mineralogy and dry biomass. The derived geoscience information from these systems is critical for a range of science and application needs from environmentally sustainable mineral and energy (hydrocarbon and geothermal) resource exploration and development to soil characterisation for improved agricultural productivity in a changing climate. The following table summaries timelines for a range "geoscience-tuned systems being developed.

geoscience-tuned sensors		operational years
type	***wavelengths***	**2000 2010 2020**
airborne hyperspectral	VNIR SWIR	
satellite multispectral ASTER	VNIR SWIR TIR	*Australian ASTER geoscience map*
drill core logging hyperspectral	VNIR SWIR TIR	
airborne hyperspectral	TIR	
satellite hyperspectral	VNIR SWIR	
satellite hyperspectral	TIR	

Public release of continental-scale ASTER geoscience map products
Key developments this year include:

(1) the public release of ASTER geoscience maps of Western Australian (http://c3dmm.csiro.au/WA_ASTER/index.html) which is a mosaic of over 1500 scenes selected

from 30,000 available for over Australia. The complete Australian ASTER geoscience map is to be released in time for the 22nd ISPRS in August 2012;

(2) publication of the ASTER related book:

Land Remote Sensing and Global Environmental Change: NASA's Earth Observing System and the Science of ASTER and MODIS. Eds. Ramachandran, B, Justice, C, and Abrams M., Springer, New York, *273-300. 2010*

(3) Access to airborne hyperspectral thermal infrared systems, such as:

a. SPECIM's Owl (http://www.specim.fi/products/aisa-airborne-hyperspectral-systems/aisa-series.html)

b. ITRES's TASI-600 (http://www.itres.com/products/imagers/tasi600); and

c. Aerospace Corporation's SEBASS (http://www.spectir.com/assets/Text%20Files/Brochure-Remote_IR_HSI.pdf);

(4) CSIRO's drill core logging systems are now operational with all of the Geological Surveys across Australia (http://nvcl.csiro.au); and

(5) Expected launch dates for the German EnMap and Japanese HISUI hyperspectral visible to shortwave infrared imaging satellites pushed out to 2015.

The release of the WA ASTER geoscience map and its successful public web-uptake for geoscience mapping information is important because it shows that it is possible to generate for the 1st time a global baseline of land surface composition, albeit at multi-spectral resolution, from the 10 year archive of ASTER imagery (http://www.gds.aster.ersdac.or.jp/gds_www2002/index_e.html).

Accomplishments of the Working Group during 2011.

ISPRS VIII/5 accomplishments this year include:

WG member Cindy Ong (Australia) was Session Chair for "Soil information from remotely-sensed data" at the 34th ISRSE in Sydney April, 2011 (http://www.isrse34.org/);

- Unable to get 22ISPRS and 34IGC to co-promote geoscience remote sensing at these spatially/temporally overlapping Congresses;
- Unable to get geoscience GEO task submissions accepted into 2012-2015 plan despite extensive lobbying;

- Workshop accepted for 22ISPRS on "Towards Global Geoscience Mapping and Monitoring";

- Workshop submitted and accepted to the 34IGC on "3D Mineral Mapping from drill core to space"
- Business meeting submitted and accepted to the 34IGC on "Satellite ASTER Geoscience Map of Australia".
- Presented an oral paper on 3D Mineral Map of Australia at the 7ISDE, Perth, August 2011; and
- WA ASTER Geoscience map release.

WG VIII/6: Agriculture, Ecosystem and Biodiversity

Chair: Shibendu S. Ray, Chair (India)

Co-Chair: Yoshiaki Honda (Japan)

Co-Chair: Ross S. Lunetta (USA)

Secretary: N. R. Patel (India)

Webmaster: Chakrapani Patnaik (India)

Status of Science and Technology

Agriculture, Ecosystem and Biodiversity

Providing Food Security to the ever-increasing global population is the major challenge. With the limitations such as scarce water supply for irrigation, land degradation, loss of land due to urbanization & industrialization, reduction in agro-biodiversity and impact of changing climate, there is now a significant stress on agriculture to provide more food from less area. In this context remote sensing has great role in all aspects of agricultural development, which includes:

- Assessment and monitoring of agricultural resources at local, regional and global level for better planning,
- Use of remote sensing data for retrieval of biophysical parameters,
- Developing better models for crop production forecasting, including biotic and abiotic stresses,
- Understanding the energy and mass exchange in agro-ecosystems,
- Developing plans for site-specific agriculture,
- Assessing the impact of climate change on agriculture,
- Agricultural impact assessment on environment.

The fragile ecosystems, such as mangroves, wetlands, coral reefs are subject to degradation due to human exploitation and climate variability and change. Their biodiversity/richness is reducing day by day. Characterization of the ecosystem and understanding its processes is essential for ecosystem conservation. It would also provide basic inputs towards monitoring global biogeochemical cycles. Earth observation data enables the study of various aspects of ecosystems, which include,

- Ecosystem Assessment
- Carbon and Nutrient Cycling
- Biodiversity Assessment and Conservation
- Land vegetation dynamics (phenology)
- Monitoring and analyzing human impacts on ecosystems
- Assessment of climate change impact on ecosystems

Accomplishments

Website and membership:

- The website of the working group was developed as per the ISPRS format. The URL of the website is www.commission8.isprs.org/wg6/. The website has all the web pages defined by ISPRS. The website is regularly updated and the various activities like delegate's registration, abstract submission for the International Workshop (EOTE 2011) was handled by this website.
- The working group comprises of 27 members from seventeen counties (Australia, Canada, China, France, India, Italy, Japan, Kazakhstan, Lao PDR, Malaysia, Mexico, Netherlands, Russia, Rwanda, Thailand, Tunisia and USA) spread over five continents. Most of them are scientists from research organizations, institutes and universities, including one from UN organization.

Workshop/ Symposium

- International Workshop: Working Group 6, jointly with ISPRS WG VIII/8 and Indian Society of Remote Sensing organized one day International Workshop on "**Earth Observation for Terrestrial Ecosystem"** at Bhopal, India on 8th November, 2011. The workshop had 56 registered participants (covering 7 countries), and around 50 free student participants. There were 30 paper presentations, including 4 invited lectures. There were 8 sessions in the workshop, including 1 Inaugural session, 1 Invited Lecture session, 4 Technical sessions, 1 Poster session and 1 Plenary session. The workshop proceedings were brought out both in hard and soft copies with full paper**,** in form of ISPRS Archives Volume XXXVIII Part 8/W20. Resolutions were prepared and discussed during the workshop.

- The Chair of the working group, Dr. S. S. Ray, participated in United Nations/Vietnam Space Technology Applications for Socio-Economic Benefits" during October 09-14, 2011 at VAST, Hanoi, Vietnam. This workshop was organized by UNOOSA, ESA, ISPRS, NASA and the Government of Vietnam and was hosted by Vietnam Academy of Science & Technology (VAST). Dr. Ray also chaired a working group on "Natural Resources Management" and prepared its Terms of Reference.
- 74 abstracts were submitted for the Working Group theme to the ISPRS Congress, 2012 at Melbourne. The abstracts were reviewed and marks were given for identifying the abstracts for oral, poster and rejection.

Collaborations:

Within ISPRS:
WGVIII/2 collaborated with WGVIII/6 (through Alfredo Huete) by organizing the international workshop on "**Earth Observation for Terrestrial Ecosystem"** at Bhopal, India on 8th November, 2011

With Other Organizations:
WGVIII/2 collaborated with Indian Society of Remote Sensing for organizing the international workshop on "**Earth Observation for Terrestrial Ecosystem"** at Bhopal, India on 8th November, 2011

Planned Events:

The planned activities include:

- 8 technical sessions have been planned in the ISPRS congress, 2012 at Melbourne, apart from the poster sessions.

Publications:

- A special issue of the Journal of the Indian Society of Remote Sensing (published by Springer) on "*Earth Observation for Climate Change Studies*" was brought out during September 2011. This incorporates 16 selected papers from the Proceedings of WG VIII/6 organised workshop, ICCA-2009. The selected papers were submitted to the journal, peer reviewed, and then accepted. The special issue has been edited by Sushma Panigrahy. All the papers are available online at the Journal site (http://www.springerlink.com/content/0255-660x/39/3/).

- Both printed version and softcopy of the Proceedings of the International Workshop on *"Earth Observation for Terrestrial Ecosystem"* conducted during 8th November 2011 at Bhopal, India were brought out. The proceedings (ISPRS Archives Volume XXXVIII Part 8/W20) have 33 full papers and 8 abstracts, with 204 pages, edited by Sushma Panigrahy, Shibendu S. Ray and Alfredo Huete. The Proceedings have 6 sections, namely, Invited Lectures, Agro-ecosystem, Forest and Environment, Biophysical parameters, Ecosystem Dynamics, and Wetland Ecosystem. The Proceedings will be available online ISPRS website.

WG VIII/8: Land

Chair: Alfredo Huete (USA)
Co-Chair: Carsten Juergens (Germany)
Co-Chair: Ryutarou Tateishi (Japan)
Secretary: Dennis Dye (USA)

Commission VIII Working Group 8 on "Land" is focused on numerous application areas of remote sensing and earth observation in land degradation, urban areas, land cover and land cover change, and ecohydrology of arid lands. The breadth of this group is a strength and a weakness. In some respects, the 'Land' Working Group encompasses several remote sensing science and application communities, from Urban systems, Land Cover, Phenology, to traditional Land applications in degradation and soils. We have consistently generated strong interests in our sessions at various conference venues. In other respects, a broad spectrum of interests adds difficulty in building a solid single-focus remote sensing community. The Officers are: Alfredo Huete, Chair (University of Technology Sydney, Australia); Carsten Juergens, co-Chair (Urban Systems, Ruhr Univ. Germany); Ryutarou Tateishi, co-Chair (Land Cover, Chiba University, Japan); and Dennis Dye, Secretary (U.S. Geological Survey, USA). The team continues to receive new memberships and has a solid group of approximately 20 members.

Accomplishments this year (2011)

Website and membership status. We have 17 active members registered with the Land working group, in addition to the 4 officers.

Conferences, symposia, workshops, and committees

34th International Symposium on Remote Sensing of Environment; 10-15 April 2011, Sydney, Australia. We organized 3 special oral sessions on CEOS-LPV ground networks and one on Phenology. The proceedings are published on CD.

Special Session on "Phenology, seasonality, and satellite time series".
"Abstracts are invited that focus on research that uses remotely sensed time series data to better understand the complex interactions of land surface phenology with environment, climate, and land use. The timing of biological events (e.g. green-up, spring and summer flowering, budburst, peak of season, bird and other animal migration) are expected to be impacted by our changing climate. In this session, basic and applied phenology research that incorporates remotely sensed monitoring tools, techniques, and methods are invited. Presentations of land surface phenology applications to provide information for and enhanced management, adaptation and decision making are encouraged. Topics may include but are not limited to: natural resource management, agriculture and pest management, health and allergies, tourism and recreation. Other research areas that address how changes in phenology impact carbon, energy and water resources are invited as well."

Special Session (2 sessions), LPV sessions on Ground Observational Networks and Land Product Validation

"International scientific initiatives such as Global Terrestrial Observing System (GTOS) and Global Climate Observing System (GCOS) recently identified a set of Essential Climate Variables (ECVs) that play an important role in understanding the land-surface interactions with climate. Assessment of the spatial and temporal quality of satellite-derived land climate data records is critical to ensure accurate information for the management and enforcement of international conventions signed under the United Nations Framework for Climate Change (UNFCC). The Land Product Validation (LPV) sub-group of the CEOS Working Group on Calibration and Validation (WGCV) is leading international efforts to address the challenges associated with global land product validation. The LPV sub-group is fostering collaborative efforts to increase ground network observations and enhance scaling techniques that relate plot-level measurements to remote sensing. Recent advancements in environmental sensing technologies coupled with the expansion of National (e.g. NEON in USA, PEN in Japan, TERN in Australia) to International (e.g. SpecNet, Fluxnet, AERONET) observational networks, are offering exciting possibilities for scientists to assess inter- and intra-annual variability in ecosystems. Examples include wireless PAR and meteorological sensors as well as hyperspectral sensors and digital cameras for vegetation characterization. We encourage and invite paper submissions to the International Symposium on Remote Sensing of Environment (ISRSE) that focus on the development of these technologies, describe new ground networks or expand upon existing network structures to augment global land product validation efforts."

Collaboration with other ISPRS WGs

WGVIII/8 collaborated with WGVIII/6 (through Shibendu Ray) in co-organizing an international workshop on "Earth Observation for Terrestrial Ecosystems" in Bhopal, INDIA, on Nov. 8, 2011.

Website: www.commission8.isprs.org/wg6/; www.commission8.isprs.org/wg8/

Themes:
• Ecosystem Assessment using Remote Sensing data
• Carbon and Nutrient Cycling
• Biodiversity Assessment and Conservation
• Land vegetation dynamics (phenology)
• Monitoring and analyzing human impacts on ecosystems
• Assessment of climate change impact on terrestrial ecosystems

Unfortunately the Chair, Prof. Alfredo Huete, failed to arrive at this meeting, being stranded in Bangkok during the week of the major flooding (Nov. 1-5), which resulted in his Visa to India not being ready in time.

News/Plans for Upcoming Activities

We are planning for 4 sessions for upcoming ISPRS Congress 2012 in Melbourne, August 2012. We have 36 abstracts submitted to Land sessions.

We continue to develop closer ties with with GEOSS related working groups. and the UNCDD on land degradation initiatives.

WG VIII/9: Ocean

Chair: W. Timothy Liu (USA)
Co-Chair: Joji Ishizaka (Japan)
Co-Chair: Samantha Lavender (United Kingdom)

Status of Science and Technology

The main concerns of Working Group 9, in concert with international organizations, e.g., Global Climate Observing System (GCOS), Global Ocean Observing System (GOOS), World Climate Research Program (WCRP), Joint WMO-IOC Technical Commission for Oceanography and Marine Meteorology (JCOMM), is the advocacy and implementation for continuous and consistent observations of high quality ocean-related parameters from space for both operational and scientific applications.

NASA has successfully launched the ocean surface salinity sensor, Aquarius, in 2011. The launch of Aquarius to measure ocean surface salinity has slipped from April to June 2011. With the anticipated launch of GCOM, SMAP, and GPM in the next few years, they will advance the study of global water cycle. The Ice-bridge project, with aircraft flights in co-ordination with Icesat is enhancing the understanding of the cryosphere. The failure of OCO is a setback to the study of carbon cycle; but we saw a fast start of OCO-2, which is scheduled to be launched in 2013. In 2010, data from European Missions, Cryosat-2, SMOS, and GOCE became available. Some preliminary data from the India Mission Oceansat-2 are being examined. China is scheduled to launch Haiyan-2 within a year.

Accomplishments

Under the sponsorship of ISPRS, Working Group 9 has convened a special session in Pan-Oceanic Remote Sensing Conference (PORSEC) in Keelung Taiwan, in 2010, and co-sponsored the Workshop of Climate Change and Ocean Carbon in Xiamen, china, in 2011, both with strong international participation. Our co-chair Samantha Lavender participated in the GEO Inland and Near-Coastal Waters Working Group – inputs to a review meeting held in advance of the ESA Coast Colour Workshop & summary report.

Upcoming Working Group Activities

We will convene a special session on Satellite remote sensing of the physical and biogeochemical processes of the ocean and their interactions in the Ocean Science Meeting in Salt Lake City in 2012. We are planning to sponsored a special session in PORSEC 2012 in Kochi, India

WG VIII/10:Cryosphere

Chair: Josefino Comiso (USA)
Co-Chair: Beata Csatho (USA)
Secretary: Kohei Cho (Japan)

Status of Science and Technology

Global warming has been regarded as one of the most serious problems facing mankind in the 21st Century. The cryosphere is expected to provide early signals of global warming as may be attributed to the increasing percentage of greenhouse gases in the atmosphere. The main reason is the amplification of global signals through the "ice-albedo feedback" effects which is associated primarily with the high contrast in the reflectivity of the snow and ice covered surfaces compared to other surfaces. Modeling studies have revealed that the amplification can be as high as 3 to 5 times in the Arctic region. Such amplification may already be occurring since the results of analysis of

thermal-infrared data have indicated that the surface temperature of snow and ice covered areas in the Northern Hemisphere has been increasing at 3- times the rate of increase of global temperatures in the last 30 years. Concurrently, the area covered by snow, sea ice, and glaciers have been declining at the rate of about 2 to 4% per decade in the Northern Hemisphere. Moreover, the area that gets melted in the Greenland ice sheet has been increasing and mass loss of its outlet glaciers through dynamic processes is accelerating. The most remarkable change, however, has been the rapid decline of the perennial sea ice cover, which is ice that survives the summer melt period. The area covered by perennial ice, which consists mainly of multiyear ice floes that survives the summer, has been observed to be declining at the rate of 12% per decade and reached a dramatically low value in 2007 when the area was almost 40% lower than the average over the last three decades. An independent study of the Arctic multiyear ice, or ice that has survived at least two summers, shows an even more drastic decline of this thicker ice type of about 17.5% per decade. Remote sensing methods play a critical role in monitoring ongoing changes and in developing better ice sheet models to predict future sea level rise.

In the Southern Hemisphere, observations from satellite data show practically no trend or an opposite trend. The sea ice cover of the Southern Ocean has been shown to be increasing at the rate of about 1% per decade and some cooling, especially at the Antarctic plateau has been observed by satellite microwave and thermal infrared sensors, respectively. Meanwhile, record size icebergs have come out of Ross Ice Shelf, the Ronne Ice Shelf, the Larson Ice Shelf, Pine Island and other shelf regions. New insights are needed including the possible impact of the Ozone Hole on the climate of the region. The continuing role of remote sensing in the study of this phenomenon is undoubtedly critical. The impact of changes in the cryosphere is expected to be profound since it is an important component of the climate system and has been regarded as the heat sink and a prime source of bottom water that is part of the global thermohaline circulation. The sea level equivalent of the Greenland Ice Sheet and Antarctica is about 70 to 80 meters while the glaciers have been the source of drinking water of millions of people located in the vicinity. Recent studies, using GRACE gravity observations, ICESat laser altimetry and regional atmospheric climate modeling revealed an increasing mass loss of Greenland and Antarctica. However, despite of significant progress in monitoring and modeling outlet glacier behavior, predicting ice sheet mass loss caused by changes in ice dynamics remained a challenge. Ongoing spaceborne and airborne campaign, such as ESA/CryoSat-2 and NASA's Icebridge mission collect critically needed new observations for monitoring ice sheet mass balance and related sea level rise as well as for improving our understanding of ice sheet, atmosphere, ocean interactions controlling these processes.

Among various satellite remote sensing sensors, passive microwave sensors are arguably the most useful for cryospheric sciences studies. Data from these sensors have been used extensively for large scale characterization of the sea ice and snow cover including persistence and melt patterns. The data are useful during day/night and almost all weather conditions and for monitoring the distribution of snow and ice at relatively high temporal resolution on global basis. A long time series

of the data is now available, starting with the ESMR (1973 to 1976), SMMR (1978 TO 1987), SSM/I (1987 to the present) and AMSR-E (2002 to 2011). To ensure continuity of the time series which has been shown to be useful for climate change studies, JAXA is planning to launch the advanced passive microwave sensor AMSR-2, which is similar to AMSR-E) on board GCOM-W1 in March 2012. Some members of the working group are involved in developing and improving sea ice algorithms for extracting geophysical parameters from GCOM-W1 data. The relatively long time series for sea ice extent and area has been used for sea ice cover and trend studies. However, we basically do not have similar capabilities for assessing the changes in the thickness. Ice thickness in the Arctic has been determined primarily through the use of submarine upward-looking sonars and although thousands of km of data exist, the transects have been basically random in time and space. Since sea ice is very dynamic, some biases in these measurements are also possible. The situation has been improved through the use of ICESat laser ranging data which measures the freeboard of the ice which can be used to estimate the thickness. The system, however, have had some instrumental problems and measurements could only be made only twice a year, one usually in the month of March and the other in the month of November. Furthermore, the system has been slowly deteriorating and provided the last useful data in 2009. A replacement called ICESat-2 has been approved but date of launch is expected to be after 2015. Meantime, the series is being continued with the launch of the ESA/CryoSat-2 which carries a delay/Doppler radar altimeter which has been claimed to provide more accurate measurements of the ice freeboard than the ICESat laser altimeter. Both CryoSat and ICESat sensors actually complement each other since one provides top of the snow topography and freeboard information while the other provide snow/ice interface freeboard information. All these instruments have good potential applications in other regions of the cryosphere as well. Satellite gravimetry and laser altimetry are the main missions that currently monitor interannual, annual and decadal mass balance of polar ice sheets. Repeat coverages using a combination of satellite and airborne laser and radar altimetry, including InSAR and in situ GPS observations has been used for detecting changes in ice sheet surface elevations and ice sheet velocities, needed for investigating the dynamic behavior of outlet glaciers that might trigger rapid ice loss with a warming climate. The ICESat-2 laser system will employ multiple beams of very high pulse repetition frequency photon counting lasers arrayed across track, thus providing unprecedented resolution for topographic mapping and change detection of the cryosphere. Several working group members are participating in the definition of the ICESat-2 mission science goals and design parameters as well is in assessing the potential of the single photon counting laser systems for ice sheet altimetry.

Accomplishments

Website and membership:

The website has been maintained following the general format provided by ISPRS. Complementary information about the state of the cryosphere is also provided on a weekly manner at

a NASA website (http://neptune.gsfc.nasa.gov). The members are mainly exchanging ideas via e-mails from time to time to get good representation of countries that are directly affected by changes in the cryosphere.

Conferences, symposia, workshops, and committees:

On 15-16 March 2011, the"Satellite-derived Sea Ice Products Community Workshop" was organized at NASA Goddard. Several members of the WG attended the workshop and discussed about the strategies on how to best serve the community and fulfill the objectives of the commission. The WG Chair has also just been elected as a member of the International Ocean Color Coordinating Group which met in Quebec, Canada in November 2011 and is now putting together a document on Ocean Color Studies in the Polar Regions. In August 2011 the WG co-chair convened a session on "Remote sensing of polar regions" at the IGARSS meeting in Vancouver, Canada.

News/Plans for Upcoming Activities

In January 2012, the Joint PI Workshop of Global Environment Observation Mission 2011 will be held in Tokyo. The chairperson and several members of the WG are planning to attend the workshop and plans to organize a meeting on the working group session planning of the ISPRS 2012 Congress to be held in next Summer. In addition to ISPRS, the WG plans to work closely with IEEE, Remote Sensing Society of Japan (RSSJ), International Glaciological Society and American Geophysical Union on cryospheric sciences initiatives, Asian Association on Remote Sensing (AARS), including workshops and opportunities as they occur. The WG Chair has been involved in preparing the IPCC/WG1 AR5 report as a coordinating lead author of the chapter on "Cryosphere Observations," of which is expected to be completed in 2013. He is also a member of an expert panel reviewing the Canadian research program in the Arctic. The WG Co-Chair is also holds key managerial positions in two remote sensing programs namely, she is the science definition team leader of NASA's IceSat-2 mission which is scheduled for launch in 2016 and serves as a science team member of NASA's IceBridge Program which is an on-going Aircraft Program that monitors the Greenland Ice Sheet, the Arctic and the Antarctic before the launch of IceSat2. Also, the WG Co-Chair was invited to serve as a Scientific Committee member for IGARSS 2012. Such activities are very relevant to the objectives of ISPRS working group 10.