



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

**FIG Commission 5 Positioning and Measurement  
July 2018 eNewsletter and FIG Working Week  
Istanbul Report**

Dear Colleagues,

In this edition you will read about the activities of our Commission at the FIG Congress and General Assembly from 6-11 May as well as the FIG pre-event joint FIG/IAG/ICG/HKMO Technical Seminar from 4 to 5 May in Istanbul, Turkey.

We had a great FIG congress and a very well attended and organized Technical Seminar focussing on Kinematic and Dynamic Reference Frames. Besides high quality presentations, papers, panel discussions and personal discussions, we all enjoyed the Turkish hospitality and friendliness.

Apart from that, the six Working Groups of FIG Commission 5 are working hard to achieve the targets of the work plan of this period.

Dan Roman from the USA was elected commission 5 chair for the next period 2019-2022 at the general assembly. I am very confident that FIG Commission 5 will continue to be very active in the coming years and that Dan Roman and his team will be successful.

Kind Regards

Volker Schwieger (Volker.Schwieger@iigs.uni-stuttgart.de),  
Chair of FIG Commission 5



# Technical Seminar on Reference Frames in Practice

## - Reference Frames, Kinematics and Dynamic Datums

4-5 May 2018 at Hilton Bosphorus, Istanbul, Turkey



Report by Prof. Dr. Muzaffer Kahveci, Turkey

### Introduction

The Technical Seminar on Reference Frames in Practice was held in Istanbul on 4-5 May 2018. The main focus was on reference frames in general, kinematics and dynamic datums which reflects geodetic priorities for all regions suffering from natural disasters such as earthquakes. Participants mostly come from countries where there is a strong need to model deformation to maintain their accurate spatial reference frames. So, this Seminar has been a good platform to share knowledge and resources for their mutual benefits. We believe that this Seminar series have been a geodesy's classics and should be continued also in future under the umbrella of FIG.



The Seminar was organised by FIG Commission 5, in conjunction with the International Association of Geodesy (IAG), the United Nations International Committee on GNSS (UN ICG) and the Turkish Chamber of Survey and Cadastre Engineers (HKMO).

The seminar was held in Hilton Bosphorus Hotel in conjunction with the FIG2018 Congress&GA at the Istanbul Congress Center. Primary organisers were Muzaffer KAHVECİ (HKMO-LOC), Volker Schwieger (FIG Comm. 5), and Li Zhang (FIG Comm. 5).

### Participants

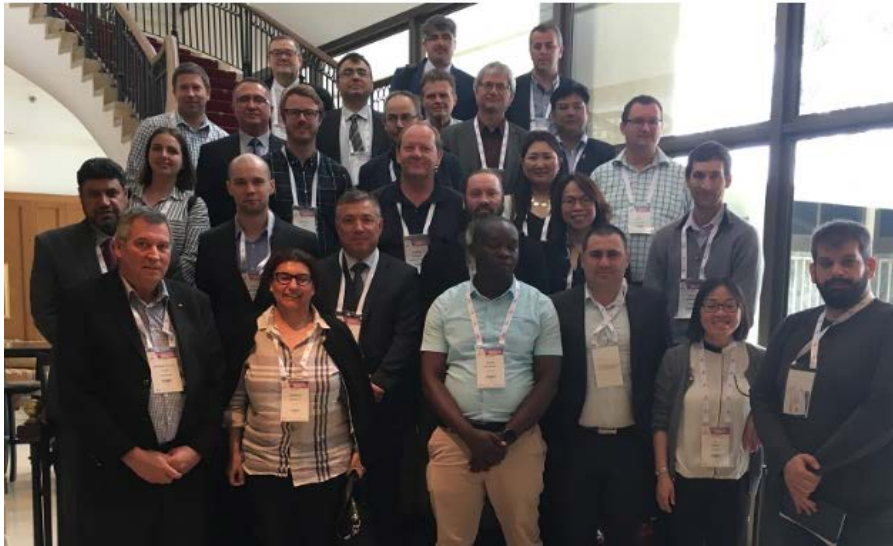
There were 37 participants, including presenters, from around the world. Countries represented were Austria, Australia, Congo, Denmark, Finland, France, Germany, Mongolia, Nepal, New Zealand, Nigeria, Papua New Guinea, Russia, Saudi Arabia, Sweden, Uganda, USA and Turkey. Attendees represented a mix of

academic, government and commercial institutions. List of participants is given as appendix-1 to this report.

Organisational representatives in Istanbul were as follows:

Volker Schwieger (FIG)  
Daniel Roman (IAG)  
Sharafat Gadimova (ICG)  
Muzaffer Kahveci (HKMO)

*Group photo of attendees*



### **Technical Content**

The seminar focussed on the theory and practice of 3D reference frames. Topics covered were:

- Introduction to 3D Reference Frames
- Introduction to Vertical Reference Frames
- Kinematic Frames and Deformation Modelling
- Dynamic Datum and Modelling of Crustal Deformation
- GNSS and Geodetic Software
  - o RTKLIB
  - o SNAP
- Case Studies
  - o Iceland
  - o Europe (ETRS89 and ERVS)
  - o USA
  - o Russia
  - o New Zealand
  - o Turkey
- International Geodesy Initiatives
  - o ICG at UN
  - o UN-GGIM

The presentations are available on the FIG website at <http://www.fig.net/fig2018/rfip.htm>

A full copy of the RFIP final technical programme is given as appendix-2 to this report.

Besides, a technical tour was organized to Kocaeli Municipality where the big earthquake ( $M_w=7.4$ ) had happened on 17 August 1999 causing the deaths of thousands of people (North Anatolian Fault Zone) on 5 May 2018 in the

afternoon. There, people from the municipality has made presentations regarding the current status of the city and realized technical&social projects after the earthquake until now. Below are some pictures about Kocaeli technical visit.



### **Networking and Social Events**

There were excellent opportunities to network and socialise during the lunch and tea breaks, which the participants took advantage of. One of the highlights of the seminar was the dinner held on the first evening. Dinner was held in Midpoint Restaurant at Nisantasi and provided an opportunity to sample a number of local dishes and continue the networking.

### **Sponsorship**

The seminar was well supported by Leica and Trimble, in terms of both financial support and attendance. The ICG provided financial support to several participants from developing nations. The organisers FIG, IAG, UN ICG and HKMO would like to thank and acknowledge the sponsors for their generous support of this event.

# FIG Congress 2018 – Istanbul, Turkey, 6-11 May 2018



06-11 MAY 2018  
EMBRACING OUR SMART WORLD  
WHERE THE CONTINENTS CONNECT:  
ENHANCING THE GEOSPATIAL  
MATURITY OF SOCIETIES



## The Event Overview

The FIG Congress 2018 week and General Assembly (GA) 2018 was held successfully on 6-11 May, 2018, in Istanbul, Turkey.

More than 2300 surveyors from Turkey and all over the world participated in this congress. There were more than 400 presentations in 63 technical sessions, and 3 pre-events.

## Technical Program Summary



Commission 5 had 11 technical sessions, and one of them was conducted jointly with Commission 6. The chairs and rapporteurs of each session have provided the summary and highlights. All the sessions of Commission 5 were well-attended, from 30 to more than 100 participants. The rooms were fully filled with audience.

### **TS01E: GNSS – CORS**

Chair: Prof. Dr. Muzaffer Kahveci, Turkey

Rapporteur: Dr. Li Zhang, Germany

Report: Dr. Li Zhang, Germany

There were seven presentations in this session about the interesting applications and the evaluation of the CORS stations in different countries like Saudi Arabia, Turkey, Ghana and Nigeria. For example, Mr. Mpaka Erekosima gave a presentation about the implementation, benefits and challenges of CORS stations in the oil industry in Nigeria. By using the CORS technology, the cost for the surveying reduced significantly (about 60%-75%); challenges are infrastructure like defective power supply and limited 4G LTE internet service as well as limited in-

country expertise. This session was well-attended; there were more than 100 participants.



## TS02E: GNSS Measurements Technique

Chair: Prof. Dr. Mualla Yalcinkaya, Turkey  
Rapporteur: Prof. Dr. Suelynn Choy, Australia  
Report: Prof. Dr. Suelynn Choy, Australia

The session consisted of five presentations in the area of GNSS measurement techniques for various different applications. The audience were engaged with the speaker with many questions and good suggestions to improve the quality of the speaker's work.



### **TS03E: Multi-GNSS**

Chair: Prof. Dr. Suelynn Choy, Australia

Rapporteur: Mr. Bilgehan Makineci, Turkey

Report: Prof. Dr. Suelynn Choy, Australia

The session consisted of five presentations: four of which related to Multi-GNSS processing; and one related to EDM calibration. The first presenter gave an overview of the Australian and New Zealand SBAS testbed. The second presentation was on multi-GNSS processing using the latest Trimble Business Centre software. The third and fourth presentations were on utilization of triple-frequency GNSS measurement for quality assessment and cycle slip detecting and repair. The fifth and last presentation was on EDM calibration. Overall, it was an interesting and well-received session.



### **TS04E: GNSS PPP and Networks**

Chair: Prof. Dr. I. Oztug Bildirici, Turkey

Rapporteur: Dr. Leonid A. Lipatnikov, Russia

Report: Dr. Leonid A. Lipatnikov, Russia



The combination of precise point positioning and network GNSS techniques is one of the most promising directions of research and development because it is a key to seamless high-precision GNSS positioning everywhere on earth. A wide range of relevant topics was covered during the session including the study of precise mass-market applications and the comparison of different processing platforms such as online processing services and software. Different aspects of enabling high positioning accuracy were discussed, particularly using different GNSS constellations and compensation of rover antenna tilt in RTK. All presentations were interesting and substantial and attracted well-deserved attention of the audience.



## **TS05E: Future of Positioning**

Chair: Mr. Mikael Lilje, Sweden

Rapporteur: Dr. Yasemin Sisman, Turkey

Report: Dr. Li Zhang, Germany

The session "Future of positioning" was presented by invited presenters (so there were no papers and presentations are only online available), most of whom are Com 5 WG chairs. The topics of this session covered the focus of Com 5 and showed the current trends of positioning.

Prof. Volker Schwieger (Com 5 chair) gave an insight into sensors needed for advanced driver assistance systems (ADAS) as well as autonomous driving. He expects an enormous impact on the geodetic education as well as on geodetic job perspectives. Prof. Allison Keally (Com 5 WG5.5 chair) then presented the current technologies in the indoor positioning field. She gave an overview of some of the major approaches and methodologies and the current status and also the future research challenges of these technologies.

Prof. Suelynn Choy (Com 5 WG5.4 chair) gave an overview of currently provided services of different global navigation satellite systems like Galileo, QZSS, Beidou, GLONASS, and their benefits for the future GNSS positioning. She also showed the current trends of hardware of the GNSS positioning; the antennas and receivers are cheaper and smaller, but the accuracy has increased. Dr. Li Zhang (Com 5 Vice chair of Administration) made a presentation on the low-cost GNSS for geodetic applications. Examples of static and kinematic positioning using low-cost GNSS receivers and antennas were presented. Experiences, challenges and limitations up to now as well as the possibilities for the applications in the near future were discussed. Dr. Martin Lidberg indicated the importance of reference



frames in the precise positioning, since the reference systems will play a role in the reference frames in a dynamic world. He pointed out that the different precise positioning services should be provided in the same geodetic reference frame and discussed possible alternatives for the handling of reference frames in real time streams from positioning services and spatial information. The experience with the invited presenters and the presentations from the Com 5 is quite good; probably we can continue this in the future to improve the quality of technical sessions.



**TS06E: Gravity and Geoid**

Chair: Dr. Dan Roman, USA

Rapporteur: Mr. Erol Uysal, Turkey

Report: Dr. Dan Roman, USA

Session TS06E presented examples of modernizing gravity and geoid models around the world. These new models are more precise and accurate based on new observations and techniques. Case studies showed improvements in the Nordic gravity field as well as geoid models in Chile, North America, India, and Malaysia.



#### **TS07E: Reference Frames**

Chair: Prof. Dr. Muzaffer Kahveci, Turkey

Rapporteur: Dr. Li Zhang, Germany

Report: Dr. Li Zhang, Germany

This session consisted of five presentations on reference frames in different countries (Japan, New Zealand, USA and Turkey); two of them were given by Com 5 WG chairs.



Mr. Basara Miyahara introduced the geodetic reference frame in Japan which is basic infrastructure for the precise GNSS positioning. Mr. Graeme Blick and Dr. Dan Roman (Com 5 WG5.3 chair) introduced the new reference system NZVD 2016 (New Zealand Vertical Datum 2016) and the forthcoming United States NSRS 2022 (National Spatial Reference System 2022) and its challenges. Mr. Nic Donnelly (Com 5 WG5.2 chair) gave a presentation about a single adjustment of all the geodetic observations in New Zealand with the free-available software SNAP (Survey Network Adjustment Package). Ms. Irem Yakar reported on the results of height system modernization and geoid modelling studies in Turkey. This session was well-attended, with up to about 100 attendees.



### **TS08E: Modern Surveying Techniques and Applications**

Chair: Prof. Dr. Allison Kealy, Australia

Rapporteur: Dr. Dan Roman, USA

Report: Prof. Dr. Allison Kealy, Australia

This session covered a diverse range of topics across Geodesy and Surveying. These included:

Boris Resnik: *Ultrasonic measurements on concrete foundations of modern wind energy plants.* Many wind turbines in Germany at the limit of their lifespan. Measurements between the wind turbine tower and foundation done using vertical lasers, accelerations or inclinometers. etc, Condition monitoring important to define exact statement on condition. Defects can be identified using ultrasonic measurements. Workflow developed here for generating a point cloud of conditions. Measurement methodology developed – more experiments required to validate and interpret the data correctly.

Alexander Prushakov: *Status and Prospect of Creation of the State GeoSpatial Data of the Russian Federation.* Collection and updating of spatial data by national agencies, use by private and public sectors through market mechanisms. Changes in the use of spatial data from federal bodies to business structures between 2014-2017. Information infrastructure direction part of the digital economy program to collect and update spatial data consistent with diverse user needs. Geodesy a strategic priority. Spatial data tools and unified cartographic approaches also a strategic priority.

Adin Lee: *Mobile Mapping System for Cadastral Surveying.* Challenges of cadastral surveying in China include, the environment, efficiency, accuracy, 3D laser scanning approach to these challenges. Workflow developed; scene investigation, fieldwork collection using a motorbike, point cloud generated, draw lines from point cloud. Efficiency analysis shows improvements with new technique 2-4 times. Reduction in fieldwork and cost. Can be applied to a range of other applications including digital transportation, city management etc.

Rob Sarib: *The social, technical, environmental and economic benefits and opportunities of accessing and sharing geodetic data.* Message -- Sharing and exchanging geodetic data is one pathway to a modernized geodetic reference frame (geodetic sharing policy), Surveyors need to have the competency and capability to contribute to a geospatial reference system policy.

Bashkim Idrizi: *Study of length differences from topography for map projection within the state coordinate system for some countries on the Balkan Peninsular.*

Reductions/projections between Earth surface, geoid, ellipsoid and map projection. Validate methodology for most appropriate state map projection. Criteria for appropriateness of official state coordinate system defined. Distortions of the map projection cannot be considered as main criteria (too large) for appropriateness. 5 different length differences computed. Length differences computed within the state coordinates for seven countries across the region.



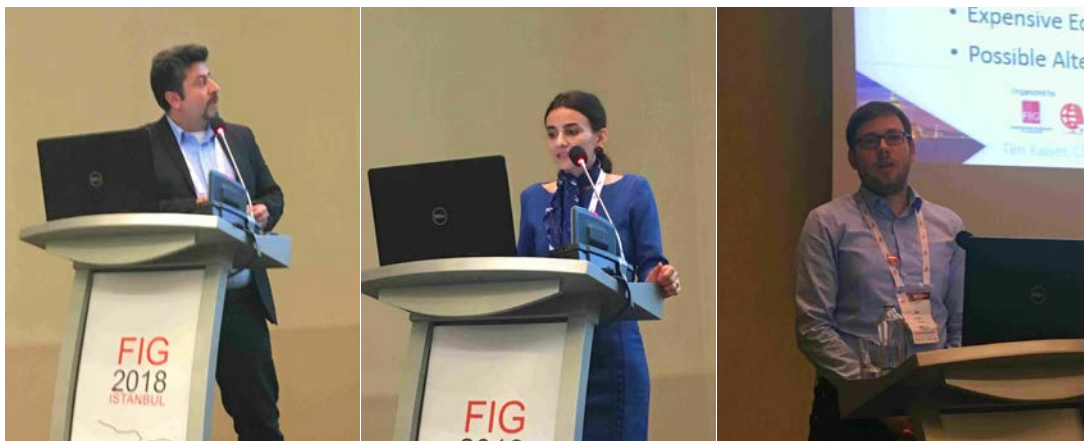
#### **TS09E: Geodetic Algorithms**

Chair: Dr. Leonid A. Lipatnikov, Russia

Rapporteur: Ms. Emel Zeray Öztürk, Turkey

Report: Dr. Leonid A. Lipatnikov, Russia

Development of new algorithms is one of the main ways of geodetic technology evolution. This important, diverse and roomy sphere of activity was covered by the session. Algorithms and their application in different disciplines of geodesy were discussed during the session: from 3D point cloud approximation and coordinate transformation to estimation of temporal mass variations using satellite gravity mission data. Among the presentations that attracted major interest of the audience there was one devoted to the quantitative evaluation of structure from motion software for the 3D-reconstruction of traffic accidents.



#### **TS10E: Geodetic Risk Monitoring**

Chair: Mr. Nic Donnelly, New Zealand

Rapporteur: Ms. Ceren Yagci, Turkey

Report: Mr. Nic Donnelly, New Zealand

This session featured six presentations from Turkey, New Zealand, Nepal, Republic of Korea and Malaysia. The highlight of the session was the presentation

of the NavXperience award to Wan Anom Wan Aris, of Malaysia, for the best positioning and measurement paper. In her presentation, she explained how secular, coseismic and post-seismic deformation in Malaysia is modelled to support a dynamic reference frame.



Other topics covered included the Nepalese semi-dynamic datum, earthquake deformation in Turkey, South Pacific deformation modelling and efficient surveying methods for recovery after natural disasters. The session was well-attended, with good audience engagement, although time constraints meant there was little time available for discussions.



*NavXperience Awards (Volker Schwieger, Wan Anom Wan Aris, Dirk Kowalewski)*

## **TS11E: Terrestrial Laser Scanning (Commission 5 and 6 Joint Session)**

Chair: Dr. David Martin, France

Rapporteur: Mr. Erol Uysal, Turkey

Report: Dr. David Martin, France

The first presentation given by Andreas Wieser entitled Fusion of Laser Scanning and Photogrammetric Data for the Documentation and VR Visualization of an Archaeological Tomb Complex discussed the combined use of photogrammetry and TLS in a tomb complex in Egypt. The aim was to create a high-resolution model of the complex.

The second presentation given by John Laurent and entitled High Resolution Multi-Lane Road Surface Mapping Using 3D Laser Profilers discussed high resolution/precision measurement of the shape of the road surface in order to evaluate its condition (i.e. cracks, bumps etc...) using 3D laser sensors. This was my personal favourite in this session.

The third paper entitled Application of Terrestrial Lidar for 3D Modelling of the Bulgarian Antarctic Station "st. Kliment Ohridski" and presented by Adil Arslan was a very interesting discussion on two subjects: characterising the movement fracturing of the adjacent Ice Pack and modelling the icons at the station chapel. This was also a fascinating presentation.



The final paper Combination of 3D Terrestrial Laser Scanning and GNSS Technologies for Measurement of hard /Impossible/ to Access Objects of Cadastre in the Process of data Acquisition for the Required Update of the Cadastral plan given by Gintcho Kostov.

For more information about all the technical sessions, please refer to website - [http://www.fig.net/resources/proceedings/fig\\_proceedings/fig2018/techprog.htm](http://www.fig.net/resources/proceedings/fig_proceedings/fig2018/techprog.htm) to review the all the presentations and technical papers as well as the reports of the task forces.



## Commission 5 Steering Committee Meetings

Two steering committee meetings were held to discuss the technical seminar and to do the last preparations for the technical sessions and the opening meeting. The first one was directly after the technical seminar on the reference frame on 6 May in the afternoon after the first General Assembly, and the second was on 11 May in the morning in the Congress Centre. The plans of Commission 5 for the next period were discussed. A study group for diversity and equity will be built up within Com 5. A summary of the discussions from the steering committee meeting can be found in the respective minutes, and are available via the web location –

[http://www.fig.net/organisation/comm/5/activities/steering\\_committee/2018\\_steering\\_meeting.pdf](http://www.fig.net/organisation/comm/5/activities/steering_committee/2018_steering_meeting.pdf).

## General Assembly

The FIG General Assemblies (GAs) were held on two days, before and after the technical program. The main outcomes or highlights from the GAs were –

- **Election of new President and two Vice Presidents**

The FIG President and two Vice Presidents were elected:

President:

- Rudolf Staiger, DVW, Germany

Vice Presidents:

- Diane Dumashie, RICS, UK
- Jixian Zhang, CSSMG, China



The incoming Council from left: President Elect Rudolf Staiger, Vice President elect Jixian Zhang, FIG President Chryssy Potsiou, VP Orhan Ercan VP - and Vice President elect Diane Dumashie and VP Mikael Lilje

- **Election of new commission chairs**

8 commission chairs were elected at the General Assembly and one was appointed (commission 2) by the FIG Council, because there were no candidates at the deadline of the call for nominees. The commission 4 chair is vacant at the moment and will be appointed by the FIG council. The new commission chairs for the period 2019-2022 are:



- Commission 1: Winnie Shiu (CSSMG, China)
- Commission 2: David Mitchell (SSSI Australia, appointed)
- Commission 3: Hartmut Müller (DVW, Germany)
- Commission 4: vacant (FIG Council will appoint)
- Commission 5: Dan Roman (NSPS, USA)
- Commission 6: Maria João Henriques (OE-CEG, Portugal)
- Commission 7: Daniel Paez (CSS, Columbia)
- Commission 8: Marije Louwsma (GIN, the Netherlands)
- Commission 9: Ben Elder (RICS, UK)
- Commission 10: Alan Muse (RICS, UK)



The incoming commission chairs from left: Winnie Shiu (com1), David Mitchell (com2), Hartmut Müller (com3), Dan Roman (com 5), Maria João Henriques (com6), Marije Louwsma (com8), Melissa Harrington (Young Surveyors), Ben Elder (com9), Diane Dumashie (council representative to the Commission chairs).

- Regarding the hosting of FIG Congress 2022. It was a close run, and the persons behind both bids: Orlando, Florida and Cape Town, South Africa. Finally it was decided by the General Assembly that the Congress 2022 will take place in Cape Town, South Africa.



The local organising committee 2022 - Cape Town South Africa

For more details about the General Assemblies, please refer to the FIG website.  
 Web location – [http://fig.net/news/news\\_2018/05\\_ga\\_minutes.asp](http://fig.net/news/news_2018/05_ga_minutes.asp).

## Social Activities

There were several social events organized for the delegates.

Besides the Welcome Reception, Opening Ceremony, Foundation Dinner, Gala Dinner (<http://www.fig.net/fig2018/socialevents.htm>) which were organized for all participants, the traditional **Commission 4, 5, 6 Dinner** was organized by Commission 5 with the support of the local organizer and held in Develi Nişantaşı on 8 May at 7:30 pm. It was a perfect occasion to get to know many experts and share knowledge and discuss with them in a very pleasant atmosphere.





## Upcoming events

**REFAG (IAG Commission 1) with COSPAR 2018, 14-22 July, Pasadena, California, USA**

Web: <http://cospar2018.org/>

**MCG (Machine Control & Guidance), 01-02 October 2018, Berlin, Germany**

Web: <https://www.mcg2018.tu-berlin.de/home/>

**Intergeo, 16-18 October 2018, Frankfurt, Germany**

Web: <http://www.intergeo.de/>

**Multi-GNSS-Asia, 23-25 October 2018, Melbourne, Australia**

Web: <https://2018.mgaconference.com.au/>

**GEOPREVI, Joint Seminar of FIG Commission 5, 6 and 10, 29-30 October 2018, Bucharest, Romania**

Web <https://geoprevi.xyz/>

*The organizing committee will support young surveyors from Romania and abroad.*

- **Young surveyors from outside Romania** that will submit an article and give a presentation can be **granted by maximum 400 €** to support travelling, accommodation and registration fee. If you are interested please send your application including a CV, the title and the abstract of the presentation as well as a motivation letter to Volker Schwieger [volker.schwieger@iigs.uni-stuttgart.de](mailto:volker.schwieger@iigs.uni-stuttgart.de) and Li Zhang [li.zhang@iigs.uni-stuttgart.de](mailto:li.zhang@iigs.uni-stuttgart.de). Additionally you have to register at the mentioned website. We will award minimum two grants.
- **Romanian young surveyors** that will submit an article and give a presentation will be **granted for the registration fee** of 30 € on-site. Please apply by sending a CV, the title and the abstract of the presentation to Ana Cornelia Badea [anacorneliabadea@gmail.com](mailto:anacorneliabadea@gmail.com) and Aurel Negrilă [negrilaa@yahoo.co.uk](mailto:negrilaa@yahoo.co.uk). We will award up to fifteen grants.

**FIG Working Week 2019, 22-26 April 2019, Hanoi, Vietnam**

Web <http://www.fig.net/fig2019/>

**IUGG General Assembly, 8-18 July, 2019, Montreal, Canada**

Web <http://iugg2019montreal.com/>

## 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.

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 the Vice Chair of Administration – Li Zhang [li.zhang@iigs.uni-stuttgart.de](mailto:li.zhang@iigs.uni-stuttgart.de).

All responses should include a one or two paragraph biography of your professional career to date.

There is also another way to assist Commission 5 with its 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 it already has a National Delegate for Commission 5 and if it has been officially listed on our website, location <http://www.fig.net/organisation/comm/5/delegates/index.asp>.

Briefly, the role of National Commission Delegates 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 is looking forward to your response. Please do not hesitate to ask any questions or contact us 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 of Administration – Li Zhang [li.zhang@iigs.uni-stuttgart.de](mailto:li.zhang@iigs.uni-stuttgart.de) or
- Chair of Commission 5 - Volker Schwieger [volker.schwieger@iigs.uni-stuttgart.de](mailto:volker.schwieger@iigs.uni-stuttgart.de)

More Information can be found on

Web: <http://www.fig.net/organisation/comm/5/>