

# Welcome to the Commission 5 Open Meeting



FIG  
2018  
ISTANBUL

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



1984



FIG



# Outline

- Welcome
- FIG
- UN resolution on *Global Geodetic Reference Frame*
- FIG Commission 5 2015-18
- Technical programme in Istanbul
- Coming events
- Open discussion



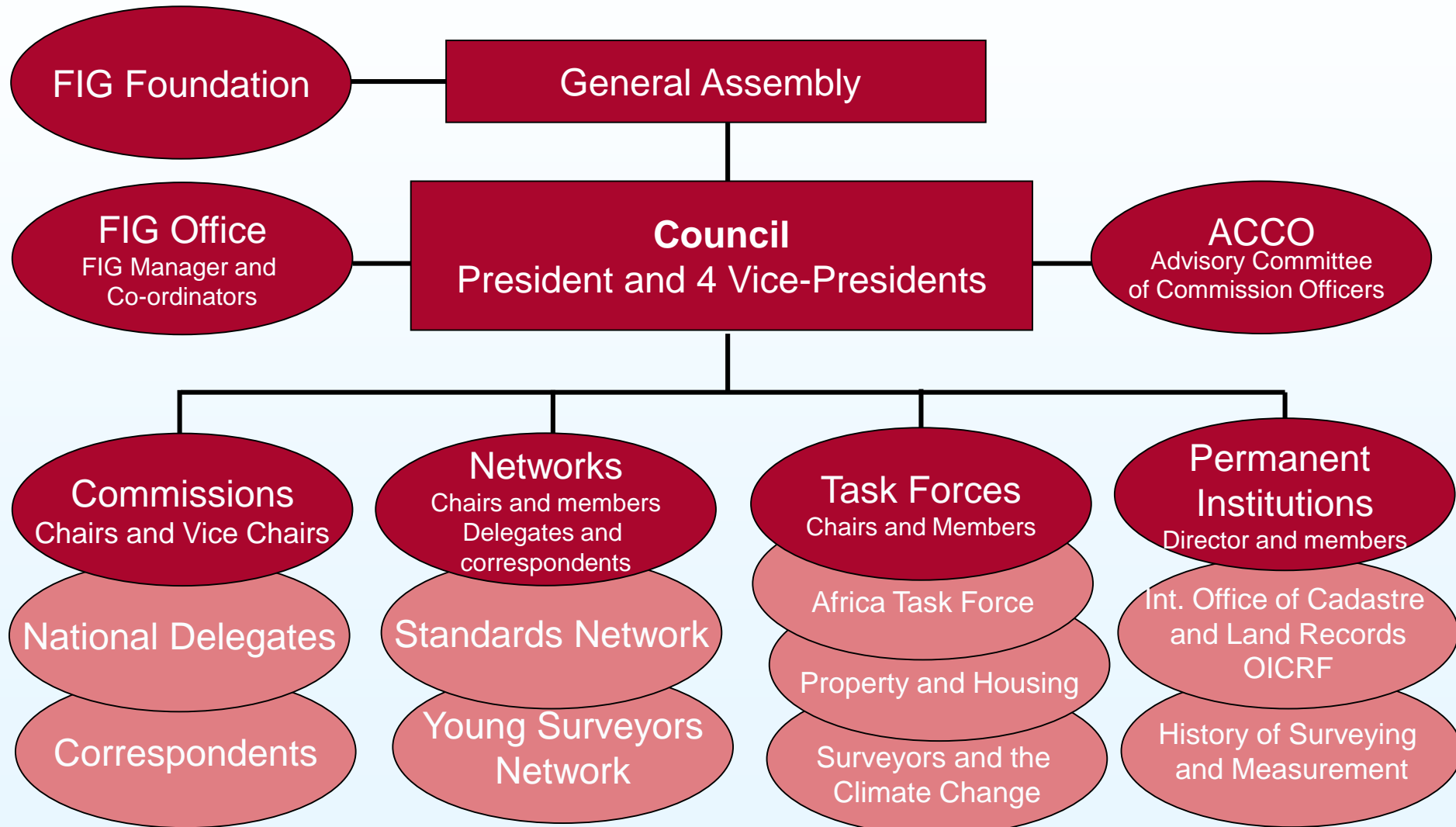
International Federation of Surveyors  
Fédération Internationale des Géomètres  
International Vereinigung der Vermessungsingenieure

## What is FIG?

- Established in 1878 in Paris by 7 member associations (Belgium, France, Germany, Italy, Spain, Switzerland and UK)
- Federation of national associations
- Only international body representing all surveying disciplines
- UN-recognised non-governmental organisation (NGO)



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





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

## FIG Council



From left: Vice President Prof. Dr. Rudolf Staiger, Germany, Vice President Mikael Lilje, Sweden, President Dr. Chryssy Potsiou, Greece, Vice President Orhan Ercan, Turkey and Vice President Diane Dumashie, United Kingdom



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

## FIG Office and administration



Complex housing the FIG Office, Copenhagen



Louise Friis-Hansen  
FIG Manager



Claudia Stormoen Pedersen  
Office and Events  
Coordinator



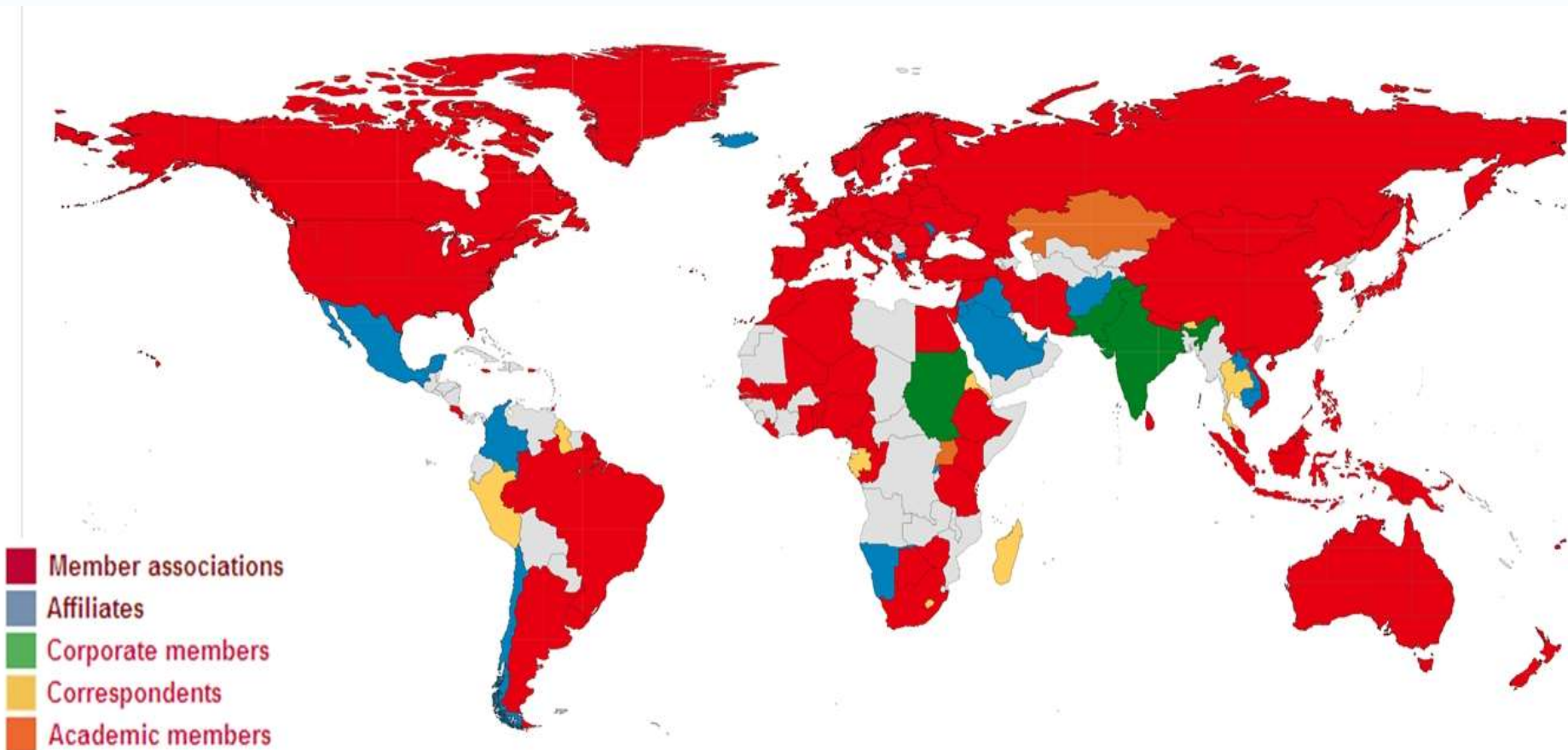
Maria Bargholz  
Book keeper



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

# Members

- **121 countries represented in 2015 – more than 300,000 individuals**





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

---

## Members

Membership categories:

- 101 member associations from 88 countries
- 45 affiliate members from 43 countries
- 92 academic members from 58 countries
- 25 corporate members
  
- 1 correspondents
- 6 honorary presidents
- 32 honorary members





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

# **FIG Foundation**

## **Building a Sustainable Future**



Provides grants and scholarships, promoting high standards of surveying education, encouraging research activities and promoting the exchange of young surveying personnel.

# FIG Commissions

- Com 1: Professional Standards and Practice
- Com 2: Professional Education
- Com 3: Spatial Information Management
- Com 4: Hydrography
- **Com 5: Positioning and Measurement**
- Com 6: Engineering Surveys
- Com 7: Cadastre and Land Management
- Com 8: Spatial Planning and Development
- Com 9: Valuation and the Management of Real Estate
- Com 10: Construction Economics and Management



# FIG International Cooperation

## With **United Nations agencies**

e.g. UN Office for Outer Space Affairs (UN OOSA);

*in particular the ICG – International Committee on GNSS  
and UN Global Geospatial Information Management (UN GGIM)*

*in particular UN GGIM AP Working Group 1 (Geodetic  
Reference Framework for Sustainable Development)*

## With **international professional organisations** in surveying disciplines as:

International Association of Geodesy (IAG);

International Society for Photogrammetry and Remote  
Sensing (ISPRS) and

The Institution of Navigation (ION)

# FIG Commission 5 2015-18

Mission statement - The five "F";

- **F**ocus on modern technologies, technical development and assist surveyors through guidelines and recommendations
- **F**acilitate and follow technical development through collaboration with other commissions and other international organisations
- **F**oster and support research and development and stimulate new ideas.
- **F**ormulate and formalise collaboration with manufacturers on the improvement on instruments and associated software
- **F**IG Events – use these to present and promote the work of the Commission and its working groups



# FIG Commission 5

## - Positioning and Measurement



**2015-2018**

Chair: **Volker Schwieger**, Germany

Vice-Chair of Administration: **Li Zhang**, Germany

WG 5.1: Standards, Quality Assurance and Calibration  
(David Martin, France)

WG 5.2: 3D Reference Frames (Nic Donnelly, New Zealand)

WG 5.3: Vertical Reference Frames (Kevin Kelly, USA / Dan Roman, USA)

WG 5.4: GNSS (Suelynn Choy, Australia)

WG 5.5: Multi-Sensor-Systems (Allison Kealy, Australia /  
Guenther Retscher, Austria / Joint with IAG /Com. 6)

WG 5.6: Cost Effective Positioning (Leonid A. Lipatnikov, Russia)

# Working Group 5.1 - Standards, Quality Assurance and Calibration



- Examine and review the relevant standards, quality assurance, best practice, testing and calibration aspects of surveying.
- Present and promote the use of positioning and measurement standards and guidelines to the surveying profession.
- Provide an interface to the technical committees (TCs) within the International Standards Organization (ISO)
  - ISO TC 211 – Geographic Information / Geomatics,
  - TC 172 SC6 – Geodetic and Surveying Instruments
  - Guide to Uncertainty in Measurement (GUM) and its supplements

# Working Group 5.1 - Standards, Quality Assurance and Calibration



- Special Session on ISO TC211 at a FIG Working Week
- Assist other Commission Working Groups to implement Standards from TC 172/SC 6 and ISO TC211 as appropriate
- Publication regarding the implementation of the “Guide for the expression of uncertainty in measurements” (GUM) for surveying
  - Draft publications will be presented at FIG Working Weeks during the term of this plan
  - Working group final report and outcomes will be presented at dedicated session, FIG Congress, 2018.



# Working Group 5.2 - 3D Reference Frames



## Introduction

- Chaired by Nic Donnelly from New Zealand
- Focus on geometric reference frames
- Practical focus on implementation and use of reference frames, particularly as it applies for surveyors
- Close links with IAG Commission 1 – Reference Frames
- Subject matter
  - Global, regional and local reference frames
  - Practical implementation of deformation models
  - Connections to reference frames

# Working Group 5.2 - 3D Reference Frames



## Work Focus

- Capacity building
  - Workshops, seminars and technical sessions
- Reference Frames in Practice Workshops
  - Singapore, July 2015, vertical reference frames
  - Christchurch, May 2016, kinematic reference frames and deformation
  - Istanbul, May 2018, kinematic reference frames and deformation



# Working Group 5.3 - Vertical Reference Frames



## WG 5.3: Vertical Reference Frames (VRF)

### Chair of Working Group 5.3

Mr. Kevin M. Kelly  
Esri Inc.  
380 New York Street  
Redlands CA 92373  
USA  
Tel. +1-909.793.2853, ext. 1162  
E-mail: [kevin\\_kelly@esri.com](mailto:kevin_kelly@esri.com)

### Co-Chair of Working Group 5.3

Dr. Dan Roman  
NOAA National Geodetic Survey  
National Oceanic & Atmospheric  
Administration  
1315 East-West Highway  
Silver Spring, MD 20910  
USA  
Tel.: +1-301-713-3202 ext. 161  
E-mail: [dan.roman@noaa.gov](mailto:dan.roman@noaa.gov)

# Working Group 5.3 - Vertical Reference Frames

- **Education on global vertical reference frames and height systems**

- practical aspects
- implementation of new geopotential datums
- access using geoid height models and a geometric datum
- redefining heights on existing bench marks to serve as secondary control
- ties between height systems and local and global mean sea level
- Liaise with IAG, UN-GGIM, ISO TC 211 and others

# Working Group 5.3 - Vertical Reference Frames



- **Work Plan**

- National height system inventory
- VRF workshops and paper sessions
  - VRF Workshop at SEASC 2015 in Singapore
- Review paper on VRF and height systems
- Practical implementation of VRF
- VRF in Practice monograph
  - Similar to RFIP publication

# Working Group 5.4 - GNSS



## Goals

- Promote innovative GNSS positioning techniques, products and services
- Review of web-based automated positioning services
- Explore research and applications using real time networks
- Collaborate with the International Committee on Global Navigation Satellite Systems (ICG), Multi-GNSS Asia (MGA) and IAG WG4.5.2 Precise Point Positioning and Network-RTK

## Workshops

- Develop and present seminars on reference frames, GNSS, and innovative positioning applications
- Develop special sessions at FIG Working Weeks and Conferences

## FIG Publications

- Precise Point Positioning
- GNSS Advancements



# Working Group 5.5 / IAG - Multi-Sensor-Systems



- **This group is a joint working group between FIG and IAG. It focuses on the development of shared resources that extend our understanding of the theory, tools and technologies applicable to the development of multi sensor systems. It has a major focus on;**
- Performance characterization of positioning sensors and technologies that can play a role in augmenting core GNSS capabilities
- Theoretical and practical evaluation of current algorithms for measurement integration within multi sensor systems.
- The development of new measurement integration algorithms based around innovative modeling techniques in other research domains such as machine learning and genetic algorithms, spatial cognition etc.
- Establishing links between the outcomes of this WG and other IAG and FIG WGs (across the whole period)
- Generating formal parameters that describe the performance of current and emerging positioning technologies that can inform FIG and IAG members.

# Working Group 5.5 / IAG - Multi-Sensor-Systems



- **Specific project(s)**
- International field experiments and workshops on a range of multi sensor systems and technologies.
- Evaluation of UAV capabilities and the increasing role of multi-sensor systems in UAV navigation.
- Investigate the role of vision based measurements in improving the navigation performance of multi sensor systems.
- Development of shared resources to encourage rapid research and advancements internationally.
- **Workshops**
- Special Sessions at Working Weeks and Supporting Special international conferences and symposia including: Mobile Mapping Symposium, ION GNSS, IGNSS Australia, IPIN, etc.
- **Publications**
- A Special Issue of the journal Sensors "Inertial Sensors for Positioning and Navigation" Editors Kealy, Retscher, Trommer.



# Working Group 5.6 - Cost-Effective Positioning



## **Policy issues**

- ⇒ Educate FIG member associations and individual surveyors on when to use which surveying instrument or software taking into account economic reasons
- ⇒ Design fit-for-purpose cost-effective surveying systems
- ⇒ Support decision makers for establishing cost-effective positioning solutions

## **Chair**

- ⇒ Leonid A. Lipatnikov (Russia) e-mail: [l.lipatnikov@ssga.ru](mailto:l.lipatnikov@ssga.ru)

## **Specific project(s)**

- ⇒ Development of guidelines for cost-effective use and design of survey solutions including costs for labour and investment

# Working Group 5.6 - Cost-Effective Positioning



## **Workshops**

⇒ FIG workshop with Commissions 3 and 7

## **Publications**

⇒ FIG Publication on cost-effective surveying techniques

## **Timetable**

⇒ Working group final report and outcomes will be presented at dedicated session, FIG Congress, 2018.

## **Beneficiaries**

⇒ FIG member associations, academic and research institutions, spatial data acquisition specialists, GIS developers and users, surveying businesses, individual surveyors mainly dedicated to developing countries.

# Technical Program in Istanbul

7 May - Monday	8 May - Tuesday	9 May - Wednesday	10 May - Thursday
Registration	Registration	Registration	
			Acco Meeting, Volker Schwieger and Dan Roman (08:00-09:00)
Opening Ceremony	Plenary Session 2	Plenary Session 3	Plenary Session 4
Tea/Coffee Break, Opening of exhibition	Tea/Coffee Break	Tea/Coffee Break	Tea/Coffee Break
Plenary Session 1	TS03E: Multi-GNSS ÜSKÜDAR HALL 1 Prof. Dr. Suelynn Choy, Australian [C] Mr. Bilgehan Makineci, Turkey [R]	TS06E: Gravity and Geoid ÜSKÜDAR HALL 1 Dr. Dan Roman, USA [C] Mr. Erol Uysal, Turkey [R]	TS09E: Geodetic Algorithms ÜSKÜDAR HALL 1 Dr. Leonid A. Lipatnikov, Russia [C] Ms. Emel Zeray Öztürk, Turkey [R]
Lunch	Lunch	Lunch	Lunch
TS01E: GNSS - CORS ÜSKÜDAR HALL 1 Prof. Dr. Muzaffer Kahveci, Turkey [C] Dr. Li Zhang, Germany [R]	TS04E: GNSS PPP and Networks ÜSKÜDAR HALL 1 Prof. Dr. I. Oztug Bildirici, Turkey [C] Dr. Leonid A. Lipatnikov, Russia [R]	TS07E: Reference Frames ÜSKÜDAR HALL 1 Prof. Dr. Muzaffer Kahveci, Turkey [C] Dr. Li Zhang, Germany [R]	TS10E: Geodetic Risk Monitoring ÜSKÜDAR HALL 1 Mr. Nic Donnelly, New Zealand [C] Ms. Ceren Yagci, Turkey [R]
Tea/Coffee Break	Tea/Coffee Break	Tea/Coffee Break	Tea/Coffee Break
TS02E: GNSS Measurements Technique ÜSKÜDAR HALL 1 Prof. Dr. Mualla Yalcinkaya, Turkey [C] Prof. Dr. Suelynn Choy, Australian [R]	TS05E: Future of Positioning (FORUM comm 5) ÜSKÜDAR HALL 1 Mr. Mikael Lilje, Sweden [C] Dr. Yasemin Sisman, Turkey [R]	TS08E: Modern Surveying Techniques and Applications ÜSKÜDAR HALL 1 Prof. Dr. Allison Kealy, Australian [C] Dr. Dan Roman, USA [R]	TS11E: TLS - Terrestrial Laser Scanning (Joint Com 5&6) ÜSKÜDAR HALL 1 Dr. David Martin, France [C] Mr. Erol Uysal, Turkey [R]

**Technical Seminar  
on Reference Frames (4-5 May,2018)**

**TECHNICAL SEMINAR ON REFERENCE  
FRAMES IN PRACTICE REFERENCE  
FRAMES, KINEMATICS AND  
DYNAMIC DATUMS**

Istanbul, Turkey 4-5 May 2018

**Venue:** ICC (Istanbul Congress Center), Istanbul

**PROGRAMME**

# **Technical Seminar on Reference Frames (4-5 May,2018)**

- **Jointly organized by FIG, IAG, UN-ICG, HKMO**
- **Sponsored by Trimble and Leica**
- **Technical Seminar on Reference Frames 2018**
- **4-5 May in Istanbul - Attended by 36 people from 22 countries**
- **Speakers from throughout the Asia-Pacific region, as well as Europe and North America**
- **Focus on deformation and kinematic reference frames, reflecting regional priorities**

# Technical Seminar on Reference Frames (4-5 May, 2018)

## **08:30 – 09:00 Welcome and Opening Remarks**

*Prof. Dr. Muzaffer Kahveci (Convenor)*

*Prof. Dr. Volker Schwieger (International Federation of Surveyors-FIG)*

*Ms. Sharafat Gadimova (International Committee on Global Navigation Satellite Systems-ICG)*

*Dr. Dan Roman (International Association of Geodesy-IAG)*

## **09:00 – 10:00 Session 1: Introduction to 3D/Vertical Reference Frames**

1) Introduction to 3D Reference Frames

*Mr. Nic Donnelly, Land Information New Zealand*

2) Introduction to Vertical Reference Frames and Datums

*Dr. Dan Roman, NOAA National Geodetic Survey National Oceanic & Atmospheric Administration*

## **10:30 – 11:30 Session 2: Kinematic Frames and Deformation Modelling**

3) Kinematic Frames and Deformation Modelling

*Dr. Chris Pearson, University of Otago*

4) Practical implementation of time-dependent reference frames

*Mr. Richard Stanaway, UNSW Sydney*

## **12:30 – 13:30 Session 3: Dynamic Datum and Modelling of Crustal Deformation**

5) Development of deformation models to support Dynamic and semi-dynamic Datums *Dr. Chris Pearson, University of Otago*

6) Crustal deformations in Fennoscandia, and Dynamic reference frames: case study Iceland

*Dr. Martin Lidberg, Lantmäteriet – the Swedish Mapping Cadastral and Land registration Authority*

# Technical Seminar on Reference Frames (4-5 May, 2018)

## **13:30 – 14:30 Session 4: Case Studies 1**

- 7) Case Study of Europe (ETRS89 and ERVS)

*Dr. Martin Lidberg, Lantmäteriet – the Swedish Mapping Cadastral and Land registration Authority*

- 8) Case study of USA

*Dr. Dan Roman, NOAA National Geodetic Survey National Oceanic & Atmospheric Administration*

## **15:00 – 16:00 Session 5: Case Studies 2**

- 9) Case Study of Russia

*Dr. Leonid Lipatnikov, Siberian State University of Geosystems and Technology*

- 10) Case study of New Zealand

*Mr. Graeme Blick, Land Information New Zealand*

## **16:00 – 17:30 Session 6: 3D&Vertical Control Networks and Earthquakes in Turkey**

- 11) Height Reference System Modernization in Turkey: Current Status and Future Plans

*Assoc. Prof. Dr. Hasan Yildiz, General Command of Mapping*

- 12) Semi-Dynamic Reference Frame Realization in Turkey: Towards an Improved Velocity Field Model

*Dr. Ali İhsan Kurt, General Command of Mapping*

- 13) Monitoring Seismo-geodetic Behaviour of Earth's Crust in Marmara Region: KandilliNet

*Prof. Dr. Haluk Ozener, Bogazici University, Kandilli Observatory and Earthquake Research Institute*

## **17:30 – 19:00 Session 7: International Geodesy Initiatives and Geodetic Infrastructure**

### **14) ICG at UN**

*Ms. Sharafat Gadimova, United Nations Office for Outer Space Affairs*

- 15) United Nations Global Geospatial Information Management (UN-GGIM)

*Dr. Dan Roman, NOAA National Geodetic Survey National Oceanic & Atmospheric Administration*

# Technical Seminar on Reference Frames (4-5 May, 2018)

## Saturday 5 May 2018

### 09:00 – 10:00 Session 8: GNSS and Geodetic Software

17) Introduction of RTK-LIB

*Mr. Ryan Ruddick, Geoscience Australia, Dr. Suelynn Choy, RMIT University*

18) Introduction to the SNAP least squares computation software

*Mr. Nic Donnelly, Land Information New Zealand*

## 10:00 – 10:30 Morning Tea

### 10:30 – 11:30 Software Demonstration

*Mr. Ryan Ruddick, Geoscience Australia, Dr. Suelynn Choy, RMIT University, Mr. Nic Donnelly, Land Information New Zealand*

### 11:30 Closing Remarks – FIG Commission 5, IAG

## 12:00 – 12:30 Lunch (Lunch Box)

Afternoon: Technical Tour in North Anatolian Fault Zone



# Technical Seminar on Reference Frames (1-2 May, 2018)



# Technical Seminar on Reference Frames (1-2 May, 2018)



# Technical Seminar on Reference Frames (1-2 May, 2018)



# Coming events

- REFAG (IAG Commission 1) with COSPAR 2018, 14-22 July, Pasadena, California, USA
- MCG (Machine Control & Guidance), 01-02 October 2018, Berlin, Germany
- Intergeo, 16-18 October 2018, Frankfurt
- Multi-GNSS-Asia, 23-25 Oktober 2018, Melbourne Australia
- GEOPREVI, Joint Seminar of FIG Commission 5, 6 and 10, 29-30 October 2018, Bucharest, Romania
- FIG Working Week 2019, 22-26 April 2019 Hanoi, Vietnam
- IUGG General Assembly, 8-18 July, 2019, Montreal, Canada
- FIG Congress 2020, 10-14 May 2020, Amsterdam, The Netherlands

# GEOPREVI, Joint Seminar of FIG Commission 5, 6 and 10



- **Geodesy for Smart Cities,**  
FIG Commission 5, 6 and 10 Symposium in Bucharest,  
Romania, 29-30 October



# GEOPREVI, Joint Seminar of FIG Commission 5, 6 and 10

The main topics of the symposium are the following:

## Positioning and Measurement - Commission 5

- Standards, Quality Assurance and Calibration
- 3D and Vertical Reference Frames
- GNSS
- Multi-Sensor-Systems
- Cost Effective Positioning

## Engineering Surveys - Commission 6

- Deformation Monitoring and Analysis
- Engineering Surveys for Buildings and Communication Infrastructure
- Sensor Fusion, Data Acquisition and Processing Techniques
- Wide Area Engineering Surveys for Monitoring and Environmental Monitoring Management
- Laser scanning applications, mobile Lidar and UAV applications

## Construction Economics and Management Commission - 10

- BIM - Building Information Modelling
- International Construction Measurement Standards

## GIS, Cartography and Cadastre

- GIS and Geo Data for Smart Cities
- Cartography and Visualization of Geo and Building Data
- Cadastre as a base for Smart Cities





# 10<sup>th</sup> Multi-GNSS Asia (MGA) Conference



RMIT University  
Melbourne, Australia  
**23-25 October 2018**

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



# Discussion