

# Quadrennial Report 2011–2014 of the International Association of Geodesy

*<http://www.iag-aig.org>*

## INTRODUCTION

The objective of the IAG is to study all geodetic problems related to Earth observation and global change. This includes the establishment of reference systems, determination of the Earth gravity field, monitoring Earth rotation, positioning of surface points, and studies of crustal deformation, mass transport and sea level changes. To accomplish the objectives, IAG is divided into four Commissions, fourteen Scientific Services, the Global Geodetic Observing System (GGOS), the Communication and Outreach Branch (COB), and the Inter-Commission Committee on Theory (ICCT). The administration is supervised by the Council and operated by the Bureau, the Executive Committee and the Office. The outreach is done by the COB. All these entities are in steady contact and inform about their activities through the IAG Newsletter and the bi-annual IAG Reports (Travaux de l'AIG).

## ADMINISTRATION

### IAG Council

The Council met twice during the IUGG General Assembly 2011 in Melbourne, Australia, and once at the IAG Scientific Assembly 2013 in Potsdam, Germany. The list of national correspondents forming the IAG Council was regularly updated in contact with the IUGG Secretary General. The Council was informed by e-mail about activities of the Bureau and the Executive Committee.

### IAG Executive Committee (EC)

The Executive Committee is composed by the IAG President, immediate Past-President, Vice-President, Secretary General, the four Commission Presidents, the Chairperson of GGOS, the President of the COB, three representatives of the Services, and two members at large. Seven EC meetings were held during the legislative period from 2011 to 2014: Melbourne, Australia, July 2011, San Francisco, CA/USA, December 2011, Singapore, August 2012, Vienna, Austria, April 2013, Potsdam, Germany, September 2013, Vienna, Austria, April 2014, and San Francisco, CA/USA, December 2014. The meeting summaries were published by e-mail in the IAG Newsletter in IAG's Journal of Geodesy (Springer-Verlag) and are available online in the IAG Homepage (<http://www.iag-aig.org>) and in the IAG Office Homepage (<http://iag.dgfi.badw.de>).

Main agenda items at the EC meetings were the regular reports of the Commissions, Services, GGOS, ICCT, COB, the Editor in Chief of the Journal of Geodesy, and the Editor of the IAG Symposia Series (both at Springer). They were followed by the discussion on specific scientific issues, changes in the structures of GGOS and Services, and IAG publications. Other important topics were the IAG Scientific Assembly 2013, the preparation of the IAG Symposia during the IUGG General Assembly 2015, the discussion of the bi-annual IAG Reports (Travaux de l'AIG), sponsoring of symposia, and the links to other organizations, e.g. FIG, GEO, JBGIS, IHO, ISO, and UNOOSA (see below).

### IAG Bureau

The IAG Bureau, consisting of the President, the Vice-President and the Secretary General, held monthly teleconferences and met regularly before each EC meeting. The President and Secretary General participated in the IUGG Executive Committee Meetings. The Bureau members represented IAG at various international scientific meetings and in several anniversaries, e.g. the 150<sup>th</sup> anniversary of the Swiss Geodetic Commission, Zürich, Switzerland, 10 June 2011, the 150<sup>th</sup> anniversary of the

Arc Measurement in the Kingdom of Saxony, Dresden, Germany, 1 June 2012, the 150<sup>th</sup> anniversary of the Central European Arc Measurement, Vienna Austria, 14 September 2012, the 150<sup>th</sup> anniversary of the Austrian Geodetic Commission, Vienna, Austria, 7 November 2013.

## **ACTIVITIES**

### **IAG Office**

The IAG Office assists the Secretary General in the administrative organization of all IAG business, meetings and events. This includes the budget management, the record keeping of the individual IAG membership, and the preparation and documentation of all Council and Executive Committee meetings with detailed minutes for the EC members and meeting summaries published in the IAG Newsletters and the IAG Homepage. Important activities were the preparation and execution of the IAG Scientific Assembly 2013 together with the celebration of the 150<sup>th</sup> IAG anniversary and the IAG symposia of the IUGG General Assembly 2015, the edition of the Geodesist's Handbook 2012 as the organisational guide of IAG with the complete description of the IAG structure (reports, terms of reference, documents), and the Mid-Term Reports 2011–2013 (Travaux de l'AIG Vol. 38). The accounting of the Journal of Geodesy and the IAG Symposia series, both published by Springer, were supervised. Travel grants for young scientists to participate in IAG sponsored symposia were handled.

### **Communication and Outreach Branch (COB)**

The task of the COB is the IAG public relation in particular by maintaining the IAG Homepage and publishing the monthly Newsletter online and in the Journal of Geodesy. It also keeps track of all IAG related events by the meetings calendar. The IAG newsletter is sent to all IAG Officers, individual members, the Presidents and Secretaries General of the IUGG Associations and liaison bodies. The COB prepared, printed and distributed a new IAG leaflet and a big IAG brochure and participated in the preparation of the Geodesist's Handbook 2012.

### **Commissions and Inter-Commission Committee**

The four IAG Commissions (Reference Frames, Gravity Field, Earth Rotation and Geodynamics, Positioning and Applications) and the Inter-Commission Committee on Theory established their structure and scientific programme for the period 2011 – 2015 (published in the Geodesists' Handbook 2012) and coordinated their implementation. They reported regularly to the EC and prepared the mid-term reports 2011 – 2013 for publication in the IAG Reports (Travaux de l'AIG). Each Commission maintained its individual Homepage and held several symposia, workshops and other meetings (see below). All of them organized a symposium at the IAG Scientific Assembly 2013.

### **Services**

There are fourteen IAG Services which may be split into three general fields: geometry (IERS, IDS, IGS, ILRS, and IVS), gravity (IGFS, ICGEM, IDEMS, IGeS, and BGI) and combination (IAS, BIPM, ICET, and PSMSL). All of them maintain their own Homepages and data servers and hold their administrative meetings (Directing Board or Governing Board, respectively). They published their structure and programme 2011 – 2015 in the Geodesists' Handbook 2012, and the progress reports 2011 – 2013 in the IAG Reports (Travaux de l'AIG). Most of the Services held international meetings (see below).

### **Global Geodetic Observing System (GGOS)**

The GGOS is IAG's observing system to monitor the geodetic and the global geodynamic properties of the Earth as a system. A complete new structure was set up during a retreat in 2011 and implemented in 2012. It includes a Consortium composed by representatives of the Commissions and

Services, the Coordinating Board as the decision-making body, the Executive Committee, and the Science Panel. The scientific work of GGOS is structured by Themes, Working Groups and Bureaus. The outreach is done by the GGOS Portal, Webpages ([www.ggos.org](http://www.ggos.org)), an exhibit booth, brochures and books. Several retreats were held in the following years for updating the structure.

### **Coordination with other organisations**

IAG maintains close cooperation with several organizations outside IUGG. There were frequent meetings with the Advisory Board on the Law of the Sea (ABLOS, together with IHO), Group on Earth Observation (GEO, with IAG as a participating organization), International Standards Organization (ISO, TC211 Geographic Information / Geomatics), Joint Board of Geospatial Information Societies (JBGIS), United Nations Offices for Outer Space Affairs (UN-OOSA, with participation in Space-based Information for Disaster Management and Emergency Response, UN-SPIDER, and International Committee on Global Navigation Satellite Systems, ICG), and the United Nations Global Geospatial Information Management (UN-GGIM).

### **Meetings**

Important meetings of IAG components and sponsored IAG meetings were in 2011 – 2014:

- 20th EVGA Meeting. & 12th VLBI Analysis Workshop, Bonn, Germany, March 29-31, 2011;
- 1st International Workshop “The Quality of Geodetic Observation and Monitoring Systems” (QuGOMS), Garching/Munich, Germany, 13-15 April 2011;
- Third Conference “Earth Observation for Global Changes (EOGC2011)”, Munich, Germany, 13-15 April 2011;
- 17th International Workshop on Laser Ranging and 23rd General Assembly of the International Laser Ranging Service (ILRS), Bad Kötzing, Germany, 15-20, May 2011;
- Sub-Commission 1.3a “EUREF” Symposium, Chisinau, Republic of Moldova, 25-28 May 2011;
- 2nd GIA Modeling Training School, Gävle, Sweden, 13-17 June 2011;
- Sub-Commission 1.3b “SIRGAS” General Meeting, Heredia, Costa Rica, 8-10 August 2011;
- International Workshop on GNSS Remote Sensing for Future Missions and Sciences, Shanghai, China, 7-9 August 2011;
- 3rd International Colloquium “Scientific and Fundamental Aspects of the Galileo Programme, Copenhagen, Denmark, 31 August – 2 September 2011;
- Internat. Symposium on Deformation Monitoring, Hong Kong, China, 2-4 November 2011.
- IGS Workshop on GNSS Biases, Bern, Switzerland, 18-19 January 2012;
- IVS VLBI2010 Workshop on Technical Specifications (TecSpec), Bad Kötzing/Wetzell, Germany, 1-2 March 2012;
- 7th IVS General Meeting "Launching the Next-Generation IVS Network", Madrid, Spain, 12-13 March 2012;
- Symposium and Workshop on PPP-RTK and Open Standards, Frankfurt am Main, Germany, 12-14 March 2012;
- IERS Global Geophysical Fluids Center (GGFC) Workshop, Vienna, Austria, 20 April 2012;
- EUREF 2012 Symposium, Saint Mandé, France, 6-8 June 2012;
- IGS Analysis Center Workshop, Olsztyn, Poland, 23-27 July 2012;
- IAG Symposium at the AOGS-AGU (WPGM) Joint Assembly, Singapore, Singapore, 13-17 August 2012;
- International Symposium on Space Geodesy and Earth System (SGES2012), Shanghai, China, 19-20 August 2012;
- WEGENER 2012 Symposium, Strasbourg, France, 17-20 September 2012;

- 17th International Symposium on Earth Tides and Earth Rotation (ETS 2012), Cairo, Egypt, 24-28 September 2012;
- 20 Years of Progress in Radar Altimetry, Venice, Italy, 24-29 September 2012;
- IDS Workshop, Venice, Italy, 25-26 September 2012;
- 7th IAG-IHO ABLOS Conference, Salle du Ponant, Monaco, 3-5 October 2012;
- European VLBI Network (EVN) Symposium, Bordeaux, France, 9-12 October 2012;
- Workshop on Reflectometry using GNSS and Other Signals, Prudue University, West Lafayette, IN, USA, 10-11 October 2012;
- International Symposium on Gravity, Geoid and Height Systems GGHS 2012, Venice, Italy, 10-12 October 2012;
- Sub-Commission 1.3b “SIRGAS” Meeting 2012, Concepción, Chile, 20-31 October 2012;
- International VLBI Technology Workshop, Westford, Massachusetts, USA, 22-24 October 2012;
- International Technical Laser Workshop “Satellite, Lunar, and Planetary Laser Ranging: Characterizing the Space Segment”, Frascati, Italy, 5-9 November 2012;
- 21st European VLBI for Geodesy and Astrometry Workshop, Helsinki, Finland, 6-8 March 2013;
- 17th Int. Symposium on Earth Tides “Understand the Earth”, Warsaw, Poland, 15-19 April 2013;
- Internat. Symposium on “Mobile Mapping Technology”, Tainan, Taiwan, 30 April – 2 May 2013;
- Seventh IVS Technical Operations Workshop, Westford, Massachusetts, USA, 6-9 May 2013;
- IERS Workshop on Local Ties and Co-locations, Paris, France, 21-22 May 2013;
- IAG Sub-Commission 1.3a “EUREF” Symposium 2013, Budapest, Hungary, 29-31 May 2013;
- International Symposium on “Reconciling Observations and Models of Elastic and Viscoelastic Deformation due to Ice Mass Change”, Ilulissat, Greenland, 30 May – 2 June 2013;
- GNSS Precise Point Positioning: Reaching Full Potential, Ottawa, Canada, 12-14 June 2013;
- VIII Hotine-Marussi Symposium, Rome, Italy, 17-21 June 2013;
- Int. Conference on “Earth Observations and Societal Impacts”, Tainan, Taiwan, 23-25, June 2013;
- International Symposium on Planetary Sciences (IAPS2013), Shanghai, China, 1-4, July 2013;
- IAG Scientific Assembly, Potsdam, Germany, 1-6 September 2013;
- 2nd Joint Int. Symposium on Deformation Monitoring, Nottingham, UK, 9-11 September 2013;
- IAG Third Symposium on “Terrestrial Gravimetry: Static and Mobile Measurements (TGSM-2013)”, St Petersburg, Russian Federation, 17-20 September 2013;
- Scientific Developments from Highly Accurate Space-Time Reference Systems, Observatoire de Paris, Paris, France, 16-18 September 2013;
- ITU/BIPM Workshop on “The Future of the International Time Scale”, Geneva, Switzerland, 19-20 September 2013;
- 2nd International VLBI Technology Workshop, Seogwipo, South Korea, 10-12 October 2013;
- IAG Subcommission 1.3b “SIRGAS” Symposium, Panama City, Panama, 24-26 October 2013;
- 18th International Workshop on Laser Ranging, Fujiyoshida, Japan, 9-15 November 2013;
- European VLBI Network Technical and Operations Group (EVN TOG) Meeting, Bad Kötzing, Germany, 23-24 January 2014;
- International VLBI Service for Geodesy and Astrometry (IVS) General Meeting, Shanghai, China, 2-7 March 2014;
- European Reference System (EUREF) Symposium, Vilnius, Lithuania, June 04-06, 2014;
- International GNSS Service (IGS) Workshop "Celebrating 20 Years of Service", Pasadena, CA, USA, 23-27 June 2014;
- 3rd International Gravity Field Service (IGFS) General Assembly, Shanghai, China, 30 June - 6 July 2014;
- International Symposium on Geodesy for Earthquake and Natural Hazards (GENAH 2014), Matsu-shima, Miyagi, Japan, 22-27 July 2014;

- 18th WEGENER General Assembly: Measuring and Modelling our Dynamic Planet, Leeds, UK, 1-4 September 2014;
- Journées 2014 "Systèmes de référence spatio-temporels", Pulkovo Observatory, St. Petersburg, Russia, 22-24 September 2014;
- 12th European VLBI Network (EVN) Symposium, Cagliari, Italy, 7-10 October 2014;
- Reference Frames for Applications in Geosciences (REFAG2014), Luxembourg, Luxembourg, 13-17 October 2014;
- International DORIS Service (IDS) Workshop, Konstanz, Germany, 27-28 October 2014;
- International Laser Ranging Service (ILRS) Technical Workshop, 27-31 October 2014, Greenbelt, MD, USA;
- Third International VLBI Technology Workshop, Groningen/Dwingeloo, The Netherlands, 10-13 November 2014;
- PECORA 19 Fall Meeting (ASPRS, IAG, ISPRS) "Sustaining Land Imaging: Unmanned Aircraft Systems (UAS) to Satellites", Denver, Colorado, USA, 17-20 November 2014;
- Sub-Commission 1.3b "SIRGAS" Symposium, La Paz, Bolivia, 24-26 November 2014;
- 11th International Symposium on Location-Based Services, Vienna, Austria, 26-28 November 2014.

The following IAG Schools were held 2011 – 2014:

- SIRGAS School "Geodetic Reference Systems", Heredia, Costa Rica, 3-5 August 2011;
- GNSS School, Hong Kong, China, 14-15 May 2012;
- Internat. Summer School "Space Geodesy & Earth System", Shanghai, China, 21-25 August 2012;
- SIRGAS School "Real Time GNSS Positioning", Concepción, Chile, Oct., 24-26, 2012;
- EGU-IVS Training School for the Next Generation Geodetic and Astrometric VLBI, Helsinki, Finland, 2-5 March 2013.
- 11th School of the International Geoid Service: Heights and Height Datum, Loja, Ecuador, 7-10 October 2013.
- SIRGAS School "Reference Systems, Crustal Deformation and Ionosphere Monitoring", Panama City, Panama, 21-23 October 2013.
- SIRGAS School "Vertical Reference Systems", La Paz, Bolivia, 20-22 November 2014.

## Publications

The Journal of Geodesy, the official IAG scientific periodical with an Editor in Chief approved by the IAG Executive Committee, was continuously published with monthly issues in Springer-Verlag. In the IAG Symposia proceedings Series, the following volumes were published in:

- 136: Geodesy for Planet Earth; Proceedings of the IAG Scientific Assembly 2009 (2012);
- 137: VII Hotine-Marussi Symposium on Mathematical Geodesy 2009 (2012);
- 138: Reference Frames for Applications in Geosciences; Symposium of Commission 1 (2013);
- 139: Earth on the Edge: Science for a sustainable Planet; Proceedings General Assembly 2011 (2014);
- 140: Quality of Geodetic Observation and Monitoring Systems Workshop 2011 (on-line 2014).

Reports of all IAG components were published in the Travaux de l'AIG Vol. 37 (2011) and 38 (2013).

## Awards, anniversaries, obituaries

The following medals and prizes have been awarded:

- Levallois Medal to Ruth Neilan, USA (2011);
- Bomford Prize to Johannes Boehm, Austria (2011);
- Young Author Award to Elizabeth Petrie, UK (2011);

- Young Author Award to Thomas Artz (2013);
- Young Author Award to Manuela Seitz (2013).
- 53 Travel Awards to young scientists for participation in 15 IAG sponsored symposia.

The following anniversaries were celebrated with IAG participation:

- 150<sup>th</sup> anniversary of the Swiss Geodetic Commission, Zürich, Switzerland, 10 June 2011;
- 150<sup>th</sup> anniversary of the Arc Measurement in the Saxony, Dresden, Germany, 1 June 2012;
- 150<sup>th</sup> anniversary of the Central European Arc Measurement, Vienna Austria, 14 September 2012;
- 150<sup>th</sup> anniversary of the Austrian Geodetic Commission, Vienna, Austria, 7 November 2013;

Obituaries were written for former IAG officers and outstanding geodesists who passed away:

- 2011: A. Bjerhammar, Sweden; I. Fejes; Hungary; A. Finkelstein, Russia, S. Henriksen, USA;
- 2012: K.-P. Schwarz;
- 2014: C. C. Tscherning.

Hermann Drewes, IAG Secretary General



Opening Session of the IAG Scientific Assembly on the occasion of the 150th Anniversary of IAG, Potsdam, Germany, 1-6 September 2013



IAG Presidents Gerhard Beutler (2003-2007), Wolfgang Torge (1991-1995), Ivan I. Mueller (1987-1991), Chris Rizos (2011-2015), Michael Sideris (2007-2011) and Secretaries General Hermann Drewes (2007-...) and Claude Boucher (1991-1995) at the IAG Scientific Assembly, Potsdam, Germany, 1-6 September 2013