IUGG
IAG AIG
International Association of Geodesy

Newsletter
March 2020

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Contents

The *IAG Newsletter* is under the editorial responsibility of the *Communication and Outreach Branch* (COB) of the IAG.

It is an open forum and contributors are welcome to send material (preferably in electronic form) to the IAG COB (newsletter@iag-aig.org). These contributions should complement information sent by IAG officials or by IAG symposia organizers (reports and announcements). The *IAG Newsletter* is published monthly. It is available in different formats from the IAG new internet site: http://www.iag-aig.org

Each *IAG Newsletter* includes several of the following topics:

I. news from the Bureau Members
II. general information
III. reports of IAG symposia
IV. reports by commissions, special commissions or study groups
V. symposia announcements
VI. book reviews
VII. fast bibliography

General Announcements

IAG Project – Novel Sensors and Quantum Technology for Geodesy (QuGe)

President: Jürgen Müller, Germany
Vice President: Marcelo Santos, Canada

Terms of Reference

The novel developments in quantum physics of the previous decade, including new technologies and related measurement concepts, will open up enhanced prospects for satellite geodesy, terrestrial gravity sensing and reference systems. In close collaboration between physics and geodesy, this new IAG project shall exploit the high potential of quantum technology and novel measurement concepts for various innovative applications in geodesy.

Climate change often is reflected in mass variations on Earth. And, many mass change processes in the hydrosphere, geosphere and atmosphere are widely imprinted in gravitational data. However, gravitational data with better spatial-temporal resolution and higher accuracy is required, which can only be achieved by employing innovative quantum technology concepts. Highly stable and accurate reference systems provide the fundamental backbone to monitor the change processes in the Earth system, where clocks will play a central role in the future. QuGe will serve as a unique platform for developing and evaluating those novel concepts and observation systems, where also further applications, like in exploration and navigation, may benefit. Technology development and space mission requirements have to be linked to geodetic and geophysical modelling in a synergetic way. Optical ranging between test masses in satellites, atom-interferometric accelerometry and gradiometry, and chronometric levelling with clocks are the needed approaches to overcome the problems of classical concepts in geodesy. With these novel techniques, mass variations on almost all spatial and temporal scales can be observed with unprecedented accuracy and will serve as input for a multitude of applications in geosciences, from the monitoring of smaller groundwater basins and geodynamic effects to the observation of the complex global mass transport processes in the oceans.

The combination of expertise from quantum physics and geodesy in QuGe, integrating engineering skills and fundamental research, serves as an excellent basis to advance the frontiers of gravimetric Earth observation and the realization of reference systems.

Objectives

QuGe will put its focus on three major pillars

1) Atom interferometry for gravimetry on ground and in space (quantum gravimetry) will allow for a comprehensive set of applications, such as fast local gravimetric surveys and exploration, or the observation of gravimetric Earth system processes with high spatial and temporal resolution. In space, atom interferometry will enable accelerometry and inertial sensing in a modernistic way. The use of atom interferometry in hybrid systems with electrostatic accelerometers may allow to cover a wide spectral range for future inertial sensing and navigation. It will benefit satellite navigation, but also serve as a basis for developing the next generation of gradiometer missions (GOCE follow-on).
2) Laser-interferometric ranging between test masses in space with nanometer accuracy belongs to these novel developments as well, where technology developed for gravitational wave detection and successfully tested in the LISA/pathfinder mission is being prepared for geodetic measurements. GRACE-FO already demonstrates this new development. Even more refined concepts, like tracking a swarm of satellites, might be realized within the next years. Optical techniques may also be applied for test mass sensing in future accelerometers, and even combined to next generation gradiometry in space.
3) Frequency comparisons of highly precise optical clocks connected by optical links give access to differences of the gravity potential over long distances (relativistic geodesy). In the future, relativistic geodesy with clocks will be applied for defining and realizing height systems in a new way, locally as well as globally. As further application, clock measurements will provide long-wavelength gravity field information. Moreover, accurate clocks help to improve the accuracy of the International Atomic Time standard TAI. They are important for all space geodetic techniques as well as for the realization of reference systems and their connections. Another application example is the possible use of high-performance clock networks to support GNSS.

In all three research areas, along with the research on measurement systems and techniques, the analysis models have to be put on a sound theoretical basis. This requires dedicated geodetic and relativistic modelling of the various involved gravity field quantities and measurement concepts.

Jürgen Müller

Meeting Announcements

EUREF 2020 Symposium

The EUREF 2020 Symposium will be held from *Wednesday, May 27th, 2020* to *Friday, May 29th, 2020* in Ljubljana, Slovenia. A half day tutorial will be held on *May 26th*.

EUREF is the IAG Reference Frame Sub-Commission for Europe, integrated in the Sub-Commission 1.3, Regional Reference Frames, under Commission 1 - Reference Frames, following the implementation of the new IAG structure at the IUGG (International Union of Geodesy and Geophysics) General Assembly held in Sapporo, 2003. The Sub-Commission EUREF was founded in 1987 at the IUGG General Assembly held in Vancouver. The EUREF Symposium has been organized every year since 1990 and is the forum where the EUREF activities are discussed.

Deadline for abstract submission is *April 20 2020*. The webpage of the Symposium is https://euref2020.si/.

The G-ET2020 meeting moved to the next year

Dear all colleagues,

Due to the present pneumonia epidemic situation in Wuhan, and after discussion with the chair of the Scientific Organizing Committee (Prof. Houze Xu, China), and the IAG officers of sub-commission 3.1 (Prof. Carla Braitenberg, Italy, Dr. Severine Rosat, France, and Prof. Janusz Bogusz, Poland), the Local Organizing Committee now announces the G-ET Symposium 2020 will be moved to the next year, i.e., 22–26 June, 2021 (Wuhan), one week before the IAG Scientific Assembly (28 June–3 July, 2021 Beijing). We apologize for any inconvenience for this change. Thanks a lot for your understanding. We look forward to meeting you in Wuhan next year.
The official website remains as http://get2020.csp.escience.cn/

Heping Sun, Wei Feng
Local Organizing Committee
20 Feb. 2020

Meetings Calendar

IAG Sponsored Meetings

11th IVS General Meeting

March 22 –28, 2020, Annapolis, MD, USA
URL: https://ivsgm2020.com/

EUREF 2020 Symposium

May 27 –29, 2020, Ljubljana, Slovenia
URL: https://euref2020.si/

IGS Workshop "IGS 2020: Science from Earth to Space"

August 10 –14, 2020, Boulder, CO, USA
URL: https://www.igscb.org/event/

43rd COSPAR Scientific Assembly

August 15 –22, 2020, Sydney, Australia
URL: http://www.cospar2020.org/

2nd International Symposium of Commission 4: Positioning and Applications

September 7 –11, 2020, Potsdam, Germany
URL: https://www.iag-aig.org/events/17

International Workshop on GNSS Ionosphere (IWGI2020)

October 19 –21, 2020, Shanghai, China
URL: http://202.127.29.4/geodesy/iwgi2020/index.html

International DORIS Service Workshop

October 19 –21, 2020, Venice, Italy
URL: http://ostst-altimetry-2020.com/home/

22nd International Workshop on Laser Ranging

November 2 – 6, 2020, Kunming, China
URL: https://ilrs.cddis.eosdis.nasa.gov/about/meetings.html

19th International Symposium on Geodynamics and Earth Tides (G-ET Symposium 2020)

June 22 –26, 2021, Wuhan, China
URL: http://get2020.csp.escience.cn/

IAG Scientific Assembly

June 28 – July 3, 2021, Beijing, China
URL: http://www.iugg.org/meetings/assemblies.php

IAG Related Meetings

3rd UN GGIM Subcommittee on Geodesy Plenary Meeting

April 20-22, 2020, Windsor, United Kingdom
URL: http://ggim.un.org/meetings/2020/6th_HLF

6th High Level Forum on UN GGIM

April 20-22, 2020, Windsor, United Kingdom
URL: http://ggim.un.org/meetings/2020/6th_HLF

EGU General Assembly 2020

May 3-8, 2020, Vienna, Austria
URL: https://egu2020.eu/

FIG Working Week 2020

May 10-14, 2020, Amsterdam, the Netherlands
URL: http://www.fig.net/fig2020/

AOGS2020 17th Annual Meeting

June 28 – July 4, 2020, Gangwon, South Korea
URL: http://www.asiaoceania.org/aogs2020/public.asp?page=home.html

International Symposium on Satellite Navigation (ISSN 2020)

October 21 – 24, 2020, Nanjing, China
URL: http://issn2020.csp.escience.cn/dct/page/1

22nd meeting of the Consultative Committee for Time and Frequency (CCTF)

October 26 –30, 2020, Sèvres, France
URL: https://www.iers.org/IERS/EN/NewsMeetings/ForthcomingMeetings/forthcoming.html