



International Fédération of Surveyors
Fédération Internationale des Géomètres
Internationale Vereinigung der Vermessungsingenieure

FIG Commission 5 Position and Measurement e Newsletter – Rome Working Week

Dear Colleague,

In this edition you will read about the activities of our Commission at the Working Week in Rome "Knowing to Manage the Territory, Protect the Environment and Evaluate the Cultural Heritage". Please feel free to distribute this newsletter to colleagues and friends.



Regards Mikael Lilje, (Mikael.Lilje@lm.se)
Chair of FIG Commission 5

FIG Working Week 2012 - Rome, Italy, 6-10 May 2012



The Event

The FIG Working Week and 35th General Assembly was held at the Rome Cavalieri, Waldorf Astoria Hotels & Resorts. The event was jointly organized by FIG and the governance body for the Italian survey profession, the National Council of Surveyors and Graduate Surveyors (Consiglio Nazionale Geometri e Geometri Laureati, CNGeGL). More than 1500 surveyors from 96 different countries participated in this conference and 750 abstracts submitted. Delegates attended 500 presentations in 100 sessions.

Prior to the Rome Working Week, 130 young professionals were present at the inaugural Young Surveyors Conference – "Knowing to Create the Future" Palazzo Corrodi Cassa Geometri. Commission 5 also held our first Reference Frame in Practice Seminar at the same venue, and attracted 42 delegates from various parts of world involved with operational geodetic surveying. Our event was jointly organized with the International Association of Geodesy (IAG) and the United Nations International Committee on GNSS (ICG).

Technical Program

Like previous Working Weeks, the Commission 5 technical program was extensive. It comprised of 17 technical sessions and almost 100 papers and presentations. To summarise the technical proceedings the Chairs and Rapporteurs from each session have provided the following overview –

- TS01B - Geodetic Datum I
The international GNSS Service has developed to become even more important, not only for post-processing but also for real time services. However, still its development is very much dependent on the contribution

from the involved countries. CORS with long and stable time series is important as well as the access of data from these stations in real time. The session discussed issues from the international perspective to the local government perspective regarding reference frames and development of geodetic infrastructure.

- TS02B - Geodetic Datum II

In this session a number of interesting papers were presented and they were principally concerned with Terrestrial Reference Frames. Indeed for those who did not have the opportunity to participate in the Reference Frames in Practice Seminar held before the Working Week, this session provided a broad overview of many important topics discussed during this event. The subjects were nicely inter-related covering Recently Adopted Changes to the Terrestrial Reference Frames Used in the United States, Coordinate Systems for Surveying and Mapping in Hong Kong and Towards Implementing Dynamic Datum Data Management in GIS. An important theme running through all of the presentations in this session was dynamic four dimensional datums. The comprehensive presentation Four Dimensional Deformation Modeling, the link between International, Regional and Local Reference Frames nicely summarised this timely and important subject.



- TS03D - Multi-Sensor Systems

This session was facilitated by FIG Commission 5 WG 5.4 and WG 5.5 and the contributions were mainly from the WG members. A broad field of topics was covered. The coupling and integration of different sensor for simulation purposes as well as evaluation of mobile mapping systems were in the focus of the presentations. Fast static GNSS as well as a general overview concerning practical and research challenges for kinematic multi-sensor systems completed the interesting session.

- TS04B - Heights, Geoid and Gravity

This session investigated the use of gravity models and geoids for the development of vertical datums. An interesting description of height modernisation in the US by implementing a gravimetric vertical datum by Renee Shields was followed by a more in depth discussion on the technicalities of implementing a new geoid for a new vertical datum in North America by Dan Roman. Clearly the establishment of a new modern vertical datum for North America is a high priority and significant progress is being made. Two further talks discussed focused on more traditional aspects of vertical datums such as the determination of astro-geodetic vertical deflections using digital zenith camera systems



- **TS04H - Measurement Applications of Unmanned Vehicles**
Unmanned Aerial Vehicles (UAV) or Systems (UAS) are a new challenging field for the surveying community. This session reflects the variety of topics to be discussed, e.g. photogrammetry and navigation. The session was well attended and the audience listened numerous papers on - the use of UAV for post seismic documentation; the automatic processing of images taken by UAVs camera; and dealing with the navigation purpose to integrate different sensors. A highlight was the second presentation given by Marcus Arthur who showed in a very structured way new methods for automated image processing.
- **TS05B - GNSS CORS Infrastructure and Applications I**
This session stimulated lots of interesting discussions on the use of online GNSS processing facilities. As CORS networks have now attained some maturity both as part of the national geodetic infrastructure for many countries as well as supporting high precision positioning applications, the papers in this session focused on how CORS network processing can be facilitated and automated through the provision of interactive, online tools, how they are evolving into the future and aspects of network quality.



- **TS05H - Remote Sensing I**
This was essentially a flash session with a number of interesting papers. One particularly intriguing and visually impressive paper discussed monitoring the full scale real time failure testing of an in situ electricity transmission tower with off the shelf photogrammetric instrumentation and techniques.
- **TS06E - GNSS CORS Infrastructure and Applications II**
There were three talks in CORS Infrastructure and Applications II. The primary emphasis was on networks and how the data was being made available to the public. The networks were being designed to provide real time information to users / subscribers to meet a variety of needs. A separate talk was given on how to set up and build a network (Hong Kong Area). The discussion focused on lessons learned when establishing control in a built up area with many tall buildings.
- **TS06I - Remote Sensing II**
This session consisted of several flash presentations showcasing the application of remote sensing and photogrammetric technology for mapping and environmental/geo-hazard monitoring. The integration of products from different remote sensing platforms through the application of GIS was a key highlight for many of the presentations in this joint Commission 3, 5 & 6 session, with the PanGeo Project, identifying geo-hazards from remote sensing imagery drawing many points of discussion among the participants.
- **TS07A - Laser Scanners I**
Terrestrial Laser Scanning and its application to different fields was again a focus on the Working Week. This is documented by the 80 plus attendance in this session. The presented applications were in the domains of cultural

heritage, rockslides and cave documentation. Here different projects and procedures were presented. Other foci were kinematic and 'stop & go' laser scanning covering statistical analysis as well as development of a new multi sensor system. Additionally a contribution deals with the accuracy analysis of Terrestrial Laser Scanning.



- **TS07H - GNSS Measurement Devices**
 GNSS measurements can be used for positioning in various applications. This session investigated techniques/methods to improve the modeling performance of GNSS biases in measurements. Moreover, positioning accuracy of GNSS measurement devices was assessed. The presenters described techniques/methods and results of GNSS antenna calibration, positioning accuracy evaluation with known baselines and EDM, performance assessment with sub-sets of satellites, evaluation of tropospheric models, and applying meteorological data in GPS measurements. Audiences and presenters had good discussion about GNSS bias modeling techniques and assessment methods used and data processing results presented.



- **TS08B - The Impact of Earthquakes and Geodynamics on Geodetic Ref Frame**
 Ground movements due to a variety of causes have an impact on the geodetic infrastructure. Movements can be caused by long term effects such as plate tectonic motions to more localized effects such as those due to landslides. This session focused on measuring ground motions due to these various causes using a variety of geodetic techniques including GNSS and land based InSAR surveys. Of particular interest was a presentation comparing monitoring of the Assisi Landslide using both long term GNSS and SAR measurements.
- **TS08C - Laser Scanners II**
 This session highlighted the diversity of applications for laser scanners. Presenters covered structural applications including historic building modeling and identification of structural failure in concrete buildings. Mobile laser scanner was presented as a cost-effective means to carry out a wide area topographic survey to support natural hazard mitigation and there was also discussion of user self-calibration of instruments.
- **TS08D - Vertical Reference Systems**
 Determination of your height with respect to a body of water has been a fundamental need for planners in coastal communities for millennia. This was a joint session between Commission 4 and 5. It focused on measuring or modeling the water surface and monitoring changes to that.

Discussion by the presenters focused on transforming between various reference surfaces and the use of technology to access or remotely monitor changes, which included several novel approaches. As a result of these discussions it is apparent that Hydrographers and geodesists need to have more detail deliberations on this subject in the near future.



- **TS08I - Low Cost Surveying and Mapping**
Two presentations focused on cost-effective methods and processes for revising street map products and in novel application of discrete geographic points (called a point cadastre) to represent land parcels as a low cost cadastral solution for parcel registration. The street map revision process benefits from recent developments in Computer Aided Cartography (CAC) that has transformed the analogue method of map-making. The demonstration project in Nigeria showed the benefits of applying CAC to revise street maps that are precise and current in essential information that meets the needs of local government and the general public. The point cadastre presentation described studies leading to defining requirements for a cadastre system based on geographic points. The requirements will serve as a basis for land administrators to consider point cadastre as a viable lower cost option for land parcel registration. For both presentations, there was very good interaction and discussion between the audience (about 28) and the presenters.
- **TS09B - Precise Point Positioning**
This is an active area of research, particularly with regard to real-time centimeter-level positioning. Presenters discussed improved algorithms for positioning, the incorporation of GLONASS data and the use of PPP for atmospheric mapping. There was also a reminder that PPP remains unproven for centimeter-level real-time positioning, so infrastructure such as CORS to support relative GNSS positioning techniques is still required.
- **TS09D - Laser Scanners III**
In the last session on Terrestrial Laser Scanning mainly young researchers gave an insight into their investigations. One contribution discussed the combination of GPS and Laser Scanning. The other presentations dealt with application-focused filter algorithms delivering reliable and encouraging results. There were two highlight presentations / papers and these were by Carmen Müller and Timothy Nuttens. Both showed progresses in the field of automatic shape extraction on the base of laser scanning data.

Refer to website <http://www.fig.net/pub/fig2012/techprog.htm> or the "Surveyors Reference Library" <http://www.fig.net/srl/> to review the presentations and technical papers.

Meetings

One of the primary purposes of the Working Weeks is to provide working group members the opportunity to meet, resolve and formulate strategies 'face to face' both formally and informally. Commission 5 is very supportive of such meetings

and thus participated in and convened various administrative meetings during this event. The main meetings that the Commission 5 Chair and Vice Chairs attended were -

- ACCO - Advisory Committee of Commission Officers
- Commission 5 Open Annual
- Steering Committee
- IAG Liaison

A summary of the discussions from these meeting can be found in the Steering Committee Minutes, and are available via the web location – http://www.fig.net/commission5/steering_committee/steeringcommittee.htm

In addition to the above meetings David Martin, who is the Chair of FIG WG 5.1 Standards, Quality Assurance and Calibration, and also the Chair of the **FIG Standards Network**, convened a Standards Network meeting for all delegates interested in “standards”. At this meeting there was a discussion around who will replace Ian Greenway as the FIG liaison to the ISO Technical Commission (TC) 211 (<http://www.isotc211.org/>). Ian Greenway advocated the new representative should come from one of Commission 4, 5 or 6. This is where there is considerable work in the field of standards right now.

Briefly, TC 211 is concerned with standardization in the field of digital geographic information. This commission aims to establish a structured set of standards for information concerning objects or phenomena that are directly or indirectly associated with a location relative to the Earth. These standards may specify, for geographic information, methods, tools and services for data management (including definition and description), acquiring, processing, analyzing, accessing, presenting and transferring such data in digital/electronic form between different users, systems and locations. The work links to appropriate standards for information technology and data where possible, and provides a framework for the development of sector-specific applications using geographic data.

Nic Donnelly, from Land Information New Zealand, spoke about the importance of Metadata standards. This is an important field - not just in surveying and geodesy. He is looking to establish a joint FIG/IAG working group to study this important subject.

There was some discussion concerning FIG Publication No. 9. At the FIG working week held in Marrakesh it was decided to that FIG publication No. 9 Recommended Procedures for Routine Checks of Electro-Optical Distance Meters - (http://www.fig.net/pub/figpub/pub09/FIG-Publication_Nr9_english.pdf) should be revised with additions for recommendations for hand held distance-meters and reflector-less instruments. Unfortunately due to a very heavy workload this has not advanced.

Also with the present revisions of a number of important instrument testing standards, the Standards Network is looking to appoint a FIG liaison from Commission 5 to TC172 SC6

People that would be interested in assisting or even leading any of the projects in any of the positions mentioned above should contact David Martin - martin@esrf.fr .

General Assembly

As per other Working Weeks there were two FIG General Assemblies (GAs). The main outcomes or highlights from the GAs were –

- FIG membership consists of - 105 member associations from 87 countries; 25 corporate members; 87 academic members; and 14 correspondents.
- Matthew B Higgins was appointed Honorary Member of FIG. Matt was a Working Group Chair within Commission 5 during the period 1998-2002 and the Chair of the Commission for the term 2002-2006. He also served as Vice President for FIG between 2006-2010.
- FIG accounts indicate that our financial position is reasonable and stable.
- Dr Pengfei Cheng (China PR) and Mr Bruno Razza (Italy) were elected as the next Vice Presidents of FIG for term 2013-16.
- The Commission Chairs Elect for 2013-14 are -
 - Commission 1: Mr. Brian Coutts (New Zealand)
 - Commission 2: Ms. Liza Groenendijk (Netherlands)
 - Commission 3: Mr. Enrico Rispoli (Italy)
 - Commission 4: Ms. Angela Kesiena (Nigeria)
 - Commission 5: Prof. Volker Schwieger (Germany)
 - Commission 6: Dr Ivo Milev (Bulgaria)
 - Commission 7: Ms Gerda Schennach (Austria)
 - Commission 8: Mr Kwame Tenadu (Ghana)
 - Commission 9: Prof Liao Jinping (China PR)
- FIG Working Week 2015 will be in Sofia, Bulgaria
- FIG Working Week 2016 will be in Christchurch, New Zealand
- FIG Voting Rights - the Working Group tasked with this recommended to FIG Council that each membership association should have the right to vote, and will have a voting entitlement based on their membership numbers. It was decided that FIG Council now need to prepare a proposal for the General Assembly to vote on so that if required the resolution can be implemented after the 2014 Congress in Malaysia.



For FIG Commission 5 we would like to highlight that our Chair Elect was endorsed by the General Assembly and that we would like to congratulate Prof. Volker Schwieger as the incoming Chair of the Commission. Volker will serve as Commission chair for the term 2015-18. Currently he is the Chair of Working Group 5.4 - Kinematic Measurement and has been an active member of our commission for many years.

Social Activities

There were several social events organized for the Working Week delegates -

- Opening Ceremony and concert at the Giuseppe Sinopoli Hall, Parco della Musica
- Foundation Dinner at the Cavalieri Hilton, Grand Ballroom
- Gala Dinner at the Villa Miani

In conjunction with Commission 4 and 6 we also had our traditional technical commission's dinner. The dinner was held in a private function room at a beautiful cozy restaurant located in the heart of Roma called "Libreria Enoarcano". The

food and wine were excellent. On behalf of the 50 plus attendees Commission 5 thank **Alessandro Capra** for organizing this activity.

For photos of the FIG Rome Working Week please refer to the FIG Picture Galleries at web location - <http://www.fig.net/news/fig2012/index.htm> .

Reference Frame in Practice Technical Seminar



The IAG, (International Association of Geodesy), FIG and ICG (International Committee on GNSS) held a technical seminar prior to the Working Week, on 4-5 May 2012. This event was held at the Cassa Geometri (Cassa Italiana Di Previdenza Ed Assistenza Dei Geometri Liberi Professionisti). 42 delegates were present on both days to listen and discuss presentations on -

- The Role of Geodesy–GGOS and Future Trends by Prof. Chris Rizos President IAG – This presentation provided an overview of the transition from traditional to modern geodesy, describing the evolution of roles, impact of services, central importance of reference frame definition, contributions to geoscience and GGOS.



- Global Terrestrial Reference Systems and Frames by Dr Zuheir Altamimi, who discussed theory relating to ITRS / ITRF / WGS-84; associated transformations; how ITRF is determined; and how geodetic techniques (VLBI, GNSS, DORIS, SLR) contribute to ITRF.

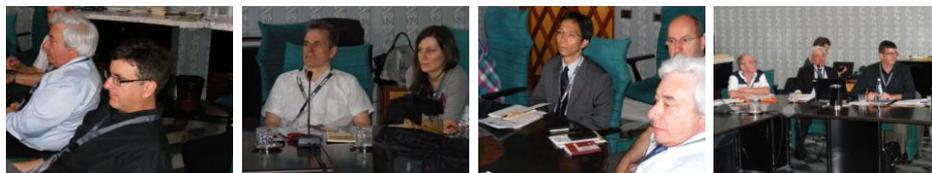


- Regional and National reference systems by Eng. Joao Torres and Dr John Dawson. This session described the mathematical relationship between the ITRF and regional or national reference frames using EUREF and APREF as case studies. The topics covered included the definition, realisations, GNSS CORS infrastructure and campaigns, transformations, and monitoring of such regional reference frames.

- Worked examples of Terrestrial Reference Frame Realisations by Dr John Dawson, Prof Volker Schwieger, and Mr Nic Donnelly. In this session delegates were provided additional case studies from countries describing how their geodetic datum has been realised in relationship to a regional reference frame or ITRF and any local problems and issues. It also included the discussion of issues for an intra-plate country as opposed to one across a plate boundary.



- IGS Services and Other Initiatives by Ms Ruth Neilan. In this presentation, an overview on how these services and other initiatives contribute to global reference systems; regional and national reference systems; organisational benefits; and how do agencies participate i.e. requirements was provided.
- Gravity and WHS by Dr Dan Roman. In this session, the presenter focused on the relationship between various aspects of the Earth's gravity field such as the geoid, geopotentials, gravity, deflections of the vertical, and physical heights (e.g., above mean sea level). It also covered the different means of observing the gravity field and how they are combined to produce models for height determination both at global scales, such as the World Height System, and locally for National Vertical Datums.



- Multi GNSS Environment by Ms Sharafat Gadimova, Dr Lawrence Lau, and Mr Larry Hothem. The presenters provided an overview of the ICG work plan, its activities, and the Providers Forum. There were also presentations on the 'state of play' and 'emerging issues' relating to a multi GNSS environment. This included information relating to signals, augmentation and space; the technical effects of a multi GNSS environment on reference frame infrastructure, positioning applications and techniques.
- Standards and Traceability of a Terrestrial Reference Frame / GNSS by Dr David Martin and Mr Larry Hothem. This session provided an overview of the standards, best practice and traceability respect to reference frames, GNSS measurements, GUM, the ISO 9000 series of standards, the ISO 17123 series and TC211. It also included the status of Geodetic Network Registry.



- Four dimensional deformation models for Terrestrial Reference Frames by Mr Graeme Blick and Mr Richard Stanaway. The presentations examined the concepts of 4 dimensional datums; the pros and cons of static, semi-dynamic datum and dynamic datums; and the development of Deformation Models which incorporate the effects of events such as earthquakes. The information was explained through case studies from Australia and New Zealand.



The organizers of this seminar would like to thank Cassa Geometri, Trimble Navigation, ESRI and the hosts CNGeGL for their support and assistance to make this event a success. We would also like to thank UNOOSA (United Nations Office for Outer Space Affairs) for their generosity as they sponsored 4 delegates to attend this seminar.

Please note, it is proposed to organise another reference frame in practice seminar in 2013, so please keep in contact with FIG Commission 5 or your National Delegate for more information.

Upcoming events:

- The Department of Astronomy and Geodynamics of the University of Warmia and Mazury (UWM) is hosting the **2012 IGS Workshop**. This 5-day workshop will be held at UWM in Olsztyn, Poland from July 23-27, 2012. http://www.uwm.edu.pl/kaig/igs_workshop_2012/
- The next **International Workshop on Accelerator Alignment** IWAA is planned to be held between 10 and 14 September 2012 at Fermi National Accelerator Laboratory in Batavia Illinois, USA. This workshop is devoted to large scale and high precision positioning of particle accelerators and photon science experiments, focusing on the exchange of information between geodesists, surveyors, physicists and others specialists. The fields of geodesy, geomatics, metrology and traditional surveying overlap in this unique gathering.
- **Seventh Meeting of the International Committee on Global Navigation Satellite Systems** (ICG) hosted by the Government of People's Republic of China. Beijing, 5th November – 9th November , 2012. <http://uujoin.com/index.php?p=General%20Information>
- 26-29 November, Montevideo, Uruguay. **8th FIG Regional Conference**. Organised by Asociación de Agrimensores del Uruguay AAU and FIG. Web site: www.fig.net/uruguay
- 6-10 May, Abuja, Nigeria. Environment for Sustainability. **FIG Working Week and General Assembly**. Web site: <http://www.fig.net/fig2013>

How to Participate in Our Commission

Commission 5 Chairs of the working groups are continually developing the membership for their working groups. There is still opportunity for you to join any of the working or joint working groups. If you are interested then there are two levels in which you could actively contribute and they are –

- The first level of participation is as a “core member” of a working group contributing directly to discussions, publications, meetings, and facilitates technical sessions, etc.
- The second level of participation is as part of a “reference group” to review publications, technical papers, provide feedback on issues and general assistance, etc.

People interested in being involved in one of the working groups should contact the Chair of the relevant Working Group and send a copy to our Vice Chair for Administration, Rob Sarib (Australia) email: robert.sarib@nt.gov.au .

All responses should indicate the desired level of participation, either as a “core member” or as part of a “reference group” and also include a one or two paragraph biography of your professional career to date.

There is also another way to assist Commission 5 with their work and that is to become a National Delegate to Commission 5. Please note, we recommend that before you consider this option you will need to check with your FIG member association whether they already have a National Delegate for Commission 5 and if it has been officially listed on our website, location <http://www.fig.net/comm/natdel5.htm> .

Briefly, the role of a National Commission Delegate is to –

- establish networks within their countries to communicate information and obtain feedback for the Commission,
- be actively involved in commission activities, including responding to questionnaires or correspondence and identifying topics and authors of papers for Commission symposia and FIG congresses,
- seek and encourage funding support to attend FIG activities, including commission meetings, and
- write at least one annual report for publication in a local newsletter or technical journal or for dissemination by some other means to individual members of their member association or organisation.

If you wish to be a National Delegate for Commission 5 your FIG member association must formally submit in writing to the FIG Office the name, professional title, address, telephone and fax numbers and email address of the nominated person.

Commission 5 looks forward to your response and please do hesitate to ask any questions or if you have any further queries.

FIG Commission 5 e-Newsletter

If you would like to circulate Commission 5 NEWS to all our members please email your item for consideration to the

- Vice Chair Administration – Rob Sarib robert.sarib@nt.gov.au or
- Chair of Commission 5 - Mikael Lilje Mikael.Lilje@lm.se