



International Society for Photogrammetry and Remote Sensing (ISPRS)
Technical Commission IV
Geodatabases and Digital Mapping
Annual Report 2011

President: Dr. Marguerite Madden, USA
Secretary and Web Master: Dr. Thomas Jordan, USA
WG Website: <http://www.commission4.isprs.org>

WORKING GROUPS of ISPRS COMMISSION IV

WG IV/1 - Geospatial Data Infrastructure
WG IV/2 - Automatic Geospatial Data Acquisition and Image-Based Databases
WG IV/3 - Mapping from High Resolution Data
WG IV/4 - Virtual Globes and Context-Aware Visualisation/Analysis
WG IV/5 - Distributed and Web-based Geoinformation Services and Applications
WG IV/6 - Global DEM Interoperability
WG IV/7 - Planetary Mapping and Databases
WG IV/8 - 3D Spatial Data Integration for Disaster Management and Environmental Monitoring

INTERCOMMISSION WG of ISPRS COMMISSION IV

ICWG IV/VIII - Updating and Maintenance of Core Spatial Databases
ICWG IV/II - Geo-Sensor Networking and GeoGrid
ICWG II/IV - Semantic Interoperability and Ontology for Geospatial Information

1. State of Science and Technology

The reports of Commission IV WGs and ICWGs that follow below are testimonies of the work and collaboration that is necessary in order for the world to be prepared at any instant when a disaster of the magnitude of the 2011 Japanese Earthquakes take us by surprise. We are all grateful that our discipline can contribute in both small and substantial ways to the crisis at hand.

2. Accomplishments of ISPRS Commission IV

In 2011, Commission IV Technical President, Marguerite Madden, participated in the biannual workshop “High-Resolution Earth Imaging for Geospatial Information”, June 14-17, 2011 in Hannover, Germany and presented the keynote entitled “Multitemporal Imagery Supporting Earth Studies and Sustainability”. She also presented an opening welcome via Skype in WG IV/5 GeoWeb 2011, “Pervasive Web Mapping Geoprocessing and Services”

conference together with the Working Groups IV/1 and IV/4 held at Simon Fraser University, Vancouver, B.C., Canada, August 10-12, 2011. She is working with CIPA to organize a special session, 3D Dynamic Landscape Visions for Cultural Heritage/Archaeology for the 2012 Melbourne Congress.

3. Working Group Activities

a. WG IV/1: Geospatial Data Infrastructure

Chair: Jie Jiang, China

Co-Chair: Michael P. Finn, USA

Co-Chair: E. Pattabhi Rama Rao, India

Secretary: Xinyan ZHENG, China

Contact Information (*New information highlighted*)

Chair: Jie Jiang

National Geomatics Center of China

28 Lianhuachi West Road

Beijing, 100830 CHINA

Tel: +86 10 6388034

Fax: +86 10 6388025

Secretary: Qian WANG

National Geomatics Center of China

28 Lianhuachi West Road

Beijing, 100830 CHINA

Tel: +86 10 6388034

Fax: +86 10 6388025

E-mail: wangqian@nsdi.gov.cn

WG website: <http://isprs-wg41.nsd.gov.cn/> Last updated February 16, 2012

State of Science and Technology

Spatial data infrastructure (SDI) is generally defined as the technologies, policies, and people necessary to promote sharing of geospatial data throughout all levels of government, the private and non-profit sectors, and the academic community. Goal of SDI is to improve quality and reduce costs related to geographic information, to increase the benefits of using available data, and to establish key partnerships with states, counties, cities, tribal nations, academia and the private sector to increase data availability.

With efforts of previous years, datasets of various types have been produced at global, national, regional, city level. Recently much demand on service and application of SDI has been raised and much attention has been paid to data updating, data harmonization, and geo-spatial cyberinfrastructure that aims at solving the problem of efficiently connecting data, computers, and people over the Internet.

The objective of the October 2011 Guilin, China workshop was to provide a platform for scholars and professionals in relevant areas to exchange research ideas and interests, to present the newest research results, to discuss the cutting-edge technology, and to promote the development and application of SDI and the international collaboration. The following conclusions were drawn from the presentations and discussions of the workshop.

- (1) In the field of SDI, data integration, updating and on-line service become key points, while emphasis of data acquisition comes to image-based methods and technology.
- (2) The role of standards in SDI has been further understood, with more and more practices have been conducted on data integration for multi-scope and cross-theme services and applications.
- (3) The workshop provided fruitful communication environment for earth and planetary teams. Both sides thought it interesting and helpful.
- (4) SDI should play essential and irreplaceable role in geographic monitoring to dynamic world, which has been included into plans in global and national levels.

Accomplishments of Working Group

Participated in the WG IV/5 organized GeoWeb 2011, “Pervasive Web Mapping Geoprocessing and Services” conference together with the Working Groups IV/1 and IV/4 of the International Society for Photogrammetry and Remote Sensing (ISPRS), Galdos Systems Inc., and Simon Fraser University. The conference was held in Vancouver, B.C., Canada, August 10-12, 2011. (see: <http://geowebconference.org/registration/academic-track/>)

Hosted and led the 2011 Guilin, China Joint Workshop “Geospatial Data Infrastructure: from data acquisition and updating to smarter services”

20-21 October, 2011

<http://isprs-wg41.nsd.gov.cn>

Proceedings available:

<http://www.isprs.org/proceedings/XXXVIII/4-W25/>

Hosted by the National Geomatics Center of China, Guilin, China

Lead = IV/1 (Geospatial Data Infrastructure)

IV/2 (Automatic Geospatial Data Acquisition and Image-Based Databases)

IV/4 (Virtual Globes and Context-Aware Visualisation/Analysis)

IV/5 (Distributed and Web-Based Geoinformation Services and Applications)

IV/7 (Planetary Mapping and Databases)

ICWG IV/VIII (Updating and Maintenance of Core Spatial Databases)

The workshop was co-organized by six ISPRS working groups. They are WG IV/1(Geospatial Data Infrastructure), WG IV/2(Automatic Geospatial Data Acquisition &

Image-Based Databases), WG IV/4(Virtual Globes and Context-Aware Visualisation), WG IV/5(Distributed and Web-Based Geoinformation Services and Applications), WG IV/7(Planetary Mapping and Databases) and ICWG IV/VIII (Updating and Maintenance of Core Spatial Databases). It was hosted by the National Geomatics Center of China, and sponsored by five companies in this field, including Beijing Geoway Information Technology Inc., Wuda Geoinformatics Co., Geo-Compass Information Technology Co., ESRI China (Beijing) and TIANDITU Co.

The workshop received total 52 abstracts and among them 30 full papers arrived finally, including one keynote paper, eleven papers on “SDI Construction and Services”, nine on “Change Detection and Data Updating”, five on “Data Acquiring and Applications” and four on “Planetary Mapping and Databases”. All full papers have been re-formatted according to the ISPRS Orange Book included in the workshop proceedings(ISPRS Archives Vol. XXXVIII part 4/W25). The proceedings CDs were distributed to all of the participants.

There were total 89 registered participants from nine countries. Among them (71 from mainland China and Hong Kong, 8 from Germany, 4 from United States, 1 from Denmark, 1 from Italy, 1 from the Netherlands, 1 from Korea, 1 from Switzerland and 1 from Syria. There were more than 100 participants in the opening ceremony and the following sessions, with more than 20 participants from local surveying and mapping agencies.

The workshop received great support from the National Administration of Surveying, Mapping and Geoinformation (NASG), the National Geomatics Center of China (NGCC) and the local agency. Dr. LI Pengde, Deputy Director General of NASG, and Mr. LI Zhigang, President of NGCC, both made the special trip to Guilin to attend the workshop and delivered welcome addresses in the opening ceremony. Mr. CHEN Zhong-huai, Director General of the Guangxi Bureau of Surveying, Mapping and Geoinformation, and Mr. TANG Cheng, Deputy Secretary General of Guilin Municipality, also came to attend the opening ceremony and gave their welcome addresses.

Three keynote speakers were invited: 1) Prof. LI Deren, Academician of the Chinese Academy of Sciences and the Chinese Academy of Engineering. He gave the speech titled “On Geospatial Service Web”; 2) Dr. Raj Singh, Director of Interoperability Programs for Open Geospatial Consortium from United States. His topic was “Realizing Successful SDIs through Synergy of Policy, Partnerships and Technology”; and 3) Andreas Illert from Federal Agency for Cartography and Geodesy, Germany. He is in charge the data specification of INSPIRE. His topic was “Smart Services to Create an ESDI from NSDI: The European Challenge”.

There were eight ISPRS officers attended the workshop. They are Prof. Gottfried Konecny (ISPRS honorary member), Prof. CHEN Jun(Secretary General of ISPRS), Dr. JIANG Jie (Chair of ISPRS WG IV/1), Prof. Christian HEIPKE(Chair of ISPRS WG IV/2), Prof. LI Rongxing (Chair of ISPRS ICWG V/I during 2004-2008), Prof. DI Kaichang(Co-Chair of ISPRS WG IV/7), Dr. ZHAO Renliang (Co-Chair of ISPRS ICWG IV/VIII) and Dr. WANG Qian (Secretary of ISPRS WG IV/1). Prof. Chen Jun made a welcome address on behalf of ISPRS in the opening ceremony.



Opening ceremony



Plenary Sessions with TC IV Chairs and Co-chairs

Planned Activities: WG IV/7: IV/1 Geospatial Data Infrastructure in 2012

Technical Sessions of the 2012 Melbourne Congress are being organized. WG IV/1 received 33 abstracts, 10 full papers for peer-review and was assigned 4 Technical Sessions, as well as joining to propose theme sessions: IV/5, IV/1, II/IV, IV/8, IV/3: Free and Open Source Web Mapping and Processing IV/II, IV/8, IV/1: Volunteered Geospatial Information IV/1,4,5, II/2,6,8: Data Modeling for Online Geographic Information Services

b. WG IV/2: Automatic Geospatial Data Acquisition and Image-Based Databases

Chair: Christian Heipke, Germany
Co-Chair: Peggy Agouris, USA
Co-Chair: Younian Wang, USA
Secretary: Soenke Mueller - Germany

Contact Information: (No changes)

WG website: <http://www.commission4.isprs.org/wg2/>

State of Science and Technology

Earth imaging from air and space continues to undergo changes and innovations including high resolution digital aerial cameras, high-resolution and hyperspectral satellite sensors, laser scanning and SAR/InSAR. Calibration issues are always important for new sensors and all of these data are used for the production of geospatial information. The success of Google Earth and Microsoft Bing (formerly Virtual Earth) along with developments such as GEO (intergovernmental Group of Earth Observations), GEOSS (Global Earth Observation System of Systems) and GMES (Global Monitoring of Environment and Security) continue to significantly influence the remote sensing arena.

Applications of image-based databases focus on automatic geo-spatial feature acquisition, especially for capturing of 3D objects. Updating existing geospatial databases is a critical area of research with automation a required component of the processing chain. New directions in geodatabase updating includes the use of cloud-based imagery storage, delivery and processing towards the requirement for near-real time mapping.

As for “image based databases”, there is activity in the following areas, some of which remain relevant for our working group:

- indexing large image databases, incl. multimedia indexing;
- intelligent querying and searching (incl. compressed, progressive search);
- image and information retrieval from image databases;
- integrating image and non-image databases;
- new modalities for displaying retrieved results from image databases;
- navigating through time and space in image databases;
- storage architectures;
- compression, caching and batching in large image databases;
- web repositories (like Flickr).

Accomplishment of Working Group

Participated in 2011 Guilin, China Joint Workshop “Geospatial Data Infrastructure: from data acquisition and updating to smarter services” 20-21 October, 2011 hosted by WG IV/1.

Hosted the biannual workshop “High-Resolution Earth Imaging for Geospatial Information”, June 14-17, 2011 in Hannover, Germany

<http://www.ipi.uni-hannover.de/ipi-workshop.html>

Proceedings available:

<http://www.ipi.uni-hannover.de/418.html>

It was jointly organized by ISPRS WG II/4, III/4, IV/2 and VII/2 with support by ISPRS WG I/2, WG I/5, WG IV/3 and EuroSDR. The ISPRS Hannover Workshop 2011 entitled “High-Resolution Earth Imaging for Geospatial Information” was hosted by the Institute of Photogrammetry and GeoInformation (IPI), Leibniz Universität Hannover, from 14th to 17th June 2011. The workshop was organized by the ISPRS working groups WG I/4, III/4, IV/2 and VII/2, supported by EuroSDR and the ISPRS working groups I/2, I/5, IV/3, and sponsored by Intergraph. The aim was to analyze the applications of the new sensors and virtual globes, and the automation of the processing chain of updating geospatial databases. During the conference 66 papers were submitted of which 38 papers and 4 invited papers were delivered in the oral sessions, and 27 posters were presented in the two dynamic poster sessions.

The conference opened with the welcome addresses of Christian Heipke (Leibniz Universität Hannover) and Kevin Mooney (Dublin Institute of Technology-EuroSDR Secretary-General). Following, Marguerite Madden (University of Georgia, Athens) presented the keynote entitled “Multitemporal Imagery Supporting Earth Studies and Sustainability”. The sessions of Tuesday 14th were focused on object-based image analysis for agricultural and environmental applications, and also image processing methodologies with different purposes. The first day of the conference ended with the icebreaker, which took place in the terrace of the IPI where participants enjoyed German food with relaxed conversations.

Conference proceedings, published in the International Archives of Photogrammetry, Remote Sensing and Spatial Information Sciences are accessible online at the ISPRS website. An extended version of some papers will be published in a special issue of Photogrammetrie – Fernerkundung – Geoinformation (PFG), the peer-reviewed journal of the German Society for Photogrammetry, Remote Sensing and Geoinformation, during 2012.



2011 Hanover Workshop participants gather for an outdoor celebration.

Planned Activities:

Technical Sessions of the 2012 Melbourne Congress are being organized. WG IV/2 received 18 abstracts, 6 full papers for peer-review and was assigned 2 Technical Sessions. WG IV/2 took the lead on organizing the largest numbers of theme sessions:

IV/2, IV/4: Point Cloud Processing, Management and Visualization

IV/2, IV/5, IV/3: Enterprise and Web-photogrammetry

IV/2, IV/II: GeoSensor Networks and Sensor Web

IV/2, IV/VIII, II/IV: Crowd Sourcing for Acquisition & Update of Geospatial DBs

IV/2, IV/VIII: Machine Learning for Change Detection & Auto Updating Geospatial DBs

In addition, Chair Heipke proposed and will organize the special session:

EuroSDR and WG IV/2: Automatic Updates of National Core Geospatial databases.

Publications:

Special Issue of *Photogrammetric Engineering & Remote Sensing*: A special issue was prepared for publication in *Photogrammetric Engineering & Remote Sensing* in the middle of 2010, based on the theme of the ISPRS Hannover Workshop 2009 entitled "High Resolution Earth Imaging for Geospatial Information" and including peer reviewed papers based on the best presentations to the Workshop and additional papers which fit into the topic.

c. **WG IV/3: Mapping from High Resolution Data**

Chair: Pradeep K. Srivastava, India

Co-Chair: David Holland, UK

Co-Chair: Zhanguo He, China

Secretary: Mr. Amitabh, India

<http://www.commission4.isprs.org/wg3/>.

Contact Information: (No changes)

WG Website: <http://www.commission4.isprs.org/wg3/>

State of Science and Technology

Successful development of feature extraction technologies from high resolution satellite imagery continues to greatly increase its usability in large scale mapping from high resolution datasets in the year 2011. Recent high resolution satellite data have spatial resolutions in the 30-50 cm range with higher geometric precision and providing the opportunity to map the different portions of the world at very large scales with height information (3D) for different types of engineering applications. With efforts of previous years, various types of Maps including Thematic and Topographical have been produced by different mapping agencies through out the world. The demands of maps extracted from the high resolution imagery have shifted from novel and experimental to operational for Emergency planning, response and recovery, as well as urban planning, infrastructure

mapping, parcel mapping, disaster management and environmental monitoring. The visualizations of images and maps have evolved from image drapes (2.5D) to true 3D and 4D animations. Virtual cities are common features in different types of urban applications and are increasingly incorporated into mobile mapping applications.

Accomplishments of Working Group

WG IV/3 participated in the Joint International Workshop organized by ISPRS WG IV/2 “**High-Resolution Earth Imaging for Geospatial Information**”, June 14-17, 2011 in Hannover, Germany

Planned Activities: IV/3 Mapping from High Resolution Data

Technical Sessions of the 2012 Melbourne Congress are being organized.

WG IV/3 received the largest number of abstracts in TCIV: 63 abstracts, 23 full papers for peer-review and was assigned 7 Technical Sessions. WG IV/3 will participate in organizing the following of theme sessions:

IV/5, IV/1, II/IV, IV/8, IV/3: Free and Open Source Web Mapping and Processing
IV/2, IV/5, IV/3: Enterprise and Web-photogrammetry

c. WG IV/4: Virtual Globes and Context-Aware Visualisation/Analysis

Chair: Jianya Gong, China

Co-Chair Maged N Kamel Boulos, UK

Secretary: Peng Yue, China

Note: Co-Chair: Geoffrey J. Hay, Canada, respectively has withdrawn his involvement in WG IV/4 due to academic obligations.

Contact Information: (No change)

WG Website:<http://www.commission4.isprs.org/wg4/>

State of Science and Technology

Virtual Globes are now well-established, used in many disciplines and continue to bring the globe-scale geospatial information to our fingertips. It is capable of letting users freely fly anywhere on a virtual Earth, with different views of Earth such as satellite imagery, geographical features, terrain, 3D buildings, and advanced stars, atmosphere or sunlight effects. More specifically, it allows users to add annotations, fuse heterogeneous geospatial data from multiple sources, conduct network-based local-to-global multi-resolution visualization, and share data with others.

The wide popularity of Virtual Globe software systems such as Google Earth, Microsoft Bing (Virtual Earth), NASA World Wind in the geospatial and general communities inspire more ways of exploring and using Virtual Globes. Many efforts in geospatial domain are now trying to incorporate analysis functions into

virtual globes. The use of Virtual Globes as a platform for global data access, information extraction and knowledge discovery has become a technology.

Accomplishments of Working Group

Participated in the WG IV/5 organized GeoWeb 2011, “Pervasive Web Mapping Geoprocessing and Services” conference together with the Working Groups IV/1 and IV/4 of the International Society for Photogrammetry and Remote Sensing (ISPRS), Galdos Systems Inc., and Simon Fraser University. The conference was held in Vancouver, B.C., Canada, August 10-12, 2011. (see: <http://geowebconference.org/registration/academic-track/>)

Actively participated in the 2011 Guilin, China Joint Workshop “Geospatial Data Infrastructure: from data acquisition and updating to smarter services” on 20-21 October, 2011

<http://isprs-wg41.nsd.gov.cn>

Proceedings available:

<http://www.isprs.org/proceedings/XXXVIII/4-W25/>

Hosted by the National Geomatics Center of China, Guilin, China

Lead = IV/1 (Geospatial Data Infrastructure)

IV/2 (Automatic Geospatial Data Acquisition and Image-Based Databases)

IV/4 (Virtual Globes and Context-Aware Visualisation/Analysis)

IV/5 (Distributed and Web-Based Geoinformation Services and Applications)

IV/7 (Planetary Mapping and Databases)

ICWG IV/VIII (Updating and Maintenance of Core Spatial Databases)

Working Group News

Planned Activities: IV/4: Virtual Globes and Context-Aware Visualisation

- Participate in ISPRS Congress in 2012

Technical Sessions of the 2012 Melbourne Congress are being organized.

WG IV/4 received 6 abstracts, 1 full paper for peer-review and was assigned 1 Technical Sessions. WG IV/3 will participate in organizing the following of theme sessions:

IV/2, IV/4: Point Cloud Processing, Management and Visualization

IV/5,4,1,8, II/6, VI/1,2: Web-based Virtual and Shared Geospatial Environments

IV/1,4,5, II/2,6,8: Data Modeling for Online Geographic Information Services

d. WG IV/5: Distributed and Web-based Geoinformation Services and Applications

Chair: Songnian Li, Canada

Co-Chair: Maria Antonia Brovelli, Italy

Co-Chair: Bert Veenendaal, Australia

Secretary: Suzana Dragicevic, Canada

Contact Information: (No change)

WG Website: <http://www.commission4.isprs.org/wg5/>
<http://www.ryerson.ca/simal/ISPRSWGIV5/>

State of Science and Technology

The Joint Workshops, titled "Our Complex World: Representation, Analysis and Modeling" and sponsored by the International Society for Photogrammetry and Remote Sensing (ISPRS) and the International Cartographic Association (ICA), was successfully completed during August 10-12th, 2011 on the campus of Simon Fraser University (SFU), Burnaby, British Columbia, Canada. Building on the strong traditions and reputation of the previous Workshop series, this event blended the 4th ICA Workshop on Geospatial Analysis and Modeling organized by the ICA Commission on Geospatial Analysis and Modeling and the 2nd ISPRS Workshop on Pervasive Web Mapping, Geoprocessing and Services organized by the ISPRS Working Group (WG) IV/5 in collaboration with WG IV/1 and WG IV/4.

The ICA-ISPRS 2011 Joint Workshops brought together leading researchers to address issues related to the complexity of dynamic geographical and environmental systems from two perspectives, first the geospatial analysis and modeling one, and second the web-based mapping, geoprocessing and services one. In more than three decades, geomatics engineering, geographic information and complexity sciences have emerged as paradigms to effectively analyze the linkages between social and natural systems as they evolve in time and across geographic space. However, many unresolved conceptual, technical and application challenges still remain. Consequently, the Workshops' theme "Our complex world: representation, analysis and modeling" focused on these challenges to clarify existing understanding and advance new knowledge.

One of the goals of the joint Workshops was to continue to facilitate and promote high-quality research interaction, networking and communications. The intention was that multiple disciplines including geography, geomatics engineering, and computer, statistical and mathematical sciences would integrate ideas towards an improved understanding of the interactions between social and natural systems, and consequently more effective spatial and environmental planning, policy and decision making for a better world. These themes were reinforced by Dr. Marguerite Madden, ISPRS Technical Commission President in her opening remarks to the workshops participants.

Accomplishments of Working Group

WG IV/5 co-organized GeoWeb 2011, "Pervasive Web Mapping Geoprocessing and Services" conference together with the Working Groups IV/1 and IV/4 of the International Society for Photogrammetry and Remote Sensing (ISPRS), Galdos Systems Inc., and Simon Fraser University. The conference was held in Vancouver, B.C., Canada, August 10-12, 2011. (see: <http://geowebconference.org/registration/academic-track/>)

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Dr. Timothy Nyerges and his keynote talk



Participants engaged in the presentation



Workshops participants



Dr. Paul Torrens and his Skype keynote talk

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Since last workshop in Italy, we have done the following things:

1. Prepared and submitted two reports ISPRS highlights: one for the 2010 Italy workshop and the other one for the academic track of FOSS4G 2010;
2. Published one special issue in *Transactions in GIS*, with most papers from WebMGS 2010;
3. The ISPRS book volume was finally published, entitled "Advances in Web-based GIS, Mapping Services and Applications" and edited by S. Li, S. Dragicevic and B. Veenendaal, with Taylors & Francis. Many WG members submitted papers as chapter contributions.
4. The editing of special issue in *Applied Geomatics* is still ongoing;
5. We are in process of publishing two special issues in *International Journal of Digital Earth* and *Geomatica*, with papers from WebMGS2011 and those responding to open calls.
6. We assisted to co-organize the ISPRS Workshop on Geospatial Data Infrastructure: from data acquisition and updating to smarter services, with WG IV/1 and others in Guilin, China.

Working Group News

Planned Activities:

Technical Sessions of the 2012 Melbourne Congress are being organized. WG IV/5 received 28 abstracts, 13 full papers for peer-review and was assigned 3 Technical Sessions. WG IV/5 will take the lead in organizing the following of theme sessions:

IV/5, IV/1, II/IV, IV/8, IV/3: Free and Open Source Web Mapping and Processing
IV/5,4,1,8, II/6, VI/1,2: Web-based Virtual and Shared Geospatial Environments

WG IV/5 also will participate in the organization of theme and special sessions:
IV/2, IV/5, IV/3: Enterprise and Web-photogrammetry
ICA and WG IV/5: Crowdsourcing and Volunteered Geographic Information

f. WG IV/6: Global DEM Interoperability

Chair: Jan-Peter Mülle, UK
Co-Chair: Dean Gesch, USA
Co-Chair: Takeo Tadono, Japan
Secretary: Shih-Yuan Lin, UK

Contact Information: (No change)

WG Website: <http://www.commission4.isprs.org/wg6/> and <http://iced.net>

State of Science and Technology

July 2009 saw the release of a global 1 arc-second, 30-m DEM created from METI-NASA ASTER stereo data using all the data acquired since mission start on the NASA EOS Terra platform started in March of 2000. Some 1.5 million ASTER scenes went into the final product, which were all stereo matched, cloud cleared and stacked over each individual pixel.

This ASTER GDEM (Global DEM) is primarily available from METI and USGS, but in November 2009, Diping Li (George Mason University) started the OGC-compliant DEM explorer service for releasing WCS-compliant DEM data. In parallel, the BNSC sponsored ICEDS DEMqis (<http://iced.net>) WMS service will begin operation in January 2010. This Quality information Service includes colourised hill-shaded DEMs and a wiki to allow users of this product to post comments on artefacts and issues in the DEM to the scientific community.

In January 2009, USGS released 20 sets of 5 tiles to each respondent of an Announcement of Collaborative Opportunity which they had released at the end of 2008. A summary report was produced and made available to all those who downloaded the final product.

The U.S. Geological Survey (USGS) conducted validation of the ASTER Global Digital Elevation Model (GDEM) over the conterminous United States. The validation approach included comparison with other similar raster DEMs, including the Shuttle Radar Topography Mission (SRTM) data and the USGS National Elevation Dataset. The validation also included an analysis of the GDEM absolute vertical accuracy by comparing against a national set of high-accuracy GPS survey benchmarks. In each case the validation considered the performance of GDEM by land cover class, with land

cover information coming from the USGS Landsat-derived National Land Cover Dataset. Finally, the relative vertical, or point-to-point, accuracy of GDEM was evaluated to characterize the uncertainty of derived slope measurements. In addition to the conterminous U.S. validation, USGS also coordinated the evaluation of 200 ASTER GDEM 1x1-degree tiles by colleagues at the U.S. National Geospatial-Intelligence Agency (NGA), and an additional 150 international tiles by 20 investigators selected through a collaborative Announcement of Opportunity process. The U.S. and international validation results were summarized and presented in a report to NASA and METI, the sponsors of ASTER GDEM production. Additionally, the U.S. validation results by the USGS team were presented at the GDEM special sessions at IGARSS '09 in Cape Town, South Africa. USGS continues to distribute the ASTER GDEM data to the user community on behalf of NASA.

The USGS, in partnership with NGA, continues to work on development of a new multi-resolution global DEM based primarily on SRTM data, but including other high-quality elevation data sources. The new global DEM will have seven products (representing different generalization methods) available at each of three resolutions: 30, 15, and 7.5 arc-seconds (approximately, 1 km, 500 m, and 250 m spatial resolution, respectively). The global DEM development is scheduled for completion by the end of December 2009, with the final products being available to the public in early-2010.

Accomplishments of Working Group

Bad News: Due to a significant delay in posting the ASTER GDEM v2 (October 2011) August 2011, it was not feasible for us to hold a workshop prior the ISPRS Congress in Melbourne

Chair: Jan-Peter Muller is the lead for the 2009-2011 GEO task DA-09-03e entitled "Global Topography) for which the ASTER GDEM is a crucial component. He has invited WG IV/6 members to be involved in this GEO task.

WG IV/6 is coordinating with GEO task force (~ 40 people) and CEOS-TMSG (Terrain Mapping Sub-group) (~ 50 people) to address GEO Task DA-07-01 (and its successor in the 2009-2011 plan), 2nd highest priority of all GEO task items owing to its extreme importance for disaster monitoring and mitigation.

Working group News

Planned Activities: IV/6 Global DEM Interoperability

Technical Sessions of the 2012 Melbourne Congress are being organized. WG IV/6 received 25 abstracts, 5 full papers for peer-review and was assigned 3 Technical Sessions. WG IV/6 will take the lead in organizing the following of special session:

GEO and CEOS: A global DEM for the 21st century and the first GEO deliverable

WG IV/6 will have a special issue of a peer review journal for the ASTER GDEM v2 validation and description of the mission. This is to close out the GEO task DA-09-03d on Global DEM and would have the co-PIs of ASTER and Jan-Peter Mueller as guest editors.

g. WG IV/7: Planetary Mapping and Databases

Chair: Juergen Oberst, Germany
Co-Chair: Paul Schenk, USA
Co-Chair: Kaichang Di, China
Secretary: Marita Wählisch, Germany

Contact Information: (No change)

WG Website: <http://www.commission4.isprs.org/wg7/>
<http://europlanet.dlr.de/isprs/>

State of Science and Technology

A WG IV/7 is involved in a number of planetary mapping missions. Some of these include:

- Lunar Reconnaissance Orbiter (LRO) mission with research on the functioning of the Lunar Orbiter Laser Altimeter (LOLA) and first Digital Terrain Models (DTM). derived from Lunar Reconnaissance Orbiter Camera (LROC) WAC (Wide Angle Camera) stereo image
- Japan Aerospace Exploration Agency (JAXA) released data from the lunar explorer Kaguya (SELENE) derived during the nominal operation phase (from December 21, 2007 to October 31, 2008) to the public.
- Mars Express (MEX) has been in the Mars orbit since early 2004. The mapping with the multi-look High Resolution pushbroom Stereo Camera (HRSC) and the SRC (Super Resolution Channel) is a continuing focus of our ISPRS working group.
- Shih-Yuan Lin (University College London) developed a co-registration process to co-align multiple sets of DTMs from multi-sensors in multi-resolution collected by various Mars exploration missions over the last decade.
- The Mars Reconnaissance Orbiter (MRO) arrived at Mars on 10 March 2006 and began its primary science mission in November, 2009 with its prime mapping instrument being the HiRISE. This instrument can obtain stereo image pairs and covered up to 1% of the surface by the end of the nominal mission in 2010.
- Procedures for deriving DTMs from stereo images obtained by the MESSENGER NAC have been developed by Frank Preusker (Germany). As a result, a DTM with an effective spatial resolution of 1km was produced from 208 stereo images covering the Caloris basin, the largest well-preserved impact basin on Mercury.
- The Cassini Imaging Science Sub-system (ISS) acquired large volumes of high-resolution images (< 1km/pixel) during close flybys of Rhea in 2005 and 2007.
- State of Technology must note the international cooperation of planetary remote sensing missions. For example, the China National Space Administration launched its first lunar probe, the Chang'e 1 spacecraft on October 24, 2007 which arrived in Lunar orbit on November 7, 2007. Chang'e 1 successfully concluded its mission on March 1 of 2009 by a targeted impact on the surface of the Moon. The satellite completed a 16-month mission, mapping and creating three-dimensional images of the lunar surface.
- The Japanese Kaguya (former name: SELENE) mission to the Moon was launched on September 14, 2007, made a complete survey of the Moon using the onboard Terrain Camera (TC) and its Laser Altimeter (LALT)
- Chandrayaan-1 was India's first unmanned lunar probe. It was launched by the Indian Space Research Organization in October 2008, and operated until August 2009. It confirmed the widespread presence of water molecules in lunar soil.

- LRO is the first of an expected series of robotic missions to the Moon by the US within NASA's Lunar Exploration Program (RLEP) for preparing the way for further human space exploration. Following the successful launch in June 2009, LRO will find safe landing sites, locate potential resources, characterize the radiation environment, and demonstrate new technologies. After an initial commissioning phase, LRO began its primary mapping phase from a circular orbit with a mean altitude of 65 km. The impact of the LRO's small companion satellite LCROSS confirmed the presence of water ice in the dark craters near the Lunar South Pole.
- The MESSENGER spacecraft accomplished its third and final flyby of Mercury during its seven-year journey on September 29. The MESSENGER team has recently published a series of papers in Science, featuring initial mission results. This is MESSENGER's last encounter with Mercury before it enters in orbit on March 8, 2011.
- As of December 11, 2009 Mars Express has completed its 7620th orbit around Mars since the beginning of the mission in 2003. The European Space Agency confirmed the extension of this successful mission until 2012.
- Cassini has completed its 122 orbit about Saturn. Likewise, NASE confirmed that the mission will be extended until 2017.

Working Group Accomplishments

WG IV/7 Participated in 2011 Guilin, China Joint Workshop "Geospatial Data Infrastructure: from data acquisition and updating to smarter services" 20-21 October, 2011 hosted by WG IV/1.

Working group News

Recent and Planned Publications:

Planned Activities: WG IV/7: Planetary Mapping and Databases

Technical Sessions of the 2012 Melbourne Congress are being organized.

WG IV/7 received 15 abstracts, 3 full papers for peer-review and was assigned 2 Technical Sessions.

WG IV/5 also will take the lead in the organization of special session:

ICA and WG IV/7: Exploring the Moon!

h. WG IV/8: 3D Spatial Data Integration for Disaster Management and Environmental Monitoring

Chair: Sisi Zlatanova, The Netherlands

Co-Chair: Bo Huang, Hong Kong

Co-Chair: Jiyeong Lee, South Korea

Secretary: William Sin, Hong Kong

Contact Information: (No changes)

WG Website: <http://www.commission4.isprs.org/wg8/>

State of Science and Technology

This working group is a continuation of the WG IV/8 'Spatial data integration for emergency response' (2004-2008). The group was formed under a high need for more sophisticated and appropriate means when facing man-made and natural

risks. The focus was on interoperability of emergency services, harmonisation of data, and provision of appropriate information to ensure that citizens receive high-quality service. The most demanding phase, the Response Phase, was studied explicitly (by investigating user needs and requirements) to provide tools for efficient collaboration and understanding between different rescue teams such as the Health Sector, Police and Fire Brigade, and civil protection.

What is the current status? Many international activities (projects) have taken place to ensure timely supply of data shortly after a disaster, appropriate services (e.g. ORCHESTRA, WIN, OASIS), harmonisation initiatives (INSPIRE in Europe, HSDM in USA). Geo-portals and web access points have been developed (e.g. UN SPIDER) for easy search and access 24 hours per day. Centres for early warning have been established in several countries (e.g. India). Many bottlenecks in making data available, providing the most appropriate data and making collaborative systems have been resolved.

However, most of the operational systems are two-dimensional. Systems capable of a seamless integration of topographic (GIS), geological, meteorological, BIM models are not available yet. Insufficient research has been done in 3D indoor modelling for safe evacuation and navigation. Research on 3D analysis and 3D simulations (e.g. prediction of plume movement, earthquake simulations, etc.) is scattered and isolated.

It is our firm understanding that 3D technology can better aid disaster management and environmental monitoring and therefore we would like to focus on the three-dimensional issues.

The mission of the group will be two-fold, stimulating 3D R&D for disaster management and promoting 3D tools for disaster managers.

Accomplishments of Working Group

The First International Workshop on Spatial Information Modeling, Management and Mining (SIM³) [2011 \(April 22-25\): Hong Kong, China](#)

Geo-information for Disaster Management (Gi4DM) [2011: in Antalya, Turkey](#)

Urban Data Management Society (UDMS) [2011: \(28-30 Sep.\) in Delft, The Netherlands](#)

Working Group News

Planned Activities: IV/8 3D Spatial Data Integration for Disaster Management and Environmental Monitoring

Technical Sessions of the 2012 Melbourne Congress are being organized.

WG IV/8 received 24 abstracts, 7 full papers for peer-review and was assigned 3 Technical Sessions.

WG IV/8 also will participate in the organization of theme sessions:

IV/5, IV/1, II/IV, IV/8, IV/3: Free and Open Source Web Mapping and Processing

IV/5,4,1,8, II/6, VI/1,2: Web-based Virtual and Shared Geospatial Environments
IV/II, IV/8, IV/1: Volunteered Geospatial Information

WG IV/8 also will participate in the organization of special session:
ICA and WG IV/8: Maps, Imagery and Crowd Sourcing for Disaster
Management

ICA, WG IV/8 and WG II/7: LBS and Internet Cartography

Planned Publications:

Members Networked:

WG IV/8 has over 100 researchers and practitioners around the world showing their interests in this WG, including The Netherlands, India, Germany, Denmark, Norway, UK, Austria, Sweden, Greece, USA, Canada, Brazil, China, South Africa, Gana, Nigeria, Hong Kong, Turkey, Malaysia, Israel, Italy and South Korea.

Collaboration with Other Commissions and Working Groups: TC-I (Large scale data acquisition), TC-II (multi-resolution data modelling and TC-VIII (applications for disaster management). Some of the conferences listed above will be co-organised with the mentioned commissions.

Collaboration with Other International Organizations

ISCRAM: <http://www.iscram.org>

OGC, working group 3DIM (integration of GIS and CAD)

UNOOSA: <http://www.oosa.unvienna.org/index.html>

JB of GIS: <http://www.fig.net/jbgis>

GSDI: <http://www.gsdi.org>

ICA, WG Cartography on Early Warning and Crisis Management:

<http://cartography.tuwien.ac.at/ica>

EuroSDR <http://www.eurocdr.org/2002/index.htm>

AGILE <http://www.agile-online.org/>

CPGIS <http://www.cpgis.org/2006website/index.html>

i. ICWG IV/VII: Updating and Maintenance of Core Spatial Databases

Chair: Ammatzia Peled, Israel

Co-Chair: Costas Armenakis, Canada

Co-Chair: Zhao Renliang, China

Secretary: Andrea Ajmar, Italy

Contact Information: (No change)

WG Website: http://www.commission4.isprs.org/icwg4_8/

State of Science and Technology:

Accomplishments of Working Group

1. Activities to recruit more members has continued. There are 30 WG members now of which 22 are active and 8 are corresponding only.
2. WG officers are continuing with their efforts to initiate scientific meetings and session in ISPRS and other events:
3. **Participated in 2011 Guilin, China Joint Workshop “Geospatial Data Infrastructure: from data acquisition and updating to smarter services”**
20-21 October, 2011 hosted by WG IV/1.

Working group News

Planned Activities:

Technical Sessions of the 2012 Melbourne Congress are being organized.

WG IV/VIII received 15 abstracts, 3 full papers for peer-review and was assigned 2 Technical Sessions.

WG IV/VIII also will participate in the organization of theme session:

IV/2, IV/VIII: Machine Learning for Change Detection & Auto Updating Geospatial DBs

j. ICWG IV/II: Geo-Sensor Networking and GeoGRID

Chair: Anthony Stefanidis, USA

Co-Chair: Steve Liang, Canada

Co-Chair: Matt Duckham, Australia

Secretary: Caixia Wang, USA

Contact Information: (No change)

WG Website:

<http://sensorweb.geomatics.ucalgary.ca/isprs/gsn/index.php?q=node/1>

State of Science and Technology:

A GeoSensor Network can be defined as an autonomous, coordinated, spatially distributed infrastructure comprising sensing devices (also referred to as *nodes*, *moten* or *pods*) that *monitor* various conditions (e.g. temperature, illumination) at their locations, and transmit the collected information either to other nodes of this network, or to a remote central location. Inherent in this definition is the Sensor Web's ability to not just passively record data, but also to react to the phenomenon it monitors, e.g. by selecting specific pods to record information so as to better capture the underlying event. Typically, the information communicated in a sensor web includes sensor location, readings, and accompanying metadata. As the collected information may be diverse, ranging e.g., from temperature and sound to digital imagery and human reports, it is easy to understand that the term *sensor* within this context is used to refer to a wide variety of devices such as thermometers and acoustic sensors or even satellite and human intelligence feeds.

Currently, the defining characteristics of a GeoSensor Network are:

- *Very high number of heterogeneous sensor nodes*, often orders of magnitude higher than in traditional networks.

- These sensors are deployed over a limited area, thus resulting in *dense coverage* that allows us to capture adequate detail of the observed phenomenon.
- *Advanced communication capabilities* within the network are needed to support the effective and coordinated collaboration of individual sensors. Information is communicated within the network in-between nodes (typically from one node to one of its neighbours), or through select gateway nodes to end-users.

The current state-of-the-art in this area reflects two types of applications. First we have the traditional computer science applications of wireless sensor networks, where the emphasis is primarily on the optimization of computational capacity given severe operational constraints (e.g., limited power). Secondly, we have geoinformatics applications of sensor networks, with examples like the OASIS sensor web infrastructure to support the USGS monitoring of volcanic activities.

Accomplishments of Working Group

Planned Activities: IV/II Geo-Sensor Networking and GeoGRID

Technical Sessions of the 2012 Melbourne Congress are being organized. WG IV/II led them session received 7 abstracts, 4 full papers for peer-review and was assigned 1 Technical Sessions.

IV/II, IV/8, IV/1: Volunteered Geospatial Information

Publications:

An edited volume resulting from the 2011 workshop on GeoSensor Networks will be released, as part of the established series of “Geosensor Networks” volumes.

k. ICWG IV/II: Semantic Data Interoperability and Ontology for Geospatial Information

Chair: Ryosuke Shibasaki, Japan
 Co-Chair: Marinos Kavouras, Greece
 Co-Chair: Mir Abolfazl Mostafavi, Canada
 Secretary: Margarita Kokla, Greece

Contact Information: (No change)

See Commission II Annual Report for details on activities.

l. Other Relevant Information

m. Commission Officer Address Update

See above contact information provided for the first time for each WG separately. Updated contact information is highlighted in yellow.