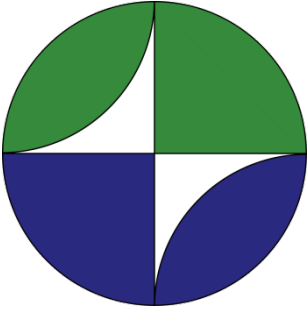


**INTERNATIONAL UNION OF GEODESY AND GEOPHYSICS**  
**UNION GEODESIQUE ET GEOPHYSIQUE INTERNATIONALE**

# **Annual Report 2018**



**INTERNATIONAL UNION OF GEODESY AND GEOPHYSICS**  
**UNION GEODESIQUE ET GEOPHYSIQUE INTERNATIONALE**

**Published by Secretary General**

**Alik Ismail-Zadeh**

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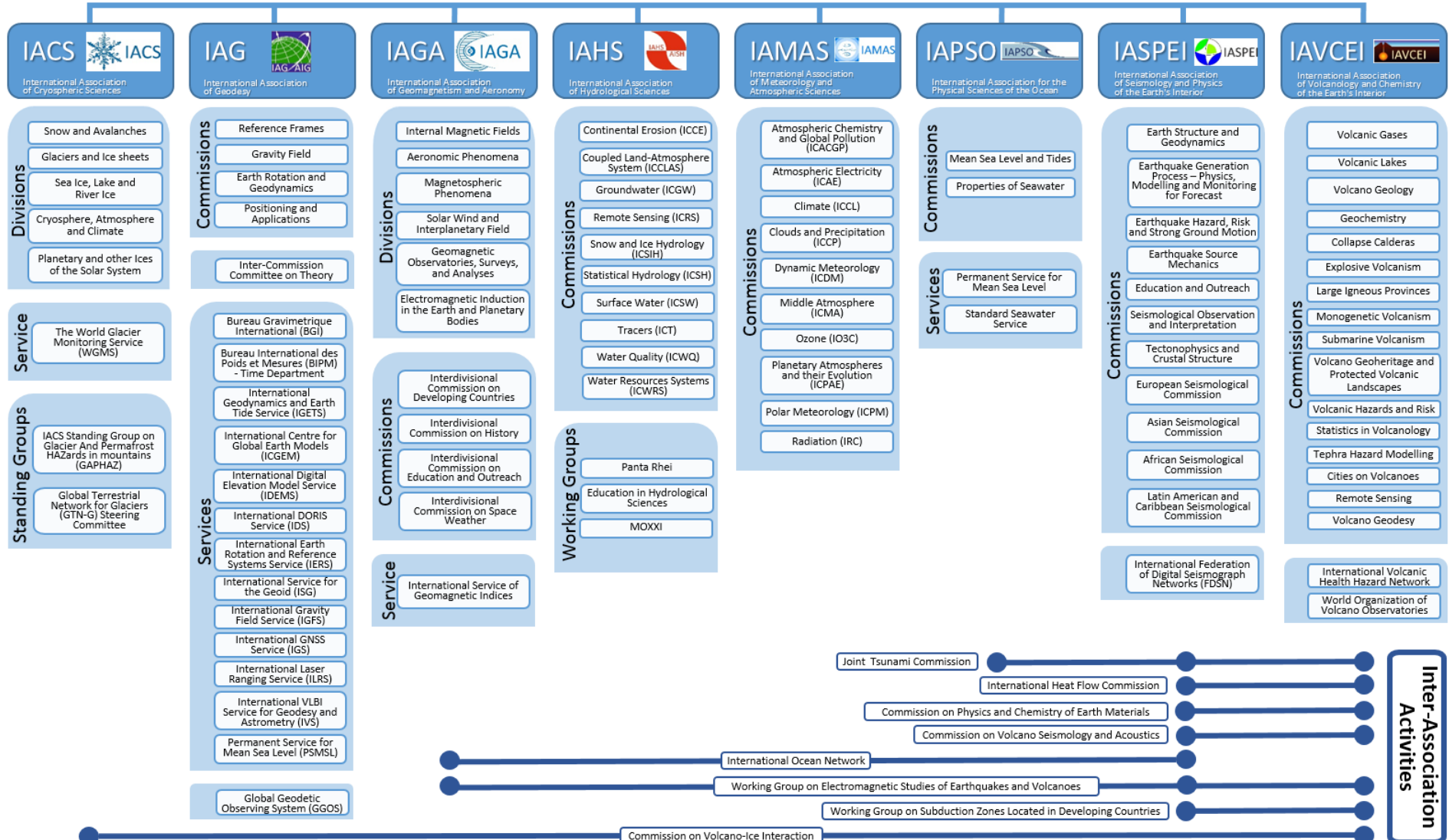
# INTRODUCTION

Established in 1919, the International Union of Geodesy and Geophysics (IUGG) is the international, non-governmental, non-profit organization dedicated to advancing, promoting, and communicating knowledge of the Earth system, its space environment, and the dynamical processes causing change. Through its constituent associations, commissions, and services, IUGG convenes international assemblies and workshops, undertakes research, assembles observations, gains insights, coordinates activities, liaises with other scientific bodies, plays an advocacy role, contributes to education, and works to expand capabilities and participation worldwide. Data, information, and knowledge gained are made openly available for the benefit of society – to provide the information necessary for the discovery and responsible use of natural resources, sustainable management of the environment, reducing the impact of natural hazards, and to satisfy our need to understand the Earth’s natural environment and the consequences of human activities. IUGG Associations and Union Commissions encourage scientific investigation of Earth science and especially interdisciplinary aspects. Each Association establishes working groups and commissions that can be accessed by using the links on our website (see also the IUGG chart on the following page).

IUGG is one of 40 scientific unions adhering to the International Science Council (ISC). ISC provides a global forum for scientists to exchange ideas and information and to develop standard methods and procedures for all fields of research. IUGG brings expertise on Earth studies from researchers in its International and Inter-Association Commissions. As a member of ISC, IUGG strongly supports its policy of non-discrimination by affirming the rights and freedom of scientists throughout the world to engage in international scientific activity without limitation by such factors as citizenship, religion, creed, political stance, ethnic origin, race, color, language, age or gender.

IUGG has initiated and/or vigorously supported collaborative efforts that have led to highly productive world-wide interdisciplinary programs and projects, such as the International Geophysical Year (1957-58), the Upper Mantle Project (1964-70), the International Hydrological Decade (1965-74), the Geodynamics Project (1972-79), the Global Atmospheric Research Program (1967-80), the International Lithosphere Program, the World Climate Research Programme, the International Decade for Natural Disaster Reduction, Integrated Research on Risk Disasters, the International Heliophysical Year (2007-2009), the Electronic Geophysical Year (2007-2008), the International Year of Planet Earth (2007-2009), the International Polar Year (2007-2008), Extreme Natural Hazards and Societal Implications (2010-2014), International Year of Deltas (2013-2014), and the International Geosphere-Biosphere Programme (1987-2015). These programs have set a model for international, interdisciplinary cooperation. Representing all geophysical disciplines, IUGG is involved in the projects and programs related to climate change, global warming, and related environmental impacts.

## Associations



## Union Commissions and Working Group

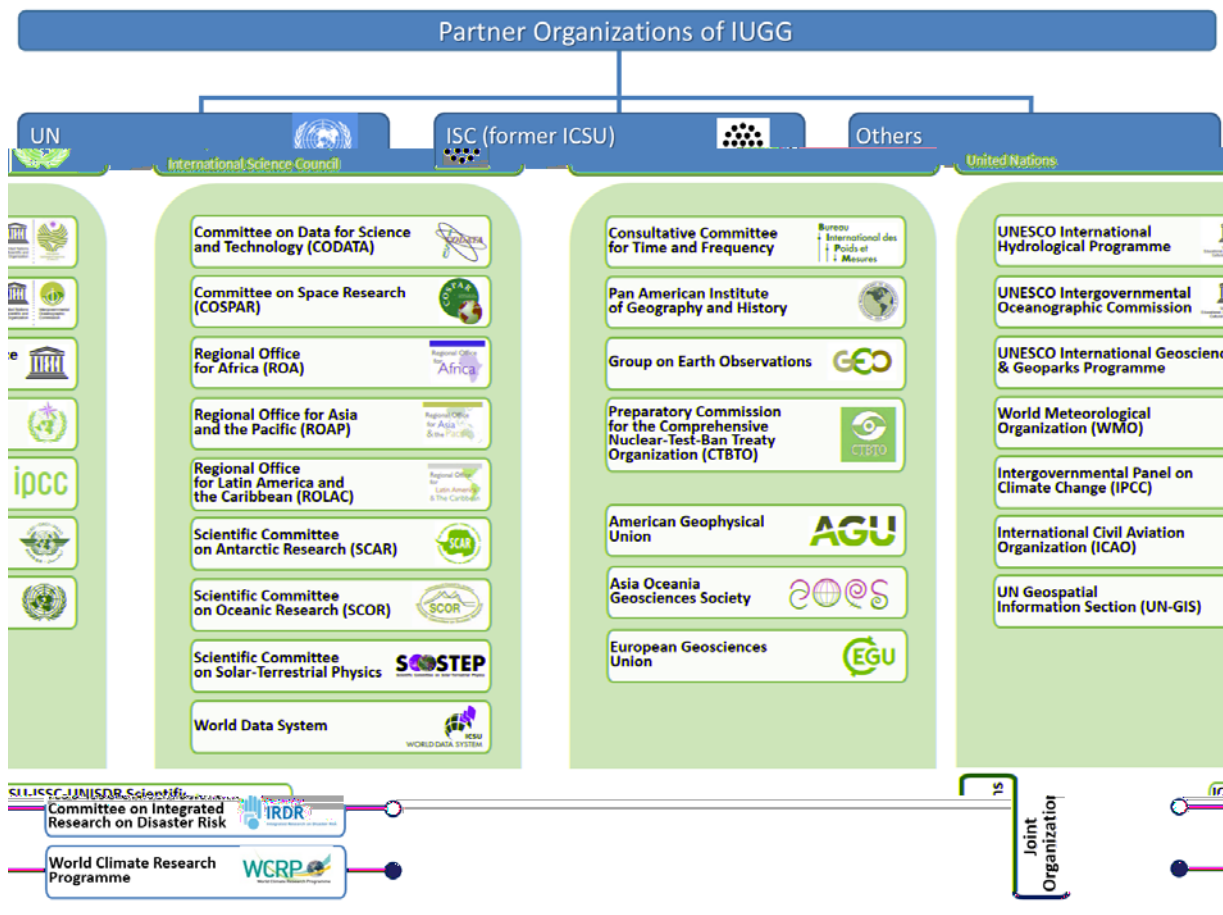


IUGG supported and supports initiatives by ISC, especially those in which Earth sciences have a role to play. IUGG cooperates with the United Nations Educational, Scientific and Cultural Organization (UNESCO) in the study of hydrological (through IAHS) and oceanographic (through IAPSO) research; with the World Meteorological Organization (WMO) to promote studies in atmospheric sciences and

Current	Past
<ul style="list-style-type: none"> <li>• <b>International Lithosphere Program</b> (ILP, a joint IUGS-IUGG activity)</li> <li>• <b>Global Geodetic Observing System</b> (GGOS, an IAG program)</li> <li>• <b>World Climate Research Programme</b> (WCRP)</li> <li>• <b>Integrated Research on Disaster Risk</b> (IRDR)</li> <li>• <b>International Year of Global Understanding</b> (YGU)</li> <li>• <b>Mathematics of Planet Earth</b> (MPE)</li> <li>• <b>World Data System</b> (WDS)</li> </ul>	<ul style="list-style-type: none"> <li>• <b>International Geosphere-Biosphere Programme</b> (IGBP, 1987-2015)</li> <li>• <b>International Year of World Water (IYWW, 2003-2004)</b></li> <li>• <b>International Year of Planetary Sciences (IYPS, 2009-2014)</b></li> <li>• <b>International Year of Planetary Health (IYPH, 2010-2014)</b></li> <li>• <b>International Year of Planet Earth</b> (IYPE, 2007-2010)</li> <li>• <b>Electronic Geophysical Year</b> (eGY, 2007-2008)</li> <li>• <b>International Polar Year</b> (IPY, 2007-2008)</li> <li>• <b>International Heliophysical Year</b> (IHY, 2007-2008)</li> <li>• <b>International Decade for Natural Disaster Reduction</b> (IDNDR, 1990-1999)</li> <li>• <b>Geodynamics Project</b> (1972-1979)</li> <li>• <b>Global Atmospheric Research Program</b> (1967-1980)</li> <li>• <b>International Hydrological Decade</b> (1965-1974)</li> <li>• <b>Upper Mantle Project</b> (1964-1970)</li> <li>• <b>International Geophysical Year</b> (IGY, 1957-1958)</li> </ul>

*Programs and Projects initiated and/or supported by IUGG*

meteorology (through IAMAS) as well as in hydrology (through IAHS). Together with the International Civil Aviation Organization (ICAO) and WMO, IUGG promotes the studies, the monitoring and the modelling of volcanic ashes (through IAMAS and IAVCEI). IUGG also cooperates with the Comprehensive Nuclear-Test-Ban Treaty Organization (CTBTO) in the studies related to seismology (through IASPEI), hydroacoustics, atmospheric transport modelling, and meteorology. In addition, IUGG places particular emphasis on the scientific problems of economically less-developed countries by sponsoring activities relevant to their scientific needs, e.g. Geosciences in Africa, eGY in Africa, Water Resources, Health and Well-Being etc.



*Scientific Partner Organizations of IUGG*

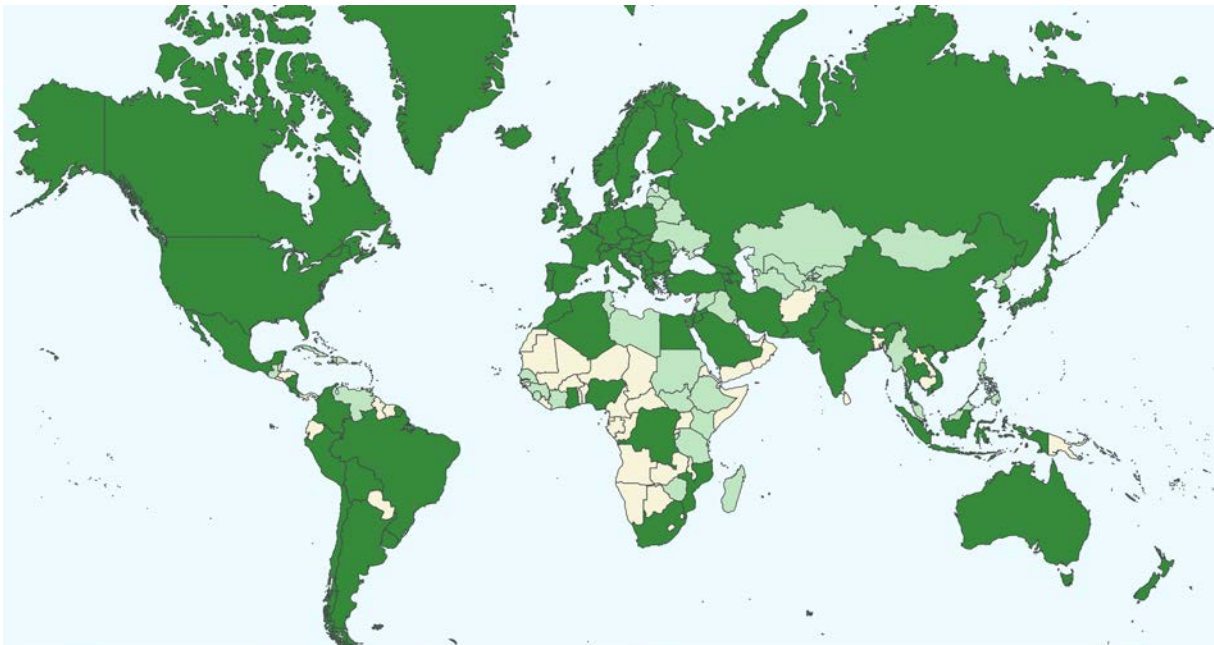
The website, available in English and French, can be found at [www.iugg.org](http://www.iugg.org).

# GENERAL INFORMATION

## MEMBERSHIP & FINANCE

By their very nature, geodetic and geophysical studies require a high degree of international co-operation. IUGG is critically dependent on the scientific and financial support of its member Adhering Bodies. The list of present and past IUGG Adhering Bodies is published in the IUGG Yearbook and posted on the website. Each Adhering Body establishes a National Committee for IUGG, and names Correspondents to each Association (as appropriate).

As of 31 December 2018, IUGG has 72 National Members including 57 countries in paying status. The paying members are placed in categories from 1 to 14 depending on their financial contribution to the Union (the membership dues rise with increasing category number). At present, the highest category used is category 11. The members pay dues according to a number of units assigned to their category (in category 1 the number of units is 1, and in category 11 the number is 35). According to a decision of the XXII IUGG General Assembly (Boulder, USA, 1995), the price of 1 unit is determined every year using an inflator index obtained from the Bureau of Labor Statistics, U.S. Department of Labor. In 2019, the price of 1 unit will be US\$ 2,020. The 57 paying members represent a total of 275 units, which is equivalent to a total income of US\$ 555,500. The funds received as dues are the basis for IUGG's operations as a scientific union, although Union associations may have their own funds earned via book selling or donations. The funds are spent to support (i) international scientific programs, projects and services, (ii) general and scientific assemblies, symposia, workshops, and schools; (iii) travel of students, early career scientists, and scientists from developing countries to attend scientific meetings; (iv) scientific activities of Union Associations and Commissions, (v) the International Lithosphere Program, (vi) the International Science Council, and (vii) administration and management.



*Regional distribution of current (dark green) and former (light green) IUGG Member Countries (as of 31.12.2018)*



## STRUCTURE

Responsibility for directing the Union's affairs is vested in the IUGG Council by the Statutes and Bylaws. The IUGG Council consists of the Council Delegates, who are designated by the Adhering Body of their respective countries. The Council is convened at each quadrennial General Assembly but can make decisions by electronic voting in between General Assemblies. A Bureau, an Executive Committee and a Finance Committee administer IUGG affairs between Council meetings. The Executive Committee has the particular responsibility of overseeing the scientific programs of the Union. The IUGG Secretariat is located at the German Research Centre for Geosciences (GFZ) in Potsdam, Germany, and assists in the implementation of the decisions of the Bureau, Executive Committee and the Council.

### Associations

The Union brings together eight semi-autonomous Associations, each responsible for a specific range of topics or themes within the overall scope of the Union's activities and each with a sub-structure. The Associations convene their own assemblies and sponsor scientific symposia, often in partnership with one another. Within its own discipline each Association is responsible for determining its own program of investigations and for supporting the activities of its own component parts. All Earth scientists, worldwide, are eligible to participate in IUGG and Association activities, assemblies, workshops, and symposia, although only scientists from member countries with dues paid may serve as Association Presidents.

The eight International Associations are listed below, and short reports on their 2018 activities are included here. Additional information about each Association is given on their websites, which can be accessed from the IUGG [website](#).

- International Association of Cryospheric Sciences (IACS)
- International Association of Geodesy (IAG)
- International Association of Geomagnetism and Aeronomy (IAGA)
- International Association of Hydrological Sciences (IAHS)
- International Association of Meteorology and Atmospheric Sciences (IAMAS)
- International Association for the Physical Sciences of the Oceans (IAPSO)
- International Association of Seismology and Physics of the Earth's Interior (IASPEI)
- International Association of Volcanology and Chemistry of the Earth's Interior (IAVCEI)

### Union Commissions

Owing to the interactive nature of the subject fields addressed by the Union's Associations, a number of Union Commissions have been established that promote the study of particular interdisciplinary problems. In 2018, the following bodies were active:

- Commission on Climatic and Environmental Changes (CCEC)
- Commission on Mathematical Geophysics (CMG)
- Commission on Geophysical Risk and Sustainability (GRC)
- Commission on the Study of the Earth's Deep Interior (SEDI)
- Commission for Data and Information (UCDI)
- Commission on Planetary Sciences (UCPS)

## Inter-Unions Commission

The International Lithosphere Program, guided by the Scientific Committee on the Lithosphere (SCL), was established in 1980 as the Inter-Unions Commission on the Lithosphere (ICL) by the International Council for Science (ICSU), at the request of IUGG and the International Union of Geological Sciences (IUGS). The name was formally changed to the Scientific Committee on the Lithosphere in 1999. According to Decision 8.4 from the 2005 ICSU General Assembly, ICSU decided "to withdraw ICSU sponsorship from SCL/ILP and to recommend that responsibility would then shift to IUGG and IUGS". Since that time, IUGG and IUGS have reaffirmed the ILP mission and have collaborated to re-define ILP as an Inter-Unions body.

## GENERAL ASSEMBLIES OF THE UNION

General Assemblies have been held since 1922 and, since 1963, at 4-year intervals. These assemblies provide an extraordinary opportunity for Earth scientists from around the world to gather and share expertise, research data, and results. Past IUGG General Assemblies are listed in the IUGG Yearbook and on the website. The most recent General Assembly was held in Prague, Czech Republic, 22 June-2 July 2015. The next IUGG General Assembly will take place in Montreal, Canada, 8-18 July 2019.

## OTHER SCIENTIFIC MEETINGS

Each Association organizes its own scientific assembly in the 4-year interval between Union General Assemblies in order to report scientific progress and conduct Association business. Associations sometimes meet jointly with the purpose of promoting interdisciplinary science. Topical and regional symposia and workshops are organized on other occasions by the Associations to provide opportunity for geodesists and geophysicists worldwide to discuss their respective methodologies, results and hypotheses and to plan collaborative research projects. The symposia, often held in less-visited, geophysically interesting locales, are intended to be attractive to the younger scientists from the developing countries of the world.

## IUGG OFFICERS FOR 2015-2019

### IUGG Bureau

President:	Michael Sideris	CANADA
Vice-President:	Kathryn Whaler	UK
Secretary General:	Alik Ismail-Zadeh	GERMANY/RUSSIA
Treasurer:	Aksel Hansen	DENMARK
Members:	Isabelle Ansorge	SOUTH AFRICA
	Pierre Hubert	FRANCE
	Chris Rizos	AUSTRALIA

### IUGG Executive Committee

IUGG Bureau members		
Immediate Past President:	Harsh Gupta	INDIA
IACS President:	Regine Hock	USA
IAG President:	Harald Schub	GERMANY
IGA President:	Eduard Petrovsky	CZECH REPUBLIC
IAHS President:	Günter Blöschl	AUSTRIA
IAMAS President:	John Turner	UK
IAPSO President:	Denise Smythe-Wright	UK

IASPEI President:	Thorne Lay	USA
IAVCEI President:	Donald Dingwell	GERMANY

### **IUGG Finance Committee**

Chair:	Jan Krynski	POLAND
Members:	Nasser Abou-Assour	EGYPT
	Corina Risso	ARGENTINA
	Virendra Tiwari	INDIA

### **Association Presidents and Secretaries General**

#### International Association of Cryospheric Sciences

President		
(2015-2017):	Charles Fierz	SWITZERLAND
(2017-2019):	Regine Hock	USA
Secretary General:	Andrew Mackintosh	NEW ZEALAND

#### International Association of Geodesy

President:	Harald Schuh	GERMANY
Secretary General:	Hermann Drewes	GERMANY

#### International Association of Geomagnetism and Aeronomy

President:	Eduard Petrovsky	CZECH REPUBLIC
Secretary General:	Mioara Manda	FRANCE

#### International Association of Hydrological Sciences

President		
(2015-2017):	Hubert Savenije	NETHERLANDS
(2017-2019):	Günter Blöschl	AUSTRIA
Secretary General:	Christophe Cudennec	FRANCE

#### International Association of Meteorology and Atmospheric Sciences

President:	John Turner	UK
Secretary General:	Teruyuki Nakajima	JAPAN

#### International Association for the Physical Sciences of the Oceans

President:	Denise Smythe-Wright	UK
Secretary General:	Stefania Sparnocchia	ITALY

#### International Association of Seismology and Physics of the Earth's Interior

President:	Thorne Lay	USA
Secretary General:	Johannes Schweitzer	NORWAY

#### International Association of Volcanology and Chemistry of the Earth's Interior

President:	Donald Dingwell	GERMANY
Secretary General:	Roberto Sulpizio	ITALY

### **Union Commission and Working Group Officers**

#### Union Commission on Climatic and Environmental Changes (CCEC)

Chair:	Tom Beer	AUSTRALIA
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Secretary: Keith Alverson USA/JAPAN

Union Commission on Mathematical Geophysics (CMG)

Chair: Yehuda Ben-Zion USA

Secretary: Ilya Zaliapin USA

Union Commission on Geophysical Risk and Sustainability (GRC)

Chair: John LaBrecque USA

Secretary: Paula Dunbar USA

Union Commission on Studies of Earth's Deep Interior (SEDI)

Chair: Jonathan Aurnou USA

Secretary: Michael Bergman USA

Union Commission for Data and Information (UCDI)

Chair: Sateesh Shenoj INDIA

Vice Chair: Anatoly Soloviev RUSSIA

Union Commission on Planetary Sciences (UCPS)

Chair: Shuanggen Jin CHINA

Secretary: Scot Rafkin USA

Working Group on History (WGH)

Chair: Hans Volkert GERMANY

Vice-Chair: Claude Boucher FRANCE

**Inter-Unions Commission: International Lithosphere Program (ILP)**

President: Hans Thybo TURKEY

Secretary: Magdalena Scheck-Wenderoth GERMANY

# MESSAGE FROM THE PRESIDENT



IUGG activities in 2018 were mainly concentrated on the preparations for our Centennial IUGG General Assembly (GA) in Montreal in July 2019, as well as on celebrating this anniversary with sister societies and adhering bodies. Centennial celebration events took place in several countries in 2018. These included: the first Scientific Congress of the Turkish National Union of Geodesy and Geophysics, May 30 – June 2 in Izmir, where IUGG was represented by its Secretary General (SG), Alik Ismail-Zadeh, who made a presentation on 100 Years of History and Future Vision of the IUGG, and on Disaster Risk and Sustainability; the International Summit on Earth Sciences: Earth Sciences and Sustainable Development in Beijing on Aug. 21 and the 3<sup>rd</sup> Congress of China Geodesy and Geophysics in Lanzhou organized by the Chinese National Committee for IUGG, where Alik talked about the Centennial of International Cooperation in Earth & Space Sciences, and Paradigm Shift in Disaster Science – Transdisciplinary System Analysis with Action-Oriented Research, respectively; the Early Career Scientists Workshop on Atmospheric Sciences and Climate in Kagawa, Japan, Sept. 22-24; the 100 Years of Geophysics Symposium on Oct. 25 in Mexico City, where I and Alik gave invited talks on Satellite Earth Observation – Applications and Challenges, and Centennial Anniversary of International Cooperation in Earth & Space Sciences, respectively; the Annual Meeting of the Mexican Geophysical Union in Puerto Vallarta, Oct. 28 – Nov. 2, where IUGG was represented by Alik and our VP, Kathy Whaler; and the AGU-IUGG Centennial Symposium on Disaster Science: Risk Reduction, Resilience, Response and Recovery on Dec. 9 in Washington, DC, which was moderated by John LaBrecque, Chair of the Commission on Geophysical Risk and Sustainability, and where I gave an opening talk on the IUGG and Disaster Science.

In addition, the Task Force for the celebration of the Union's Centennial Anniversary (TF100) continued to develop various activities, such as the selection of distinguished guests and invited speakers and organization of the IUGG Centenary Day event on July 29, 2019, at UNESCO in Paris, the website of the IUGG Centennial, special medals, network of Early Career Earth & Space Scientists, etc. The material for the planned IUGG centennial book on the History of the IUGG will now be published in a Special Issue of the open-access journal *History of Geo- and Space Sciences*. The Special Issue will be published electronically and will contain three IUGG papers, Initiation of IUGG (1919-1939), IUGG Development (1940-2000), and IUGG in the 21st Century, which have undergone review and will be published in June 2019. I am a co-author of the third paper, and I have also co-authored with Alberto Montanari the chapter on Satellite Remote Sensing of Hydrological Change in the IUGG Special Publications series book *Global Change and Future Earth* that was produced by the Union Commission on Climatic and Environmental Change and published by Cambridge University Press.

Implementation of actions for the 2016-2023 IUGG Strategic Plan developed by the Visioning Committee commenced in 2018. On April 5, the changes to the Statutes and By-Laws were approved unanimously by the IUGG Council. The Vice-President position was replaced by President-Elect (PE), duties of the PE were defined, the number of members of the Finance Committee was reduced from 4 to 3, the IUGG SG and Treasurer can hold office for a maximum of three terms, Bureau Members at large and Finance Committee members can hold office for a maximum of two terms, and the immediate Past President is now a voting member of the Executive Committee. In preparation of the 27<sup>th</sup> GA, I have appointed the members of the Nominating, Resolutions, Site Comparison, Fellow Selection, Gold Medal, and Early Career Scientist Awards Committees.

IUGG, its Commissions and Associations continued their many international scientific and educational activities, were represented at many meetings and global forums, and promoted the importance of science for decision making on issues such as climate change, risk reduction and resilience to disasters, and sustainable development. IUGG co-sponsored 17 scientific meetings and 6 geoscience education events. At the 47<sup>th</sup> Session of the International Panel on Climate Change (IPCC) held in Paris, March 13-16, IUGG was accepted as an Observer Organization. I am currently serving on the Program Board (PB) of the Group on Earth Observations (GEO) for three-year (2018-2020) and am contributing to the work of two PB Subgroups, the Sendai Framework Subgroup and the Paris Agreement Subgroup. In 2018, I attended three PB meetings and the GEO Week, Oct. 29 - Nov. 2 in Kyoto, Japan. I and Alik represented IUGG at the Inaugural General Assembly of the International Science Council (ISC), which took place in Paris, July 3-5. IUGG and the other GeoUnions were extremely pleased to see Alik elected to the ISC Governing Board as the first Secretary of the ISC. The ISC President, Prof. Daya Reddy, has accepted my invitation to attend our GA in Montreal. Before the ISC GA, the Steering Committee of the ISC GeoUnions met on July 2 in Paris, and later in Istanbul on Nov. 9-10, and discussed their role in ISC and possible joint projects and collaborations with social science unions.

The IUGG Bureau met Oct. 24-26 in Mexico City, and discussed the Union's business and status of the preparations for the 27<sup>th</sup> GA. I am pleased to report that the work of the Scientific Program Committee (SPC) and Local Organizing Committee (LOC) for the 2019 IUGG GA has progressed very well, including the organization and scheduling of sessions and special events, invitations to dignitaries, and selection of Union lecturers and Early Career Award winners. I would therefore like to thank the Chairs of the SPC and LOC, Spiros Pagiatakis and Fiona Darbyshire, the Association Secretaries, our Secretary General and Executive Secretary, Alik Ismail-Zadeh and Franz Kuglitsch, as well as Chris Rizos, the Chair of TF100 and Visioning Committee, for their exceptional work in organizing the Celebration events and Centennial GA of our Union.

Michael G. Sideris

# MESSAGE FROM THE SECRETARY GENERAL



The year 2018 was a successful year for the IUGG. The Union was involved in various activities during the last year and showed its strength in international cooperation and science promotion. Major activities and events are highlighted below.

**Association and Union Commission activities.** The IUGG Associations and Union Commissions have been intensively working on scientific programs for the 27th IUGG General Assembly to be held in Montréal, Canada from 8 to 18 July 2019. The Union Commission on Mathematical Geophysics organized an international Conference on Mathematical Geophysics (CMG2018) in Nizhny Novgorod, Russia; the Union Commission on Geophysical Risk and Sustainability organized an international symposium on Disaster Science jointly with the American

Geophysical Union in Washington, D.C., USA. The Union Commission on Study of the Earth's Deep Interior held its 16th SEDI Symposium in Edmonton, Canada; and the Union Commission on Planetary Sciences held its symposium in Wuhan, China.

**New Members of IUGG.** Algeria became a Regular Member, Serbia and Uruguay Associate Members of the Union.

**Association and Union Commission activities.** The IUGG Associations and Union Commissions have been intensively working on scientific programs for the 27th IUGG General Assembly to be held in Montréal, Canada from 8 to 18 July 2019. The Union Commission on Mathematical Geophysics organized an international Conference on Mathematical Geophysics (CMG2018) in Nizhny Novgorod, Russia; the Union Commission on Geophysical Risk and Sustainability organized an international symposium on Disaster Science jointly with the American Geophysical Union in Washington, D.C., USA; and the Union Commission on Study of the Earth's Deep Interior held its 16th SEDI Symposium in Edmonton, Canada.

**Scientific meetings.** IUGG co-sponsored 17 scientific meetings in Argentina, Azerbaijan, Brazil, Canada, Chile, China, Denmark, Germany, Indonesia, Japan, Malta, Morocco, and the USA.

**Research programs and projects.** IUGG together with the International Union of Geological Sciences (IUGS) continued to support the International Lithosphere Program (ILP).

**Science education.** IUGG and the Abdus Salam International Centre for Theoretical Physics (ICTP) in Trieste, Italy, have continued their cooperation in geophysical and geodetic education and science collaboration. IUGG co-sponsored six geoscience education events held at ICTP in Trieste, Italy as well as in Brazil, Ghana, and Tunisia.

**New publication.** The Union Commission on Climatic and Environmental Change produced a volume for the IUGG Special Publications series "Global Change and Future Earth" that was published by the Cambridge University Press.

**Union Honors.** Ten outstanding young scientists were awarded the IUGG Early Career Scientist Awards. Seven distinguished scientists were elected IUGG Fellows (Honorary Members). The IUGG Gold Medal was bestowed on William Richard Peltier (University of Toronto, Canada) for "his scientific

contributions that have been pioneering and profound in deep earth physics and climate system processes, and for his unselfish contributions to international scientific collaboration”.

**Centennial activity.** Several activities in Member countries have been supported via the IUGG Grants Program to celebrate the IUGG Centennial in 2019. Some of the Centennial events were organized in 2018 in China, Japan, Mexico, Turkey, and the USA. A Special Volume “The International Union of Geodesy and Geophysics: From Different Spheres to a Common Globe” of the Journal “History of Geo- and Space Sciences” consisting of papers on the history of IUGG and its associations is under a judgement and planned for publication in June 2019. The website of the IUGG Centennial was launched: <http://100.iugg.org>.

**International Science Council.** IUGG has been an inaugural Union Member of the International Research Council (IRC, 1919-1931), and its successors, the International Council of Scientific Unions (ICSU, 1931-1998), and the International Council for Science (ICSU, 1998 - present). In October 2017, ICSU and the International Social Science Council (ISSC) members agreed to merge the two councils and to form a new International Science Council (ISC). The inaugural General Assembly of the new Council was held on 3-5 July in Paris, France. IUGG Secretary General Alik Ismail-Zadeh was elected the Secretary of the ISC Governing Board.

**Cooperation.** (i) IUGG continued to strengthen its cooperation with ISC scientific unions including the GeoUnions and the International Union of Biological Sciences (IUBS). The IUGG President and Secretary General met with their colleagues from other eight GeoUnions (<http://www.icsu-geounions.org>) in Paris, France, and in Istanbul, Turkey, to discuss joint activities and the interaction with ISC. Together with IUBS and other international partners, IUGG participated in the ICSU project “Trans-disciplinary Research Oriented Pedagogy for Improving Climate Studies and Understanding”. (ii) IUGG continued its cooperation with several interdisciplinary bodies of ICSU. In particular, the Union representatives attended the International Data Week in Gaborone, Botswana and participated in the General assembly of ISC-CODATA. (iii) IUGG contributed to the development of the scientific program of the Science & Technology Conference of the Preparatory Commission on the Comprehensive Nuclear-Test-Ban Treaty Organization (CTBTO) in Vienna, Austria. (iv) IUGG participated in the work of the Program Board of the Group on Earth Observations (GEO). (v) IUGG continued its cooperation with the World Meteorological Organization (WMO), the Intergovernmental Panel on Climate Change (IPCC), the United Nations Education, Science and Culture Organization (UNESCO) via its International Hydrological Program (IHP), Earth Science and Geohazard Risk Reduction section, and the Intergovernmental Oceanographic Commission (IOC) as well as with scientific programs such as the World Climate Research Programme (WCRP), the Integrated Research on Disaster Risk (IRDR) Programme, the Global Framework for Climate Services (GFCS), Future Earth and with some other international and intergovernmental organizations, professional societies of geoscientists, and international programs.

**Business meetings.** The annual meeting of the IUGG Bureau was held in El Colegio Nacional, Mexico City, Mexico, from 24 to 26 October 2018.

Alik Ismail-Zadeh



# IUGG ACTIVITIES

## IUGG SECRETARIAT

The IUGG Secretariat is located at the German Research Centre for Geosciences in Potsdam (GFZ, <http://www.gfz-potsdam.de/en/centre/international/iugg-secretariat/>). The Secretariat is managed by the IUGG Secretary General Dr. A. Ismail-Zadeh and the Assistant Secretary General / Executive Secretary Dr. F. Kuglitsch, with a support from Mrs. K. Gundrum. The Secretariat is responsible for implementing for the day-to-day operations of IUGG; this includes (i) maintenance of daily correspondence and communication with IUGG National Committees, Adhering Organizations, Union Associations, Executive and Financial Committees, Union Commissions and Committees; (ii) maintenance of IUGG electronic databases and technical documents; (iii) supervision of the IUGG web-master and preparation of updates for the IUGG website and social media in timely fashion; (iv) development of IUGG Yearbooks and Annual Reports; (v) negotiations with companies for production of IUGG-related publications, medals, pins etc.; (vi) publication of the IUGG E-Journal (monthly issues); (vii) assistance in technical screening of IUGG grant applications, medal and awards nominations; (viii) preparation work for IUGG General Assemblies, Council, Executive Committee, and Bureau Meetings; and some other activities. The Secretariat adopted a web-conferencing software, which provides a platform for business meetings of IUGG Bureau, Union Commission and other Union bodies across geographically dispersed locations through: text-based instant messages, voice and video chat, online presentations, web conferences, and desktop sharing enables participants to increase communication, reduce travel expenses and conserve time, increase productivity, and accelerate the decision-making process.

The IUGG Secretariat is co-sponsored by **GFZ** and **German Research Foundation (DFG)**. IUGG thanks the GFZ for the arrangement and financial support of the Secretariat, and DFG for generous support of the position of the Assistant to Secretary General and business trips of the Secretary General.

**IUGG Yearbook.** The Secretariat maintains the data related to the IUGG and its Association and produce annually a Yearbook which is available at the IUGG website electronically in PDF format (<http://www.iugg.org/publications/yearbooks>). By the decision of the IUGG Bureau only the current Yearbook should be linked to the IUGG website.

**IUGG website and social media.** The IUGG website <http://www.iugg.org>, in English and French, was maintained by Dr. D. Krupsky, IUGG Web-master, and permanently updated in 2018. In addition, a new website dedicated to the 100<sup>th</sup> anniversary of IUGG was developed (<http://100.iugg.org>) and linked to the main IUGG website. To learn more about IUGG and to keep individuals updated on Union's activities, the IUGG Secretariat maintains

FACEBOOK: <https://www.facebook.com/InternationalUnionGeodesyGeophysics>

TWITTER: <https://twitter.com/theIUGG>, and

YOUTUBE: <https://www.youtube.com/channel/UCgslvZyuEJ-RA9JkZv3MNN-w>

**IUGG Electronic Journal.** The E-Journal, an informal newsletter, was published and distributed monthly keeping IUGG Member National Committees informed about the activities of IUGG, its Associations and Commissions, and the actions of the IUGG Secretariat. Also the journal publishes feature articles, news from the International Science Council (ISC), news and reports related to IUGG scientific programs and co-sponsored scientific meetings, and a calendar of scientific meetings (<http://www.iugg.org/publications/ejournals/>).

## IUGG BUREAU MEETING

The IUGG Bureau met on 24-26 October 2018 in Mexico City, Mexico. The meeting was held at El Colegio Nacional and hosted by Jaime Urrutia-Fucugauchi, a Colegio Fellow, former President of the Mexican Academy of Sciences and Member of the IUGG Nominating Committee. The Bureau received the reports by the Officers: President, Vice President, Secretary General, and Treasurer as well as the Chair of the Finance Committee. The following agenda topics were considered and discussed: membership issues (including the engagement of least developed countries in activities of the Union); activities of the Union Commissions and the International Lithosphere Program; the work of the Union Ad-hoc and Standing Committees. In particular, a list of candidates for the 2019-2023 Bureau and Finance Committee (see later in this issue of the E-Journal) provided by the Nominating Committee was approved; the responsibilities of the Site Evaluation Committee were considered; 10 scientists were approved to receive IUGG Early Career Scientist Awards (announced on 5 November 2018); the activities of the Outreach and Visioning Committees were discussed; basic principles for the Standing Committee membership renewal were discussed and approved.

The Bureau considered the development of the IUGG Grants Program, the Science Education Program, and Special Publications Series Program, and decided on the future of these programs. An important part of the discussion was the IUGG Centennial and the activities related to this anniversary organized in China (August), Japan (September), Turkey (June), and USA (December) as well as at UNESCO in Paris, France on 29 July 2019. The Bureau received a report of the Chair of the Centennial Task Force including information on the development of the IUGG Centennial Special Volume to be published in the Journal of History of Geo- and Space Sciences.

*At the Templo Mayor Museum. From left to right: K. Whaler, J. Krynski, I. Ansoerge, P. Hubert, C. Rizos, A. Hansen, F. Kuglitsch (upper row), A. Ismail-Zadeh, J. Urrutia Fucugauchi, and M. Sideris (lower row).*

The Bureau considered the progress made in organizing the 27th IUGG General Assembly, Montréal, Canada, 8-18 July 2019 including the updates of administrative arrangements and the scientific program. The Bureau drafted the Agenda for the IUGG Council Meeting to be held on occasion of the General Assembly. Cooperation between IUGG and international and intergovernmental organizations was considered based on the analysis of IUGG Liaisons' reports, and the process of the renewal of IUGG Liaison Officers was discussed. The Bureau discussed IUGG's future relationship with the International Science Council (ISC): the President reported on the last ICSU General Assembly, which was held in

Taipei, in October 2017, and on the inaugural ISC General Assembly, which was held in Paris, in July 2018. The emphasis was on the role of Scientific Unions and especially the cooperation of IUGG with the eight ISC GeoUnions.

The Bureau met with Hugo Delgado Granados, President of the Mexican National Committee for IUGG, along with several Members of the Committee and discussed ways of promoting international scientific cooperation in Earth and space sciences in Mexico and in the Latin American region via international scientific events and programs. At the end of the Bureau meeting, members visited the Templo Mayor Museum. An IUGG Reception was hosted by the President at El Colegio Nacional for the members of the Colegio, the Mexican National Committee, leaders of the Mexican geoscience societies, and distinguished guests including Carlos Slim, a Mexican business magnate, engineer, and science philanthropist. The next Bureau Meeting will be held in Montréal during the IUGG General Assembly.

## **IUGG ADMINISTRATION**

### **Change of the IUGG Statutes and By-Laws**

The IUGG Bureau proposed several changes to the Statutes and By-Laws to further strengthen the efficiency of the IUGG Bureau and Finance Committee, contributing to the IUGG Strategic Plan (2016-2023) major goal related to improvements in IUGG management. After consultations with the IUGG Council on the changes proposed, on 5 March 2018 the Council was invited to vote on them. Electronic voting was open for one calendar month from the date of announcement. On 5 April, the changes to the Statutes and By-Laws were approved unanimously. To provide continuity in administration and management of the Union, the position of Vice-President was replaced by President-Elect, who becomes President of the Union in the following term of office. Duties of the President-Elect were defined. The number of members of the Finance Committee was reduced from 4 to 3 people. The IUGG Secretary General and Treasurer can hold office a maximum of three terms, Bureau Members at large and Finance Committee members can hold office a maximum of two terms. The immediate Past President can now vote at the Executive Committee.

### **Ad-hoc Committees formed**

The IUGG President appointed members to several Union Committees for the 27<sup>th</sup> IUGG General Assembly (Montreal, Canada, 9-18 July 2019) responsible for (i) selections of the candidates to be included in the ballot for the election of the IUGG Bureau and Finance Committee (Nominating Committee); (ii) for comparison of the sites proposed for the next IUGG General Assembly (Site Comparison Committee); (iii) for resolutions of the IUGG General Assembly (Resolution Committee); as well as to three award committees: (iv) the Gold Medal Committee; (v) the Fellow Selection Committee; and (vi) the Early Career Scientist Award Committee. The membership of the committees can be found at: <http://www.iugg.org/about/committees/> and [http://www.iugg.org/honors/u\\_awards.php](http://www.iugg.org/honors/u_awards.php)

## **IUGG'S CENTENNIAL ANNIVERSARY**

Formed in Brussels, Belgium, on 28 July 1919, the International Union of Geodesy and Geophysics (IUGG) celebrates its 100th anniversary in 2019. The centennial year marks an important milestone for IUGG. Since its inception as a union of international scientific associations, IUGG has evolved into a prominent scientific organization promoting Earth and space sciences worldwide in the complex political, economic and scientific landscapes of the 20th and the beginning of the 21st centuries. IUGG's mission is to advance, strengthen and promote Earth and space sciences for the benefit of humanity through international research cooperation and education, and to communicate the knowledge to governments and policymakers. For the decades ahead, IUGG envisions a future Earth

that is environmentally sustainable and where societies are resilient against natural hazards. We celebrate the IUGG centennial not only to remind geoscientists how important international scientific cooperation is and how IUGG science and science diplomacy have developed over the last century, but also to think collectively about future scientific developments, international scientific initiatives, and finding solutions to the urgent problems of our society, especially to those related to the 2030 UN Agenda for Sustainable Development. We are looking at the past in order to develop a new future for Earth and space sciences and to promote science for the benefit of all.

To celebrate the Centennial of the Union, IUGG established a Task Force to develop a program for celebrations around the world for 2018-2019. In 2018, several conferences/symposia and a summer school for early career scientists were held in China, Japan, Mexico, Turkey, and the USA. The program for this year includes:

- 27<sup>th</sup> IUGG General Assembly, Montreal, Canada, 8-18 July 2019;
- Celebration of the IUGG Centennial at UNESCO, Paris, France, 29 July 2019;
- Several meetings in Europe, South America, and the Middle East;
- A special volume on “The International Union of Geodesy and Geophysics: From Different Spheres to a Common Globe” will be published as a part of the peer-reviewed journal *History of Geo- and Space Sciences*.

As a part of this program, a website dedicated to the IUGG Centennial has been developed and is now open to the public. Please visit <http://100.iugg.org/> to learn more about the history of IUGG. We hope all visitors to the website, especially IUGG scientists from all nations and geoscientific disciplines, will enjoy this wonderful 100-year journey through space and time and appreciate the work of several generations of Earth and space scientists, who voluntarily contributed their time and efforts to the development of international cooperation in geosciences.

### **AGU and IUGG to celebrate their centennial with a series of meetings on disaster science**



The International Union of Geodesy and Geophysics (IUGG) and the American Geophysical Union (AGU) will celebrate the centennial of their founding in 2019. AGU and IUGG wish to foster a dialogue on the growth of science and its impacts over the past 100 years, especially in the area of disaster science. To that effect, AGU-IUGG agreed to organize (i) a Centennial Workshop on Natural Hazards and Disaster Science on 9 December 2018 before the AGU 2018 Fall Meeting in Washington, D.C., USA, and (ii) a Symposium on Georisk Reduction: Science, Resources, and Governmental Action on 14 July 2019 at the 27th IUGG General Assembly in Montreal, Canada. The meetings will focus upon the mitigation of disasters caused by natural events that may exact significant and growing global economic losses and human misery. Annual global economic losses from geological, hydro-meteorological, and climatic events are projected to approach US\$300 billion per year within the next decade. Individual events in the 21st century have caused immense economic and human life losses (e.g., the 2004 Indian Ocean earthquake- and tsunami-induced disaster claimed ~ 250,000 human lives; in 2005 Hurricane Katrina caused ~ US\$250 billion and the 2011 Tōhoku mega-thrust earthquake and resultant tsunami caused ~ US\$360 billion in economic losses). Numerous studies have contributed to a set of recommendations on how to address this growing challenge to global society. AGU and IUGG expect that these meetings will create mechanisms for improved coordination between scientists,

engineers, decision-makers, disaster managers, and funding agencies to address the challenges of growing impacts of natural hazards upon our society. The Memorandum of Understanding to implement the events was signed by Christine W. McEntee, AGU Executive Director and CEO, and Alik Ismail-Zadeh, IUGG Secretary General, on 10 April 2018 in Vienna, Austria.

### **IUGG Centennial grant awards**

The IUGG Grants Program aims to support projects, of importance to the international geophysical and geodetic community, which explore new scientific ideas, develop future international initiatives, and promote geoscience education. The year 2019 is the centennial year of the founding of the IUGG. The IUGG Bureau decided to dedicate the 2018 call to the IUGG Centennial and to award funds to proposals addressing international cooperation in Earth and space sciences and highlighting the importance of science for sustainable development of society. On 1 May 2018, the IUGG Bureau announced the winners of the IUGG grants and awarded US\$ 52,000 to the following projects:

- IUGG Centennial Celebration Activities in China;
- Implementation of the United Nations' Resolution on the Global Geodetic Reference Frame (UN-GGRF) for Sustainable Development in Latin America;
- Geoscience education and outreach for sustainable transformational change in the Middle East and North Africa region;
- IAMAS-iCACGP/IGAC Early Career Short Course on atmospheric sciences and climate;
- Knowing Planet Earth: geoscience awareness across cultures and languages; and
- Fostering developed-developing country partnerships for the advancement of global volcano science.

### **IUGG Centennial Celebration Activities in China**

The Year 2019 is the 100th anniversary of IUGG. The Chinese National Committee for IUGG, in collaboration with IUGG and its Associations, the China Association for Science and Technology (CAST), the Chinese Academy of Sciences (CAS), the National Natural Science Foundation of China (NSFC), Lanzhou University and others, organized a series of activities to promote this centennial event. A high-level ***International Earth Sciences Summit***, entitled *Earth Sciences and Sustainable Development* was held on 21 August 2018 in Beijing, China. More than 20 international scientists and 100 delegates from China and around the world (e.g., Iran, Nigeria, Pakistan) attended this summit, including *Alik Ismail-Zadeh*, Secretary General of IUGG and Secretary General of International Science Council (ISC); *Yuntai Chen*, Academician of CAS, IUGG Fellow, and former Member of the IUGG Bureau (2003-2011); *Guoxiong Wu*, Academician of CAS and IUGG Fellow; *Keith Alverson*, Secretary-Treasurer of the IUGG Union Commission on Climatic and Environmental Change (CCEC); *Teruyuki Nakajima*, Secretary

General of IAMAS; *Deliang Chen*, Foreign Member of CAS and former Executive Director of ICSU (2008-2011); *Yuanxi Yang*, President of the Chinese National Committee for IUGG (CNC-IUGG) and Academician of CAS; *Jun Xia*, Vice President of the CNC-IUGG and the member of CAS; *Xiaofei Chen*, Vice President of the CNC-IUGG, IUGG Fellow, and Academician of CAS, *Jianping Li*, Secretary General of the CNC-IUGG, IUGG Fellow, and Vice Chair of CCEC; and other distinguished participants.

Representatives of CAST, CAS, NSFC and CNC-IUGG welcomed the participants at the Opening Ceremony and delivered effusive speeches. The summit consisted of two parts: keynote presentations and panel discussion. Presentations at the summit included Developing Cryosphere Science under Climate Change (by Dahe Qin, China), the Past Achievements and Future Prospects of the Atmospheric Sciences (by Terry Nakajima, Japan), Sustainable Water Management in a Changing Climate: Challenges in the Application of Hydro-climatological Forecasting for Decision Making (by Soroosh Sorooshian, USA); Tibetan-Iranian Plateau and the Asian Monsoon (by Guoxiong Wu, China); Resilience: The science of adaptation to climate change (by Keith Alverson, Japan, UN Environment Programme); Proving Ground for Global Sustainability (by Deliang Chen, Sweden); Applications of Computational Seismology on Hazard Mitigation (by Xiaofei Chen, China), and Centennial of International Cooperation in Earth & Space Sciences (by Alik Ismail-Zadeh, Germany/Russia).

In the panel discussion, eight panelists presented their views on Earth Sciences and Sustainable Development, new challenges and opportunities in the future, particularly about interdisciplinary and transdisciplinary research related to U.N. Sustainable Development Goals, about younger scientists and geoscience research in developing countries. All participants agreed that this was a successful Earth Sciences Summit dedicated to the IUGG Centennial celebration activities. This summit not only promoted high-level academic forums of Earth Sciences and presented new prospects for sustainable development strategies, but also provided a very good platform for advanced research strategic consultation, education and talent cultivation in the Earth Sciences. Through this summit, scientists and managers for sustainable development together reviewed IUGG contributions globally and regionally such as in China, the world's biggest developing country, summarized the advantages of Earth Sciences and their important role in serving society in a sustainable way, and summed up major challenges for the future.

The meeting attracted the attention of the Chinese media, such as Xinhua News Agency, the official state-run press agency of China, and Science & Technology Daily. A report on the meeting was published by Xinhua at [http://m.xinhuanet.com/2018-08/23/c\\_129938937.htm](http://m.xinhuanet.com/2018-08/23/c_129938937.htm).

From 22 to 24 August, CNC-IUGG organized the ***Third Congress of China Geodesy and Geophysics*** at Lanzhou University, China. More than 1,000 scientists and students attended the event. At the Opening Ceremony, *Chun-Hua Yan*, President of the Lanzhou University, *Yuanxi Yang*, President of CNC-IUGG, and *Alik Ismail-Zadeh*, IUGG Secretary General, addressed the participants in the Ceremonial Hall of the University. The following keynote speeches were delivered at the congress: Atmospheric Heating Source over the Tibetan Plateau and its Climate Impact by *Guoxiong Wu*; Paradigm Shift in Disaster Science – Transdisciplinary System Analysis with Action-Oriented Research by *Alik Ismail-Zadeh*; Water Resources and Water Security by *Jun Xia*. (Reported by Jianping Li, Secretary General of CNC-IUGG; source and photos by CNC-IUGG.)

## Celebration of the IUGG Centennial in Mexico

**Foro Geofísica 100 Años**

**Panelistas**

- Lucia Capra
- Hugo Delgado Granados
- Alik Ismail-Zadeh
- William Lee Alardin
- Christine McEntee
- Joaquin Ruiz
- Efrain Villanueva Arcos
- Kathryn Whaler

**Coordinadores**

- Alik Ismail-Zadeh
- Ligia Pérez Cruz
- Jaime Urrutia Fucugauchi

The celebration of the IUGG Centennial in Mexico started in Mexico City. A symposium dedicated to the 100<sup>th</sup> anniversary of international geoscience cooperation was held at El Colegio Nacional on 25 October 2018. Jaime Urrutia-Fucugauchi, a Fellow of the Colegio Nacional, welcomed the participants of the symposium and introduced two public lectures given by Michael Sideris, IUGG President, and Alik Ismail-Zadeh, IUGG Secretary General. The lectures were delivered in English and simultaneously translated into Spanish. The IUGG President delivered a lecture entitled “Satellite Earth Observation and Geosciences” and the IUGG Secretary General lectured on “Centennial Anniversary of International Cooperation in Earth and Space Sciences”, which were followed by questions. The IUGG lectures were videotaped: [https://www.youtube.com/watch?time\\_continue=7949&v=wfj5MXjuNlc](https://www.youtube.com/watch?time_continue=7949&v=wfj5MXjuNlc)

The celebration was continued during the Annual Meeting of the Mexican Geophysical Union on 29 October 2018 in Puerto Vallarta, Mexico. The Plenary Session discussed past development of international geoscience cooperation and future perspectives related to challenging problems of society, involving early career scientists, female scientists, and cooperation between North-South and South-South. Representatives of IUGG (Vice President Kathy Whaler and Secretary General Alik Ismail-Zadeh), the American Geophysical Union (Executive Director Christine McEntee), the Mexican Geophysical Union (President Ligia Pérez Cruz), the Mexican National Committee for IUGG (President Hugo Delgado Granados) and others were among the panellists of the Plenary Session chaired by Jaime Urrutia Fucugauchi.

## UNION MEMBERSHIP

As of 1 January 2019, IUGG has 72 National Members including 57 countries in paying status (although some issues still exist for Iran, F.Y.R. Macedonia, Bulgaria and Nicaragua). The paying members are placed in categories from 1 to 14 depending on their financial contribution to the Union (the membership dues rise with increasing category number). At present, the highest category used is category 11. The members pay dues according to a number of units assigned to their category (in

category 1 the number of units is 1, and in category 11 the number is 35). According to a decision made at the XXII IUGG General Assembly (Boulder, USA, 1995), the price of 1 unit is determined every year using an inflator index obtained from the Bureau of Labor Statistics, U.S. Department of Labor. In 2019, the price of 1 unit will be US\$ 2,020. The 57 paying members represent a total of 274 units, which is equivalent to a total income of US\$ 553,480. The funds received as dues are the basis for IUGG's operations as a scientific union, although Union Associations may have their own funds earned through book sales, donations, or others. The funds are spent to support (i) scientific activities of Union Associations and Commissions; (ii) international scientific programs, projects and services; (iii) general and scientific assemblies, symposia, workshops, and schools; (iv) the IUGG Grants Program; (v) the International Lithosphere Program; (vi) the International Science Council; (vii) travel of students, early career scientists, and scientists from developing countries to attend scientific meetings; and (viii) administration and management (based on the note from the IUGG Treasurer Aksel Hansen).

### **Serbia an Associate Member of IUGG**

An application for admission of Serbia to IUGG as an Associate Member was received from the Geographical Institute "Jovan Cvijic" of the Serbian Academy of Sciences and Arts. The IUGG Executive Committee welcomed this application, and it was placed before the IUGG Adhering Bodies in regular status (dues paid) for a vote by correspondence. The vote is now complete, and the application was accepted: 32 (of 43 eligible to vote) Members voted, and all votes are affirmative. According to the IUGG Statutes and By-Laws, the membership of Serbia is provisional until the approval of the vote by the IUGG Council. Congratulations to the new officers of the Serbian National Committee for Geodesy and Geophysics! They are Aleksandra Nina (President and the IAGA correspondent), Ana Milanović Pešić (Secretary General and the IAHS correspondent), Oleg Odalović (IAG correspondent), and Milan Radovanović (IAMAS correspondent).

### **Algeria a Regular Member of IUGG**

On 5 April 2018, an application for admission of Algeria to IUGG as a Regular Member (Category 1) was received from the Centre de Recherche en Astronomie Astrophysique et Géophysique (CRAAG). Today, the institution created in 1890 as an astronomical observatory develops research in many geophysical fields and geodesy. The IUGG Executive Committee welcomed this application, and it was placed before the IUGG Adhering Bodies in Regular status for a vote by correspondence. The vote was complete by 25 May: the IUGG Secretariat received ballots from 32 Member countries (of 44 Member countries eligible to vote). The results of the vote on the admission of Algeria as a Regular Member: 31 affirmative and 1 abstained. According to paragraph 14 of the IUGG By-Laws: "Any admission accepted by a simple majority is provisional until approved by the Council." Therefore, Algeria becomes a Regular Member of IUGG (provisionally). The IUGG Council should make the final decision at the XXVII IUGG General Assembly in Montreal, Canada, in July 2019. The Adhering Body is the CRAAG. The Adhering Body established the Algerian National Committee for IUGG with Abdelkarim Yelles-Chaoche as President of the National Committee and IASPEI Correspondent; Hassen Abdellaoui, Vice-President and IAG Correspondent; Abdesslam Abtout, Secretary and IAGA Correspondent; Abdenour Ambar, IAMAS Correspondent; Mostepha Boulahdid, IAPSO Correspondent; and Nachida Abellah, IAVCEI Correspondent.

### **Uruguay an Associate Member of IUGG**

An application for admission of Uruguay to IUGG as an Associate Member was received from the Military Geographical Institute of Uruguay. The IUGG Executive Committee welcomed this application, and it was placed before the IUGG Adhering Bodies in regular status (dues paid) for a vote by correspondence. The vote is now complete, and the application was accepted unanimously. According to the IUGG Statutes and By-Laws, the membership of Uruguay is provisional until the approval of the vote by the IUGG Council. Congratulations to the new officers of the Uruguayan National Committee



for Geodesy and Geophysics! They are Norbertino Suárez (President and IAG Correspondent), Héctor Rovera (Vice-President), Jorge Faure (Second Vice-President), Francisco Kellner (Secretary General), Natalia Venturini (IACS), Leda Sánchez (IAGA and IASPEI), Pablo Gamazo (IAHS), Madeleine Renom (IAMAS), Gustavo Nagy (IAPSO), and Rossana Muzio (IAVCEI).

### The 27<sup>th</sup> IUGG General Assembly



The 27th General Assembly of the International Union of Geodesy and Geophysics will take place from 8 to 18 July 2019 in Montréal, Canada. The year 2019 marks the 100th anniversary of IUGG. More than 5,000 geoscientists from all IUGG disciplines are expected to take part in a comprehensive scientific program under the slogan “Beyond 100: The next century in Earth and Space Science”. The website of the General Assembly is now online and will be updated regularly: <http://www.iugg2019montreal.com>. Please spread the word!

On 8 April 2018, the Science Program Committee (SPC) for the 27<sup>th</sup> IUGG General Assembly (IUGG2019) met in Vienna, Austria. The SPC for the IUGG2019 discussed the scope and co-conveners of Union and Inter-Association Symposia as well as scheduled the Union Symposia and Union Lectures. The IUGG President Michael Sideris invited nine prominent scientists to deliver Union Lectures, including David Grimes, President of the World Meteorological Organization. On 12 and 13 April, IUGG Secretary General Alik Ismail-Zadeh met Alain Carbonneau, a representative of the IUGG2019 organizing company, to discuss issues related to the management of the assembly. The Memorandum of Understanding between the IUGG and the LOC-Montreal was signed on 12 April 2018.

## REPORTS FROM NATIONAL COMMITTEES

### Meeting of the Austrian National Committee for IUGG

The annual meeting of the Austrian National Committee for IUGG was held on 17-18 September 2018 in Innsbruck, Austria, at the invitation of the Department of Atmospheric and Cryospheric Sciences (ACINN) of the University of Innsbruck. The Head of the Department Georg Kaser welcomed the members of the ANC.

*Participants of the ANC meeting (from left to right): Thomas Karl, Univ. Innsbruck, Ingomar Fritz, IAVCEI Correspondent; Johannes Böhm, IAG Correspondent; Kristin Richter, IAPSO Correspondent; Georg Kaser, IACS Correspondent; Mathias Rotach, IAMAS Correspondent; Günter Blöschl, IAHS correspondent; Wolfgang Lenhardt, ANC President and IASPEI Correspondent; Franz Kuglitsch, IUGG Executive Secretary; Barbara Leichter, IAGA Correspondent; and Norbert Höggerl, ANC Secretary General.*

During the ANC meeting the following topics were addressed: (i) IUGG 2019 General Assembly Montreal: state of the ongoing preparation work; (ii) IUGG- and Liaison-Officer, Early-Career Scientists, Gold Medal and Fellowship nominations by the ANC; (iii) Reports by Correspondents of IUGG Associations; and (iv) Information exchange. The following topics were also discussed: Individual membership – advantage or disadvantage? No homogeneous answers were given, because there are differences in the benefits of individual membership: in some associations, there is a right to vote and not in others. To promote early career scientists in the International Association of Hydrological Sciences (IAHS), a commission has been set up. The idea behind this commission is to find the right way to foster communication with these scientists. Günter Blöschl, IAHS President, pointed out that early career scientists of the different Associations of the IUGG should interact more efficiently. Georg Kaser, the scientific representative of Austria in the Intergovernmental Panel on Climate Change (IPCC), gave an impressive report of the work of this UN body. Michael Meyer delivered a lecture “Peopling the Tibetan Plateau & the High Himalaya - New dates and old challenges in high-altitude (geo)archaeology on the roof of the world”. The Austrian National Committee meeting was the perfect platform for the exchange of valuable information between the members of the different associations of the IUGG in a very relaxed atmosphere. More information can be obtained on the following websites: <http://acinn.uibk.ac.at>; <http://www.oegk-geodesy.at/index.html>. (Reported by Norbert Höggerl, Secretary of the Austrian National Committee.)

### **Scientific Congress of the Turkish National Union of Geodesy and Geophysics**

The Scientific Congress of the Turkish National Union of Geodesy and Geophysics (TNUGG) was organized by the General Command of Mapping (the IUGG Adhering Organization for Turkey), Dokuz Eylül University, İzmir Katip Çelebi University and İZFAŞ (İzmir Fair Services, Cultural and Art Affairs) in İzmir, Turkey, from 30 May to 1 June 2018. The Congress enabled scientists from geodesy, geophysics and other related fields to come together and discuss interdisciplinary issues. The scientific meetings were organized by individual commissions under the auspices of the TNUGG. This congress was the first which was held with the participation of all commissions of the National Union.

### *Participants of the Scientific Congress of the Turkish National Union of Geodesy and Geophysics*

At the Opening Ceremony, participants of the conference were welcomed by Orhan Polat from Dokuz Eylül University as the head of the Local Organizing Committee. Then Osman Alp, President of the Turkish General Command of Mapping (GCM) of the Ministry of National Defense and head of TNUGG, gave a presentation about TNUGG and GCM's responsibilities, achievements and products. Alik Ismail-Zadeh, IUGG Secretary General, made a presentation on 100 years' history and future vision of the IUGG, and on Disaster Risk and Sustainability. In total, there were about 200 participants; 95 papers were presented at 18 oral sessions and 11 papers were selected for poster presentations. The Congress drew public attention to many subjects especially seismology and earthquake risk related topics in the media. For more information: <http://www.tujjbkongre2018.org>. (Reported by Erdinc Sezen, Secretary of the IUGG National Committee for Turkey.)

## **SCIENTIFIC MEETINGS OF THE UNION AND INTER-ASSOCIATION COMMISSIONS**

### **IUGG Conference on Mathematical Geophysics (CMG2018)**

The Union Commission on Mathematical Geophysics (CMG) established in 1964 by the decision of the IUGG Executive Committee aims to encourage exchange of ideas and information in all areas of geophysics, with an emphasis on the application of mathematics, statistics and computer science to geophysical problems, and to promote the development and application of mathematical methods and appropriate theoretical techniques for the solution of problems across the complete spectrum of geophysical disciplines. The Commission has organized biennial conferences on mathematical geophysics since 1986.

The 32<sup>nd</sup> IUGG Conference on Mathematical Geophysics (CMG2018) was held in Nizhny Novgorod, Russia. The conference took place on a boat that cruised the Volga River with daily stops for the conference participants to visit historic sites such as museums, cathedrals, and churches. The boat departed on 23 June in the morning and returned to the city of Nizhny Novgorod on 28 June in the afternoon. About 90 representatives of more than 20 countries attended the conference. The Opening Ceremony of CMG2018 was held on 23 June. IUGG Secretary General Alik Ismail-Zadeh welcomed the conference participants on behalf of the Union President and the Bureau, and spoke on international research cooperation in Earth and space sciences emphasizing the importance of cooperation between geophysicists and pure and applied mathematicians. The conference participants were addressed by Alexander Feigin, Chair of the Local Organizing Committee (LOC) of CMG2018, and Yehuda Ben-Zion, Chair of CMG. The opening of the conference was celebrated by launching air balloons. CMG2018 covered a wide range of current research topics in mathematical geophysics. Key theoretical problems, recent advances in numerical modeling and data assimilation as well as observations and quantitative models in solid Earth, ocean, atmosphere, cryosphere, and climate were intensively discussed during

the conference. A video report on the CMG2018 can be watched at conference website [http://cmg2018.iapras.ru/Content/media/cmg2018\\_HD.mp4](http://cmg2018.iapras.ru/Content/media/cmg2018_HD.mp4). (Reported by Alik Ismail-Zadeh)

### **Joint AGU-IUGG Centennial Symposium “Disaster Risk Reduction, Resilience, Response, and Recovery” in Washington, D.C., USA**

Disasters and natural hazards may have diverse origins but share many common threads in terms of developing resilience, reducing risks, improving responses, and in managing recovery. Addressing these requires close coordination and communication among scientists, policy makers, engineers, the business and insurance communities, planners, and more. As part of their centennial anniversary celebrations, AGU and IUGG will host a full-day symposium on these important societal issues on Sunday, 9 December, immediately preceding the AGU 2018 Fall Meeting Washington, D.C. Marcia McNutt, President of the National Academy of Science, the Head of the U.S. Adhering Organization to IUGG and former AGU President, will deliver a Keynote Lecture. The main program will be a series of four panel discussions from world-leading experts exploring the science of disasters and natural hazards and improving response, risk reduction, and recovery. The goal is to form a rich dialog among diverse communities needed to address the increasing and increasingly costly challenges posed by disasters. There will be time within each panel for discussion. Panel topics will cover: (i) Science in Disaster Risk Appraisal and Management; (ii) Science for Risk Reduction, Resilience and Response to Disasters; (iii) Dealing with Cascading Disasters; and (iv) Understanding the Societal Impact of Severe Weather (including Space Weather) and Climate Change. A full program will be available soon. Attendance is limited to 250 and open to registrants of the AGU Fall Meeting at no additional cost. Registration is available on a first come, first served-basis through the Fall Meeting’s registration site (<https://fallmeeting.agu.org/2018/centennial-events-at-fall-meeting/#AGU-IUGG100Symposium>).

Those, who have previously registered for the Fall Meeting will have the opportunity to amend their registration adding this event ticket. The Symposium will start at 8:00 AM and conclude at 5:30 PM and will be held at the Grand Hyatt Washington adjacent to the Washington Convention Center. A follow-on joint symposium will be held during the 27th IUGG General Assembly (<http://iugg2019montreal.com>) on Sunday, 14 July 2019, at the Palais des Congrès in Montréal, Québec, Canada with the aim of refining further the recommendations of the Washington symposium. (Reported by John LaBrecque, Chair, IUGG Commission on Geophysical Risk and Sustainability.)

### **International Symposium on Asteroids and Comets Gravity and Interiors (SAGI 2018)**

Asteroids and comets are leftovers from the formation of our solar system about 4.6 billion years ago. Shattered remnants of accreted planetesimals, or even made of never heated pristine materials, contain important clues about the early our solar system and the origin of water and life on Earth. The topic “asteroids and comets gravity and interiors” is among the important topics in deep space exploration. The Rosetta spacecraft built by the European Space Agency (ESA) finished its mission in 2016. The OSIRIS-REx mission operated by the National Aeronautics and Space Administration (NASA) was launched in 2016 to study the asteroid 101955 Bennu, a carbonaceous asteroid, and return a sample to Earth in 2023. The Japan Aerospace Exploration Agency (JAXA) launched the Hayabusa2 mission in 2014, which reached near-Earth asteroid 162173 Ryugu in 2018 and will also return a sample to Earth in 2020. A Chinese asteroid mission has also been put on the agenda, and several targets have been preliminarily selected.

*SAGI 2018 participants (photo: S. Jin)*

The first International Symposium on Asteroids and Comets Gravity and Interiors (SAGI 2018) was held on December 17-19, 2018, Wuhan, China and co-sponsored by the IUGG Union Commission on Planetary Sciences (UCPS), International Association of Planetary Science (IAPS), Wuhan University, and China University of Geoscience at Wuhan. The topics were focused on precision orbit determination of the solar system asteroid probes, asteroid orbit determination (ephemeris), asteroid gravity field, internal structures and geological evolution. About 120 participants attended SAGI 2018 with two-day of oral presentations. SAGI 2018 provided a very good platform for communication and discussion on the gravity and interiors of asteroids and comets (Reported by Shuanggen Jin, SAGI 2018 Co-Chair)

### **International EMSEV Meeting**

The 2018 biennial International Workshop organized by the IUGG EMSEV Inter-Association Working Group on Electromagnetic Studies of Earthquakes and Volcanoes (<http://emsev-iugg.org/>) was held in Potenza, Italy, from September 17 to 21 (<http://web.unibas.it/emsev2018/>). This workshop was supported by IAGA, IAVCEI and IASPEI, and was hosted by the University of Basilicata and the Institute of Methodologies for Environmental Analysis of the Italian National Research Council with the strong support of the National Institute of Geophysics and Volcanology. Professor Valerio Tramutoli in association with Professor Nicola Pergola efficiently organized the four-day meeting with the local organizing committee. The meeting took place at Theatre Francesco Stabile and the National Museum of Archeology "D. Adamesteanu" reminding us that our scientific studies are not only achieved for the emergence of new scientific findings on Natural Hazards, but also and surely for the benefits of the inhabitants of our planet.

The workshop primarily focused on the observation and understanding of various kinds of electromagnetic phenomena associated with earthquakes and volcanic eruptions, particularly from a multidisciplinary point of view. This meeting was also the first opportunity to discuss the preliminary observations from the new Chinese micro-satellite Zhangheng 1 (also called CSES-1), which was put into a solar polar orbit above the Earth in February 2018. It was the first step in the new cooperation built between the Institute of Crustal Dynamics and the Chinese Earthquake Administration with

EMSEV and validated by a Memorandum of Agreement signed on May 12, 2018 during the 10<sup>th</sup> anniversary of the 2008 M8.0 Sichuan earthquake (<http://www.4thicce.com/>).

In this frame, the EMSEV workshop began with sessions related to the Zhangheng 1 mission. Then, several themes were successively developed and discussed: (1) Electromagnetic methods for seismicity and volcano monitoring, (2) Theoretical and laboratory studies for understanding seismic and volcanic phenomena, (3) Satellite observations for volcanic and seismic hazard assessment and monitoring, (4) Earthquake and volcano related phenomena investigation by multi-disciplinary and multi-parametric approaches, (5) Magnetospheric, ionospheric and atmospheric phenomena associated with seismic activities, and (6) Electromagnetic signals associated with earthquakes and volcanic eruptions.

More than 110 participants from 25 different countries coming from four continents attended the meeting and presented their most up-to-date results in oral presentations and with posters. Each session was highlighted by one or two invited talks showing some advanced results in the domain. Each poster benefited from a two-minute oral presentation during plenary sessions. Posters were displayed during the meeting in the room where people had their break between sessions thereby favoring regular interactions and networking. After the initiation of the best poster award at EMSEV 2016 in Lanzhou (China), we made the award to the young student and researcher Roberto Colonna for his work on the “Development and assessment of a robust GPS-TEC data analysis (RSTTEC) for the identification of ionospheric perturbations possibly related to impending earthquakes: The case of L’Aquila (April 6th, 2009, Mw=6.1) earthquake”.

The presentations during the meeting clearly show the progress in the observation of reliable electromagnetic signals related to earthquakes and volcanic activity during the seventeen years of EMSEV’s existence. Individual teams have regrouped in larger consortiums, most often at the international scale. The topic favors multi-disciplinary approaches investigating the physical mechanisms generating earthquakes and volcanic eruptions. During recent years, satellite observations based on dedicated satellite missions/sensors have vastly improved the capability of detecting signals emitted by active faults and volcanoes or generated in the ionosphere. However, they are not still able to replace ground observations which can be more accurately performed with continuous records operated by multi-parameter higher resolution devices. Both satellite and ground observations have to be managed together in high potential hazard zones in order to refine the physical mechanisms involved prior to earthquakes and volcanic eruptions. EMSEV promotes activities on volcanoes (Taal in the Philippines) and on active faults (Kyrgyzstan). Each activity involves powerful consortia for joint observations. In the Philippines, EMSEV and Japanese teams have educated young Filipino researchers. After 14 years of cooperation, the Philippines Institute of Volcanology and Seismology (<https://www.phivolcs.dost.gov.ph/>) should be able to lead research and monitoring of Taal and EMSEV should reduce its activity there. About 8 joint papers have been published. In Kyrgyzstan, joint efforts involve researchers from Kyrgyzstan, Russia, Japan, France, Greece, and China. The identification of signals related to the transient disturbances of the ionosphere that might be associated with earthquakes is the target of this cooperative effort. More information on EMSEV activities can be found at <http://www.emsev-iugg.org/emsev/>. (Reported by J. Zlotnicki, M.J.S. Johnston, T. Nagao, V. Tramutoli and N. Pergola, EMSEV leadership).

## **SCIENTIFIC MEETINGS SELECTED FOR IUGG SUPPORT IN 2018**

IUGG co-sponsors symposia and workshops appropriate to Union disciplines of study. IUGG allocated US\$20,000 to assist meetings by supporting the participation of young and female scientists and scientists from developing countries. In 2018, IUGG will support scientific meetings listed below (the IUGG Association that endorsed the meeting is indicated in brackets):

1. 2nd IndOOS Review Workshop, Lombok, Indonesia, 22-23 March (IAPSO, \$1500)
2. XI Congreso Latinoamericano de Geofísica Espacial (XI COLAGE), Buenos Aires, Argentina, 15-20 April (IAGA, \$1000)
3. Second General Assembly of the African Seismological Commission (AfSC 2018), Al Hoceima, Morocco, 23-27 April (IASPEI, \$1500)
4. 3rd scientific assembly of the IASPEI Seismological Commission for the Latin American and Caribbean region (LACSC): "Seismology of the Americas", San Juan, Puerto Rico, 24-26 April (IASPEI, \$1500)
5. 4th ANtartic Gravity Wave Instruments Network (ANGWIN) workshop, São José dos Campos SP, Brazil, 24-26 April (IAMAS, \$500)
6. 2018 GEWEX Science Conference "Extremes and Water on the Edge", Canmore, AB, Canada, 6-11 May (IAMAS, \$1500)
7. Understanding the Problems of Inland Waters: Case Study for the Caspian Basin (UPCB), Baku, Azerbaijan, 12-14 May (IAPSO, \$500)
8. 12th General Assembly of the Asian Seismological Commission (jointly organized with the 4th International Conference on Continental Earthquakes), Chengdu, Sichuan Province, China, 12-14 May (IASPEI, \$1000)
9. 10th workshop on "Long-Term Changes and Trends in the Atmosphere", Hefei, Anhui, China, 14-18 May (IAMAS, \$500)
10. International Summer School in Glaciology, McCarthy, AK, USA, 5-15 June (IACS, \$1500)
11. 7th IAGA/ICMA/SCOSTEP Workshop on Vertical Coupling in the Atmosphere-Ionosphere System, Potsdam, Germany, 2-6 July (IAGA, \$1000)
12. ISARRA 2018 (International Society for Atmospheric Research using Remotely piloted Aircraft), Boulder, CO, USA, 9-12 July (IAMAS, \$1500)
13. X Jornadas Nacionales de Ciencias del Mar, Buenos Aires, Argentina, 30 July-3 August (IAPSO, \$1000)
14. 24th Electromagnetic Induction Workshop, Helsingør, Denmark, 12-19 August (IAGA, \$1500)
15. State of the Arc (SOTA 7), San Pedro de Atacama, Chile, 1-8 September (IAVCEI, \$1500)
16. 36th General Assembly of the European Seismological Commission, Valletta, Malta, 2-7 September (IASPEI, \$1000)
17. 2018 joint 14th iCACGP Quadrennial Symposium/15th IGAC Science Conference (in conjunction with the 2018 iCACGP/IGAC Early Career Short Course), Takamatsu, Kagawa, Japan, 25-29 September (IAMAS, \$1500)

## REPORTS OF THE CO-SPONSORED EVENTS

### The Second IndOOS Review Workshop

The goal of IndOOS (Indian Ocean Observation System) is to provide sustained high-quality oceanographic and marine meteorological measurements to support knowledge-based decision making through improved scientific understanding, weather and climate forecasts, and environmental assessments. The Indian Ocean Region Panel (IORP) established by CLIVAR<sup>1</sup> and Global Ocean Observing System (GOOS) is revising IndOOS implementation plan, with the help of a scientific team comprised of selected experts. The review seeks critical assessment of what's working well and what's not with the present Indian Ocean observing system, and advice on fruitful future directions for IndOOS. The 14th session of the IORP and the 2nd IndOOS Review Workshop was held in Jakarta, Indonesia from 21 to 23 March 2018. The workshop consisted of 25 review presentations based on the IndOOS review chapter, along three themes: Operational drivers; IndOOS components and new technologies; and Science drivers for future IndOOS. This was followed up by a review board session

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<sup>1</sup> CLIVAR (Climate and Ocean: Variability, Predictability and Change) is a core project of the World Climate Research Programme (WCRP).

and break-out session, which brought out the key recommendations for the future IndOOS that will be considered by the review board. The main product of the review will be a list of Actionable Recommendations that will guide IndOOS into the next decade so that it can successfully provide sustained observations to (i) advance our understanding of key phenomena, (ii) track the evolving state of the ocean, (iii) support calibration and validation of satellite missions, and (iv) improve forecasting and predictions of climate variability and change. While the final report is anticipated by early 2019, some of the imperatives for implementation and resources are clear through the first draft of the review. Namely, an expansion of the tropical array (RAMA) into the Arabian Sea, biogeochemistry measurements basin-wide (BGC-Argo), with emphasis on oxygen minimum and upwelling zones, and an observing system in the subtropics to capture Indian Ocean heat and nutrient budgets, including enhanced monitoring of the Indonesian Throughflow, Agulhas, and Leeuwin Currents. IUGG and IAPSO co-sponsored the meeting. (Reported by Roxy Koll, Lisa Beal, Jing Li, co-organizers of the meeting.)

### **The Fourth Antarctic Gravity Wave Instruments Network Workshop**

The 4th Antarctic Gravity Wave Instruments Network (ANGWIN) Workshop was held at the National Institute for Space Research in São José dos Campos-SP, Brazil, from 24 to 26 April 2018. The workshop's participants (35) came from Brazil, Germany, Ireland, Japan, South Africa, South Korea, UK, and USA.

#### *ANGWIN Workshop at INPE's Campus on 25 April 2018*

The goal of this workshop was to combine new Antarctic and Arctic observations using optical and radio-wave techniques, and results with modeling studies to gain fresh knowledge and insight of their large-scale effects on the general circulation of the polar-regions lower, middle and upper atmosphere and ionosphere. Dynamical coupling process between the Antarctic Peninsula and South American continent was another topic discussed at the workshop. The workshop provided an ideal opportunity for early career scientists/students to become involved in international collaborations and to work with some of the leading experts in this field of research. The Workshop's scientific program is available at: <http://www.inpe.br/angwin/program.php>. IUGG co-sponsored the workshop. (Reported by José Valentin Bageston, Workshop organizer.)

### **The Second General Assembly of the African Seismological Commission**

The Second General Assembly of the African Seismological Commission (AfSC) of IASPEI took place in Al Hoceima, Morocco, from 23 to 27 April 2018. Opening Ceremony presided over by the Governor of the province of Al Hoceima. At the Opening Ceremony, Taoufik Mourabit, Chair of the Local Organizing Committee, Johannes Schweitzer, IASPEI Secretary General, and Ayele Atalay, AfSC President,



welcomed the participants of the assembly. Three plenary lectures were delivered by Mustapha Meghraoui (University of Strasbourg, France), Robert Reilinger (MIT, USA), and Driss Bensari (Mohamed V University, Rabat, Morocco). There were 110 oral and poster presentations; the oral sessions were organized in two adjoining rooms, and the poster sessions during coffee breaks in the hall. Three training courses were organized during the assembly, and well attended by the participants: (i) Seismotectonics, supervised by Mustapha Meghraoui, Mohamed El Gabry, Ahmed Hosni and Ahmed Ksentini; (ii) Seismic signal analysis, supervised by CTBTO experts Abdelouaheb Agrebi, Ezekiel Jonathan and Alexander Poplavskiy; and (iii) Use of radar images for monitoring of superficial movements of the lithosphere, supervised by Kharki Omar and Boulaassal Abdel Hakîm from the University of Tangier. IUGG provided a financial support to the AfSC General Assembly. With this and other co-sponsors support, registration fees were waived for all (72) students participating in the assembly, and 35 participants received full or partial support. (Reported by Taoufik Mourabit, LOC Chair.)

## **The 12th General Assembly of the Asian Seismological Commission**

The Asian Seismological Commission (ASC) is one of four regional commissions of the International Association of Seismology and Physics of the Earth Interior (IASPEI) of IUGG. The 12th ASC General Assembly was held from 12 to 14 May 2018 at the Century City International Conference Center, Chengdu, China, and was jointly organized along with the 4th International Conference on Continental Earthquakes (<http://www.4thicce.com>), as part of the International Conference for the Decade Memory of the Wenchuan Earthquake. The Conference welcomed 1,408 registered participants from 49 different countries of which 129 were with ASC as their primary affiliation. There were 436 oral and 401 poster presentations. The ASC General Assembly had, in total, 107 abstracts, among which there were 52 oral presentations. The assembly was supported by IUGG, IASPEI, the Seismological Society of Japan, and the China Earthquake Administration. The ASC pre-assembly workshop was co-organized with the Northern-Central Asia Earthquake Observation Techniques Training Courses from 16 April to 11 May 2018. There were 21 participants from Armenia, Kazakhstan, Kyrgyzstan, Mongolia, Russian and Tajikistan. The theory of earthquake observation was the main topic from 16 to 28 April 2018 in Beijing, practice on seismograph and earthquake related software was the main topic from 29 April to 9 May 2018 in Zhuhai, and the effort to mitigate earthquake hazards was the main topic from 10 to 11 May 2018 in Chengdu. At the opening ceremony of the ASC General Assembly, the IASPEI President Thorne Lay gave his opening remarks. Four keynote lectures were delivered by Harsh Gupta (India), Kenji Satake (Japan), Paramesh Banerjee (Singapore), and Wu Zhongliang (China). Scientific sessions included (i) strong motion, early warning, and lessons from great earthquakes, (ii) anthropogenic seismicity: induced and triggered earthquakes, (iii) global seismo-geodetic observations: GPS, strain accumulation and silent earthquakes, (iv) seismic hazard assessment, and (v) regional cooperation in seismo-geodesy. During the three-day assembly, the ASC Executive Committee organized its Bureau and Council meetings. The ASC Statutes were revised for the first time since the inception of ASC in 1996, and unanimously adopted by the National Correspondents who were present at the assembly. The venue for the next ASC General Assembly was also discussed, and it was decided to solicit proposals from different countries. The participants endorsed two ASC Resolutions, which were presented by ASC President Paramesh Banerjee during the closing ceremony of ASC. In Resolution 1, ASC strongly encourages efforts for sharing earthquake related observational experiences and related data among ASC member countries. Recognizing the importance of earthquake forecasting studies, Resolution 2 calls on ASC to set up a working group for the coordination and collaboration of test sites in the Asian-Pacific area, especially along the Belt & Road region. More information on the assembly can be found at the ASC website (<https://www.asc-iaspei.org/>). (Reported by Li Li, Secretary of the Asian Seismological Commission.)

## **The 8th GEWEX Open Science Conference**

GEWEX, the Global Energy and Water Exchanges project of the World Climate Research Programme (WCRP), held its 8th Open Science Conference: Extremes and Water on the Edge from 6 to 11 May 2018 in Canmore, Alberta, Canada. More than 380 attendees hailing from 40 countries discussed and presented issues ranging from mountain and high latitude hydrology to atmospheric and land modeling research and observations. The Conference covered both long-standing and emerging topics and featured the work of more than 200 Early Career Researchers (ECRs). Approximately 1/3 of the attendees were female. Themes of the Conference mirrored the diverse research of the GEWEX community. The program was designed to reflect the science represented by the four core Panels of GEWEX and the two WCRP Grand Challenges on “Weather and Climate Extremes” and “Water for the Food Baskets of the World” for which GEWEX takes a leading role.



The conference, which had 7 themes and 26 sessions, was designed to cover as wide a gamut as possible of topics on water and energy climate and weather- related research. The GEWEX Global Atmospheric System Studies Panel's focus on atmospheric models was shown through contributions in, for example, the session on "Energy and Water Budget Closure and Advances in Assessment Techniques". The Global Land/Atmosphere System Study Panel's concentration on land surface model development and evaluation was show cased in, for example, the session on "Satellite Observations for Climate Extremes, Water Cycle Processes, and Land-Atmosphere Interactions". The GEWEX Hydroclimatology Panel's emphasis on regional hydroclimates was shown in particular in the session on "Regional Hydroclimate Projects". The GEWEX Data and Analysis Panel's guidance on the production and evaluation of *global* data products as well as its newer direction of analyses were well-represented in the session on "Global Energy and Water Cycles, Clouds, and Radiation". Weather and climate extremes and the food-water-energy nexus, the topics of the two WCRP Grand Challenges, were explored in detail in various sessions. Clearly, research on extremes in weather and climate was well represented and its session well attended. Given the location of the conference in the Canadian Rockies in the beautiful town of Canmore, research on mountainous regions and their hydrology and climate was given particular attention. Both in the conference main events as well as our excursions led by both John Pomeroy and the excellent story teller and scientist in his own right of Bob Sandford. High mountainous terrain, which is critical for regional water supply and access, is still a research frontier due to the lack of *research* infrastructure and many unanswered questions on weather and climate-related processes in these regions persist. In this conference significant steps were made that may lead to a new GEWEX Mountain Initiative to bring together the latest scientific knowledge and models – such as convection-permitting models – and the relevant communities. The ECRs from the Young Earth System Scientists (YESS) group (<http://www.yess-community.org>) and the Young Hydrologic Society (YHS) (<https://younghs.com>) came together to hold the 2018 Joint YESS-YHS ECR Workshop over three days before the Conference. Participants discussed creating and disseminating regional information on different spatial and temporal scales. A good portion of the students and ECRs attending the Conference also entered in the ECR and Student Presentation Competition, and five outstanding researchers came away with prizes. The conference was co-sponsored by IUGG, IAMAS, the World Meteorological Organization (WMO) and several other organizations. A detailed overview of the conference can be found at: <https://www.gewexevents.org/events/2018conference>. (Reported by Peter van Oevelen, IGPO Director.)

### **International Conference "Understanding the Problems of Inland Waters: Case Study for the Caspian Basin"**

The Conference "Understanding the Problems of Inland Waters: Case Study for the Caspian Basin – UPCB2018" was held in Baku, Azerbaijan, from 12 to 14 May 2018 and co-sponsored by IUGG-IAPSO.

The conference was organized by the Institute of Geography of the Azerbaijan National Academy of Sciences and the Inter-Islamic Science and Technology Network on Oceanography. The aim of the conference was to increase the exchange and cooperation between different international organizations and scientific teams (“communities”) dealing with studies of the Caspian Sea, Aral Sea, and Urmia and Van lakes. About 140 scientists and students from more than 55 organizations, including about 50 delegates from foreign countries, including France, Germany, Iran, Italy, Russia, Switzerland, Turkey, Turkmenistan, and the USA, participated in the conference. In addition to the conference, IUGG was also one of the main supporters of the one-day International Student Workshop devoted to the main themes of UPCB2018 Conference and organized on 11 May 2018. The aim of this workshop was to help students and early career scientists increase their knowledge of geoscience and on the application of remote sensing to studies of environmental problems related to the Caspian basin. 31 students and young researchers and nine international and local experts specializing in remote sensing and geoscience lectured at the workshop.

*At the UPCB2018 conference*

One of the main outcomes of the UPCB conference was a discussion related to the establishment of an International Working Group (IWG) on Sustainable Development of the Caspian Sea Basin with the aim to initiate and oversee multi-disciplinary studies across the Caspian basin at different scales. The IWG suggested organizing an international Capacity Building Workshop (CBW) on sustainable development of the Caspian Sea Basin in Baku. This CBW should primarily address researchers and PhD students from different fields, such as archeology, urban planning, geomorphology, geology, geophysics, petroleum, biology, sustainable development, oceanology, hydrology, climate change, remote sensing, GIS and other related disciplines. (Reported by Elnur Safarov, Organizing Committee)

**The 10th Workshop on Long-term Changes and Trends in the Atmosphere**

The 10th Workshop on Long-Term Changes and Trends in the Atmosphere was held at Hefei, China, from 14 to 18 May 2018. The workshop was attended by about 130 participants from several countries including many graduate students and young scientists. This highly successful meeting was the most attended in this Trend Workshop series with over 120 abstracts received.

The six traditional sessions include trends and variability in the troposphere, stratosphere, mesosphere, thermosphere, ionosphere and modeling trends. In addition, three tutorials for students and young scientists were given on the history of trend researches, dynamics and modeling. Jan Lastovicka gave a special seminar for early career scientists on how to publish in scientific journals. This meeting was co-sponsored by IUGG, IAMAS, IAGA, SCOSTEP and several national organizations. A

special joint issue of Journal of Geophysical Research - Space Physics and Journal of Geophysical Research - Atmosphere is planned. The Workshop's program is available at the website: <http://trends2018.ustc.edu.cn/programs.html>. (Reported by Tao Li and Jia Yue, Workshop's organizers.)

*Group photo of the Trend Workshop*

### **International Summer School in Glaciology 2018**

Nearly 30 graduate students from more than 25 universities and 17 countries as far away as Nepal, India, Peru and New Zealand gathered in the small Alaskan village of McCarthy from 5 to 15 June 2018 to participate in the University of Alaska Fairbanks's (UAF) Fifth International Summer School in Glaciology. Steep ice-covered mountains provided the perfect setting to equip early stage PhD students with tools to address the expanding challenges in quantifying and modeling rapid changes in glaciers and ice sheets occurring in response to a warming climate, and to foster collaboration among students as well as established scientists in the field of glaciology. All eight instructors from the glaciology group at UAF, and three other US universities and institutions, stayed for the entire period, offering plenty of opportunity for interaction between the instructors and students during and outside the formal instruction period.

*Group photo (photo: M. Fahnestock)*

Students took part in glaciology lectures, exercises and computer projects, and presented their own research in an outdoor poster session with posters pinned to the outdoor walls of the Wrangell Mountain Center or to laundry lines. Excursions to nearby glaciers provided hands-on experience of a glacial environment, a memorable experience especially for the almost ten students who (though studying glaciers) in fact had never been on a glacier. A number of evening activities rounded off the program, including a public lecture that attracted more than 50 locals and tourists. Overall, the course received extremely positive evaluations. Participants left not only with a stronger background in glaciology, but also with a network of professional contacts from around the world. A travel grant from IUGG supported one of the students. (Reported by Regine Hock, Summer School Organizer.)

### **ISARRA Conference**

The International Society for Atmospheric Research using Remotely-piloted Aircraft Conference (ISARRA 2018) was held in Boulder CO, USA from 9 to 12 July 2018. This annually-held conference brings together the world's experts in the use of unmanned aircraft systems (UAS) for atmospheric research. This year's conference was hosted by the University of Colorado Boulder and attended by 130 participants from 17 different countries. The conference included several plenary oral sessions, during which researchers were able to provide presentations on the following topics: UAS to measure and understand turbulence; UAS to measure and understand clouds, aerosols and trace gases; UAS in the development of numerical weather prediction capabilities; UAS to measure and understand boundary layer processes; development of UAS capabilities and infrastructure for atmospheric science; use of UAS to understand high latitude processes; and UAS as a tool for observing severe weather phenomena. In addition, there was an introductory session, a poster session, time for exhibitors to present their UAS-centric equipment, and a conference dinner. During the introductory session, Joachim Reuder and Gregory Roberts gave keynote presentations on their ongoing work to develop and deploy UAS to study high latitude boundary layers and aerosol-cloud interactions, respectively. The poster session featured 38 different posters on a variety of topics, including the deployment of UAS to study the areas listed above for the oral sessions, development of instrumentation for deployment on UAS, recent and upcoming field campaigns, and aircraft development. The industry exhibit session provided opportunities for meeting participants to interact with vendors from several companies and learn about UAS-specific instrumentation, platforms and services related to the deployment of these systems for atmospheric research.

*Conference group photo (photo: R. Laurence)*

Travel support for early career and under-represented participants was provided through a variety of channels. IUGG partially supported conference registration costs for 10 early career participants from Cyprus, Germany, India, Norway, UK, and the USA. Additional travel support was made available by the U.S. National Science Foundation and the U.S. Department of Energy. More information on the conference can be found at the event's website: <http://isarra.colorado.edu/>. (Reported by Gijs de Boer, Chair of the Conference's Local Organizing Committee.)

### **Conference on Science of Seas**

The Conference on Science of Seas ("X Jornadas Nacionales de Ciencias del Mar") hosted by the University of Buenos Aires, Argentina was held from 30 July to 3 August 2018. The main goal of this conference was to create an adequate framework for the exchange of opinions among the various national and foreign experts, and to increase cooperation among professionals with the aim of understanding, assessing and solving problems related to the care of the marine environment. The program activities included conferences, courses, and presentations in oral sessions and panels, all of them covering an ample spectrum of subjects and points of view. Thematic areas addressed included diversity and conservation, populations and communities, ecosystems, natural and anthropogenic processes, renewable/non-renewable resources, climate change, geology, oceanography, education, and legal aspects. The meeting was a resounding success as the participants themselves confirmed. More than 800 people attended, including students, educators, and researchers belonging to institutes and universities from across Argentina. The meeting also had important international participation, with presentations by researchers or students from Belgium, Brazil, Canada, Chile, France, Uruguay, and the USA. 122 presentations were delivered in oral format, 413 as posters, and 8 as plenary lectures. Additionally, there were seven workshops, one six-hour course, and eight exhibition booths representing local and foreign universities, private companies, and government institutions. All abstracts were peer-reviewed before being accepted for presentation and will become a part of an electronic book.

*Conference group photo (photo: M. Saraceno)*

The conference was co-sponsored by IUGG. For more information on the program and the abstract book please visit: <http://jornadasdelmar2018.exactas.uba.ar/las-jornadas/cronograma>. (Reported by Martin Saraceno, Viviana Alder, Fabiana Capitano, Organizing Committee.)

### **SOTA7 ("State of the Arc") workshop**

The SOTA7 ("State of the Arc") workshop was held from 2 to 9 September 2018 in San Pedro de Atacama, Chile. The workshop was organized for geoscientists interested in all aspects of arc magmatism, arc and subduction physics modelling, and the role of arcs in the formation and evolution

of planet Earth and its continents. Informal scientific discussion was the main mode of interaction, based on selected short presentations on certain topics. The organizers strove to include a number of prospective early career scientists (ECSs) at the postdoc level as well as researchers from local institutions of the host country. This workshop was attended by nine ECSs (5 male and 4 female) from Latin and North Americas, Australia and New Zealand, UK and USA. The workshop's main topics were (1) magmatism and volcanism in the Central Andes; (2) constraints on arc magma evolution; (3) on arc speed; and (4) fluids and ore deposits. ECSs held a pre-workshop that was initiated by the organizing committee and organized by three young colleagues (including one ECS): Lucy McGee (Australia), Luca Caricchi (Switzerland), and Philipp Ruprecht (USA). One day consisted of a poster session in which all attending ECSs presented their work amongst themselves; general attendees did not participate. The entire day was shaped around the posters, and these were displayed for the entire conference for further discussion amongst all attending scientists. This gave the ECSs the opportunity to present their work to each other and get into the workshop discussion mode for the coming days. Six ECSs also gave oral presentations at the SOTA7. During the main sessions, each ECS also presented a 3 minute summary of their poster to encourage scientific discussion on their poster later in the week. Feedback from the ECSs was positive and confirmed our approach to "loosen up" ECSs to enter more easily into the workshop discussions during the week. The workshop was co-sponsored by IUGG. (Reported by Gerhard Wörner, Organizing Team.)

### **Report on the School of Atmospheric Measurements in Latin America and the Caribbean (SAMLAC): Atmospheric Particles and Reactive Gases**

The SAMLAC 2018 School was held from 12 to 17 November 2018 in San Juan, Puerto Rico, and was the third in a series of IGAC Americas Working Group (AWG) training courses. The IGAC AWG was formed 2013 by scientists from Latin American and Caribbean (LAC) countries to improve the collaborations in the region, connect the LAC community internationally and build capacity in research fields related to atmospheric chemistry. Sixty seven participants representing 21 countries and regions (Argentina, Barbados, Bolivia, Brazil, Chile, Colombia, Cuba, El Salvador, France, Germany, Guadeloupe, Italy, Mexico, Norway, Peru, Puerto Rico, Saudi Arabia, Spain, Switzerland, USA, and Venezuela) recently gathered in San Juan, Puerto Rico, for the School of Atmospheric Measurements in Latin America and the Caribbean: Atmospheric Particles and Reactive Gases (SAMLAC – 2018). SAMLAC is part of the International Global Atmospheric Chemistry Project Americas Working Group (IGAC-AWG), which aims to build a cohesive network and foster the next generation of atmospheric scientists, with the ultimate goal of contributing to development of a scientific community focused on building collective knowledge in/for the Americas, with a focus on Latin America and the Caribbean. The goals of this school were to (i) improve regional capacity and stimulate the development of aerosol and reactive gases monitoring programs (regional and national) that can contribute with their data to regional and international projects and networks; (ii) foster the building of a community of atmospheric scientists in the Latin America and the Caribbean (LAC) region in order to provide expertise on topics related to atmospheric composition and its relation to anthropogenic emissions and natural variability to government agencies and international research; (iii) Educate early career scientists from the Latin America and the Caribbean region on global and regional aspects of atmospheric composition change and atmospheric composition monitoring; and (iv) promote best practices of open data sharing and open access publication within the Latin America and the Caribbean region.

The 6-day training school included: 17 classes on topics related to atmospheric particles, and reactive gases, 11 short talks on studies and opportunities related to atmospheric particles and reactive gases in the Latin America and the Caribbean region, a poster session, a session on collaborative proposals, three side meetings (IGAC Americas Working Group AWG, WMO SDS WAS, and the Caribbean Aerosol Health Network - CAHN), and a field trip to the Cape San Juan Atmospheric Observatory. Details of the activities can be found at [samlac.uprrp.edu](http://samlac.uprrp.edu).



SAMLAC brought together internationally recognized lecturers and speakers in the field of atmospheric measurements to give the lectures and/or present studies and opportunities in the LAC region. The lecturers and speakers included representatives from many diverse organizations including the World Meteorological Organizations (WMO), NASA, IGAC AWG, amongst many others (see full list at [samlac.uprrp.edu](http://samlac.uprrp.edu)). The plenary lecture “Quantifying the Health Effects of Air Pollution Globally” was given by Dr. Jason West, professor in Environmental Sciences and Engineering at the University of North Carolina - Chapel Hill, who performs interdisciplinary research that connects air pollution, climate change, energy and human health, using models of atmospheric chemistry and transport, and tools for quantitative policy analysis. The lectures covered topics such as: Measurements of Reactive Gases ( $O_3$ , CO, NO<sub>x</sub>, VOCs), Quality Control of Trace Gases Observations, Aerosols Mechanical Properties & Filters, Aerosol Artifact-free Sampling & Online Mass Monitors, Particle Counter & Particle Size Spectrometer, Data Analysis, Requirements for Global Networks for Short-lived Atmospheric Species, and Data Submission Procedures WMO NILU EBAS.



*SAMLAC participants at the venue (photo: N. Reyes)*

The poster session included 34 presentations from students and participants whose research activities are related to atmospheric measurements in the LAC region. The students’ posters were evaluated and the best three were awarded in the closing ceremony. As part of the collaborative proposals session, there was a discussion on potential funding opportunities at the country and/or regional level for the LAC region. This type of funding opportunities is scarce but is very important to advance the science in the region and to foster stronger collaborations among LAC research groups. The SAMLAC students also had the opportunity to discuss their project ideas and interests in the collaborative proposals session. They formed teams and outlined the objectives, methodologies, expected results and broader impacts of collaborative projects, based on the lectures and experiences shared during the previous sessions of the SAMLAC. The field trip took the SAMLAC participants to the Cape San Juan Atmospheric Observatory (CSJAO) in the Fajardo municipality. The participants visited the reconstructed CSJAO where the Atmospheric Chemistry and Aerosols Research group (ACAR) at the University of Puerto Rico – Rio Piedras performs their research studies. This station was devastated by Hurricane Maria on September 20, 2017, but has already been reconstructed with the help of the U.S. NSF, NASA, NOAA ESRL, DOE ARM, UPR ACAR’s group, and many others. During this visit, the participants were able to witness the installation of the NASA’s PANDORA instrument in the station. They also enjoyed the view of the Cape San Juan nature reserve and received a short talk about the importance mangroves have on coastal ecosystems. At the closing ceremony, lecturers and participants were acknowledged and the posters prizes were awarded. SAMLAC 2018 was a success; our students learned a lot and enjoyed

their stay in Puerto Rico. The IGAC AWG will continue to offer training courses to early career scientists in the LAC regions because it is clear these types of event helps the students to gain experience and motivation to continue their research in atmospheric chemistry and air quality while building a network within in the LAC region and internationally. The organizers of SAMLAC 2018 would like to thank IAMAS-IUGG for the funding they provided to SAMLAC. (Reported by Olga L. Mayol-Bracero, University of Puerto Rico, organizer of the school.)

## IUGG SPECIAL PUBLICATION SERIES

A new book of the series “*Global Change and Future Earth*” was published by the Cambridge University Press in 2018. The book was edited by Tom Beer, Jianping Li, and Keith Alverson. *Global Change and Future Earth* was derived from the work of IUGG several programs. It demonstrates how multi- and inter-disciplinary research outputs from the geoscience community can be applied to tackle the physical and societal impacts of climate change and contribute to the Future Earth programme of the International Council for Science. The volume brings together an international team of eminent researchers to provide authoritative reviews on the wide-ranging ramifications of climate change spanning eight key themes: Planetary Issues; Geodetic Issues; the Earth's Fluid Environment; Regions of the Earth; Urban Environments; Food Security; Risk, Safety and Security; and Climate Change and Global Change. Covering the challenges faced by urban and rural areas, and in both developed and developing counties, this volume provides an important resource for a global audience of graduate students and researchers from a broad range of disciplines, as well as policy advisors and practitioners.

## GEOSCIENCE EDUCATION

### IUGG grants to support geoscience education events in 2018

IUGG awarded six grants (US\$15,000 in total) to support workshops and training schools organized by the Abdus Salam International Centre for Theoretical Physics (ICTP) in 2018 as recommended by the IUGG Committee on Capacity Building and Education and in accordance with the Memorandum of Understanding between IUGG and ICTP signed in 2015. The list of the events co-sponsored by IUGG is as follows:

- Integrated Environmental Health Impact Assessment (IEHIA) on Air Pollution and Climate Change in Mediterranean Areas, ICTP, Trieste, Italy.
- Joint Summer School on Sustainable Development: Integrated Modelling Tools for Climate, Land Use, Energy and Water (CLEW) Strategies, ICTP, Trieste, Italy.
- Summer School on Theory, Mechanisms and Hierarchical Modelling of Climate Dynamics: Multiple Equilibria in the Climate System, ICTP, Trieste, Italy.
- The Coastal Ocean Environment Summer School, Ghana.
- Second Advanced School on Regional Climate Modeling and Extreme Events over South America, Sao Paulo, Brazil.
- Summer School in Seismology and Tectonic Geodesy, Tunisia.

Founded in 1964 by the late Nobel Laureate Abdus Salam and co-sponsored by UNESCO, IAEA, and the Italian government, the Abdus Salam International Centre for Theoretical Physics - ICTP (<http://www.ictp.it>) seeks to accomplish its mandate by providing scientists from developing countries with the continuing education and skills that they need to enjoy long and productive careers. ICTP has been a major force in stemming the scientific brain drain from the developing world. The impact of ICTP extends well beyond the Centre's facilities to virtually every corner of the Earth. The Earth System Physics (ESP) Section of ICTP studies a wide spectrum of the Earth system, from its fluid components (oceans and the atmosphere) to the planet's interior.

IUGG and the Abdus Salam International Centre for Theoretical Physics (ICTP) continued cooperation in geosciences education. In 2017, IUGG co-sponsored several workshops and schools organized by ICTP, and below are brief reports on the events.

### ***Workshop on the Science of Climate Change: a focus on Central America and the Caribbean Islands***

The workshop on “Science of Climate Change: a focus on Central America and the Caribbean” was organized in La Antigua, Guatemala from 14 to 16 March 2017 and so-sponsored by ICTP, IUGG, Universidad de San Carlos de Guatemala, SENACYT, and the Mesoamerican Centre for Theoretical Physics.

*Group photo (photo: ICTP)*

The workshop was attended by 40 people including lecturers and was aimed to enhance local collaborations and foster international research and educational projects on topics related to climate and climate change in this region. The general objectives of the workshop were to expose the local and regional communities to a broad and historical perspective on the science of climate and climate change. This included anthropogenic influences on climate and the state-of-the-art in global and regional climate change studies. The idea for a workshop arose from the need to foster and promote collaborations, research projects, and educational programs between experts in the field and their universities and Central American institutions and universities on climate dynamics, global and regional climate change, and adaptation and mitigation strategies for the Central American and Caribbean rim countries. The workshop also paved the way for fruitful discussions between world experts and Central American scientists with a goal of identifying the most needed research topics to be developed in the region. The IUGG grant was used to support five scientists (including one female scientist) from Costa Rica, Cuba, El Salvador, and Honduras. More information can be found at the website: <http://indico.ictp.it/event/7949>.

### ***Extended Workshop on Space Weather Effects on GNSS Operations***

The workshop was held at ICTP, Trieste, Italy from 22 May to 2 June 2017. The Workshop was organized in partnership with the Institute for Scientific Research of the Boston College and the International Committee on GNSS of the UN Office of Outer Space Affairs (UNOOSA), and co-sponsored by IUGG and several other organizations. The workshop was attended by 20 lecturers from 10 countries and 30

participants from 20 countries. Participants were exposed to both lectures and hands-on work. In addition, Group Projects were assigned and implemented to allow participants to practice with specific case studies. Theoretical topics covered: ionosphere, ionospheric irregularities and ionospheric modeling; GNSS fundamentals; space weather, space weather effects on GNSS including satellite augmentation systems operations. Particular emphasis was given to low latitudes' ionospheric conditions. An important aspect of the workshop was the computer lab hands-on work carried out by the participants through the Group Projects where selected case studies of space weather events and their effects on the ionosphere were treated. Each Group reported in a presentation their results at the end of the workshop. It has to be noted that in two cases these results gave rise to published papers. In the opinion of lecturers and participants the aim of the Workshop to give theoretical and practical training on the physics of space weather and its main effects on the GNSS operations was fulfilled. The IUGG grant was used to support two early career scientists from India and Ukraine. More information be found at the website: <http://indico.ictp.it/event/7964>.

#### ***Fourth Workshop on Water Resources in Developing Countries: Hydroclimate Modeling and Analysis Tools***

The workshop “Water Resources in Developing Countries: Hydroclimate Modeling and Analysis Tools” was held in ICTP, Trieste, Italy from 12 to 23 June 2017 and co-sponsored by IUGG. One of the Grand Challenges of the World Climate Research Programme (WCRP) is fresh water availability.

*Group photo (photo: ICTP)*

It focuses on assessing how water availability will shift in some of the major food producing regions of the world due to climate change and on the ability of the scientific community to understand and to predict precipitation variability and change. By improving the observational system based on both in situ observations and satellite observations, model validation is becoming more and more accurate and this will allow us to improve our understanding of atmospheric and land surface processes and finally to better predict precipitation. This will in turn affect the quality of the prediction of the hydrological cycle across several scales, from catchments to regional to global. On the other side the regional climate model community and CORDEX is moving towards very high-resolution simulation ensemble efforts down to the scale of the convective permitting resolution (1-3 km). This opens new frontiers for the hydrological model community because this will bridge the spatial scale gap between regional climate models and impact models (hydrological models, ecosystem models etc.) community. This workshop focused on the state-of-the-art in precipitation measurements and tried to answer the questions: what can we use to validate precipitation coming from the model output? How can ensembles of high-resolution regional climate model outputs be used as input to a hydrological model?

How can the uncertainties in global and regional climate projections be taken into account for hydro-climate simulation? IUGG funds supported participation of two female scientists and one male scientist from Argentina, Cameroon, and India. More information can be found at the website: <http://indico.ictp.it/event/7969>.

### ***Earthquakes and Tsunami: Modeling and Observations***

The international school on “Earthquakes and Tsunami: Modeling and Observations” was organized in Hanoi, Vietnam from 11 to 22 December 2017 and co-sponsored by ICTP, IUGG, and several national institutions: the Vietnam Institute for Advanced Study in Mathematics, Vietnam National Foundation for Science and Technology Development, Vietnam National University, Hanoi University of Science, and the Institute of Geophysics of the Vietnam Academy of Science and Technology. The school was attended by about 60 students and early career scientists. The two-week school began with an international conference that highlighted some of the latest developments in earthquake sciences with emphasis on the seismotectonics and hazards from earthquakes and tsunami in Vietnam and surroundings. The school brought together international experts and trained Master and PhD students and early career scientists so that each has a better understanding of the range of circumstances and knowledge related to earthquakes in Vietnam and surrounding countries. The aim was to raise national capability in the vulnerable countries, through training and establishing an international network of scientists on which those countries can call to increase their resilience. The program involved a series of lectures, seminars, discussions in earthquake and tsunami modeling. The main topics of the school covered theoretical seismology, observational and computational seismology, mechanics of earthquakes and faulting, earthquake hazard, tsunami physics and hazard. IUGG funds supported participation of two female and two male young research scientists from Indonesia, Malaysia, and Pakistan. More information be found at the website: <http://indico.ictp.it/event/8176>.

## **IUGG AND THE INTERNATIONAL SCIENCE COUNCIL (ISC)**

### **Inaugural General Assembly of the International Science Council**

*Maison des Océans, the venue of the inaugural ISC General Assembly (photo: S. Cassanas for ISC)*

On 4 July 2018, the International Council for Science (ICSU) and the International Social Science Council (ISSC) merged to form the International Science Council (ISC), a unique global non-governmental scientific organization representing both the natural and social sciences, bringing together 141 Member Organizations (national and regional academies, research councils), 39 Member Unions and Associations (international scientific organizations), and 29 Affiliated Members. The ISC General

Assembly opened with addresses from Catherine Brechignac, Secrétaire Perpétuel of the French Academy of Sciences, and Prince Albert II of Monaco, who particularly welcomed participants of the assembly in the “Maison des Océans” built in 1911 for dissemination of knowledge on the oceans under supervision of Prince Albert I (who served IUGG as the first Vice President, 1919-1922).

The main item of business for the meeting was the election of a Governing Board to lead the Council. The ISC Governing Board consists of 6 Officers and 10 Ordinary Members. In total, 74 people were placed on the ballots for voting (20 for the Officer positions and 54 for the Ordinary Member positions). The following people were elected by the Council’s Members to the Officer positions of the ISC Governing Board: President: *Daya Reddy*, mathematics, South Africa; President-elect (to become ISC President in 2021): *Peter Gluckman*, health science/science policy, New Zealand; Vice President: *Elisa Reis*, sociology, Brazil; Vice President: *Jinghai Li*, engineering, China: China Association of Science and Technology; Secretary: *Alik Ismail-Zadeh*, geophysics, Germany/Russia; Treasurer: *Renée van Kessel*, anthropology, The Netherlands. The following people were elected as Ordinary Members of the ISC Governing Board: *Geoffrey Boulton*, geology, UK; *Melody Burkins*, environmental sciences /science policy, USA; *Saths Cooper*, psychology, South Africa; *Anna Davies*, geography, Ireland; *Pearl Dykstra*, sociology, The Netherlands; *Sirimali Fernando*, health science, Sri Lanka; *Ruth Fincher*, geography, Australia; *James C. Liao*, chemical engineering, China: Academia Sinica in Taipei; *Natalia Tarasova*, chemistry, Russia; and *Martin Visbeck*, oceanography, Germany.

The ISC founding was celebrated on 5 July 2018 with a Science Day at the Maison des Océans in Paris, featuring leading scientists showcasing the range of issues the new organization will be working on. The program (<https://council.science/events/international-science-day>) included addresses by high-level representatives of the French government and the United Nations, as well as by the first ISC President. “The importance of deliberative scientific understanding to society has never been greater,” said *Thierry Coulhon*, Advisor for Education, Higher Education, Research and Innovation to the French President. “The challenge for this Council and for our academies as well is to make the voice of science heard by those taking decisions, to promote reasoning, logical systematic analysis, quantitative evidence and rigorous thinking in place of emotions in a world dominated by opinions, beliefs, ready-to-think ideas and off-the-shelf solutions,” said *Sébastien Candel*, Président of the Académie des sciences.

*Craig Calhoun*, former president of the Berggruen Institute, gave a wide-ranging talk on the need for a voice for science in today’s world. *Ismail Serageldin*, founding director of the Library of Alexandria, pointed out that freedom and science were indissociable. “History shows that scientific progress and freedom always walk together,” he said, adding “There is no science without freedom and no freedom without science.” *Esther Duflo*, development economist from the Massachusetts Institute of Technology (MIT), spoke about science fighting poverty, and deconstructed multiple poverty myths such as “giving away money is bad”. *Cédric Villani*, a member of the French National Assembly and the French Academy of Sciences, gave a closing keynote which focused on insights from his perspective of moving from science into politics. “Often what seems to be debates about technology turn out to be debates about the shape of society.” The event was livestreamed and can be watched here: [https://www.youtube.com/watch?v=RFEuO8ptWZQ&feature=player\\_embedded](https://www.youtube.com/watch?v=RFEuO8ptWZQ&feature=player_embedded) The host of the inaugural ISC General Assembly was the French Academy of Sciences (Académie des sciences), which provided not only an excellent scientific environment but also organized wonderful cultural events in the evenings. On 4 July the Academy invited all participants to the classical concert in the building of the Institut de France and on 5 July for a reception at the Muséum national d’Histoire naturelle.

## GeoUnions

The GeoUnions (GUs) is a network of representatives of the international scientific unions of the International Science Council (ISC) dealing with Earth and space sciences. The GUs established a Steering Committee in 2004 (in Paris, France) to promote the sciences worldwide, to communicate and

to coordinates scientific activities of individual unions, and to speak on behalf of GUs members to ICSU Executive Board, ICSU Members and its interdisciplinary bodies and at international level, especially to the United Nations organizations and other global stakeholders. The current Members of the GUs are:

- the International Astronomical Union (IAU),
- the International Cartographical Association (ICA),
- the International Geographical Union (IGU),
- the International Union for Quaternary Research (INQUA),
- the International Society for Photogrammetry and Remote Sensing (ISPRS),
- the International Union of Geodesy and Geophysics (IUGG),
- the International Union of Geological Sciences (IUGS),
- the International Union of Soil Sciences (IUSS), and
- the International Union of Radio Science (URSI).

More information on GeoUnions can be found at: <http://www.icsu-geounions.org>

### **GeoUnions meeting in Paris**

On the occasion of the Inaugural General Assembly, the Steering Committee of the ISC GeoUnions (9 international scientific unions dealing with Earth and space sciences; <http://www.icsu-geounions.org>) met on 2 July at the Institut national de l'information géographique et forestière (IGN) in Paris, France, to elaborate their future relationship within the framework of the new Council. The attendees discussed the role of GeoUnions in the Council and future collaboration with social science unions/associations. Also, they considered several proposals for the new initiatives mentioned in the ISC General Assembly's documents: namely, the future of scientific publishing, artificial intelligence and machine learning, science and the making of sustainable urban living, indigenous and local knowledge systems, mental health, science education, and collaborative research for the 21<sup>st</sup> century. The meeting's participants considered also the possibility of mapping the GeoUnions' scientific interests onto the Sustainable Development Goals (SDGs) in order to identify common goals and targets and to put forward new initiatives contributing to the SDGs. It was agreed that representatives of the GeoUnions should meet to discuss new initiatives in more detail. ISPRS extended an invitation to GeoUnions to hold the next Steering Committee meeting in Istanbul, Turkey.

### **Gi4DM 2018 Conference**

Gi4DM 2018 Conference was organized by the International Society for Photogrammetry and Remote Sensing (ISPRS) in Istanbul, Turkey from 18 to 21 March 2018, and co-sponsored by IUGG, the International Union of Radio Sciences (URSI), International Geographical Union (IGU), and International Cartographic Association (ICA). The conference addressed diverse topics related to methodologies and technologies within a unique platform keeping participants up to date with the latest advances in geoinformation applicable to disaster management. In total, there were 133 participants from many countries of the world; 77 papers were presented at 13 oral sessions, and 19 papers were selected for poster presentations. The sessions provided a unique platform for wider discussions on disaster risk reduction and management. On 18 March, a day-workshop on "Application-based Approach to Disaster Management and the Role of Radar Remote Sensing" was organized with 29 participants, who were introduced to theory and applications related to radar remote sensing in disaster management. The Opening Ceremony of the Conference was held on 19 March. Participants of the conference were welcomed by Orhan Altan, principal organizer of the conference; Paul Cannon, Immediate Past President of URSI; Christian Heipke, President of ISPRS; and Osman Alp, President of the Turkish General Command of Mapping of the Ministry of National Defense. Plenary talks were delivered by Deren Li on "Ten Years of Persistence Hard Working - Chinese Natural Disaster Monitoring, Assessment and Emergency Response System Based on Remote Sensing";

Alik Ismail-Zadeh on “Science-based Geohazard Risk Reduction”; Ed Parsons on “Disasters or Disaster Management in the age of Ambient Location”; and Steven Ramage on “Disaster Risk Reduction: The Sendai Framework and the GEO Work Programme”. Two best poster awards were presented to Aikaterini Karagianni, Ilias Lazos, and Alexandros Chatzipetrosvon of the Aristotle University of Thessaloniki for the paper “Remote sensing techniques in disaster management: Amynteon mine landslides, Greece” and Duygu Akyürek, Öykü Koç, Ece Miray Akbaba, and Filiz Sunar of the Istanbul Technical University for the paper “Land Use/Land Cover Change Detection Using Multi-Temporal Satellite Dataset: A Case Study In Istanbul New Airport”. The next Gi4DM will be held in Prague, Czech Republic, in September 2019 (Reported by Orhan Altan, co-organizer of the Conference).

## COOPERATION WITH INTERNATIONAL AND INTERGOVERNMENTAL ORGANIZATIONS

### IUGG becomes an IPCC Observer Organization

At the 47<sup>th</sup> Session of the International Panel on Climate Change (IPCC) held in Paris, France from 13 to 16 March 2018, the Panel accepted by consensus the accreditation of the IUGG as an Observer Organization. This accreditation will strengthen the Union’s contribution to the Panel’s activities, and allow the Union to provide direct input to the IPCC process by nominating experts to participate in scoping meetings for assessment and special reports.



*At the 47<sup>th</sup> session of the IPCC (photo: International Institute for Sustainable Development)*

The IPCC is currently in its sixth assessment cycle and will be delivering policy-relevant reports every year from 2018 to 2022, except for 2020. The first of these reports, the IPCC Special Report on Global Warming of 1.5°C, will be delivered in October 2018 as per the request of the 2015 United Nations Climate Change Conference (COP21). In 2019, the IPCC will update its methodologies in order for countries to report their emissions in line with the Paris Agreement on the basis of the best science. Two other special reports on land and on oceans will also be delivered in 2019. The Special Report on the Ocean and Cryosphere in a Changing Climate will assess new knowledge related to sea-level risks and options for increasing coastal resilience in both human and natural systems. It will look at water from the mountain top to the sea. During the Sixth Assessment Cycle, the IPCC will also assess many



topics related to life on land including desertification, sustainable land management and food security in a Special Report on Climate Change and Land. The full Sixth Assessment Report, including three working group contributions on different aspects of climate change ready in 2021, will be completed with a Synthesis Report in 2022.

During the meeting in Paris, IPCC celebrated its 30<sup>th</sup> anniversary. The IPCC was launched in 1988 to assess the scientific results related to climate change by providing periodic assessment reports. Bert Bolin, a distinguished meteorologist and IUGG Bureau Member (1963-1967), was instrumental in arguing for the establishment of the IPCC; he believed that the World Climate Research Programme (WCRP) and the International Geosphere-Biosphere Programme (IGBP) should coordinate the science related to climate, its variability and change, but the scientific results should be assessed independently. Many IUGG scientists contributed to assessment reports by IPCC, and several of them shared the Nobel Peace Prize awarded to IPCC in 2007.

### **Report on the Forty-Eighth Session of the IPCC**

The 48<sup>th</sup> Session of the Intergovernmental Panel on Climate Change (IPCC-48) and the First Joint Session of IPCC Working Groups I, II, and III took place at the Songdo Convensia, Incheon, Republic of Korea, from 1 to 6 October 2018. Jianping Li, Vice-Chair of IUGG Union Commission of Climatic and Environmental Change (CCEC), attended the sessions as an IUGG representative. IUGG has observer status in this intergovernmental panel. The opening ceremony of the Session was held on 1 October. The following people addressed the Session's delegates: Hoesung Lee, Chair of the IPCC; H.E. Moon Jae-in, President of Republic of Korea (via a video message); Elena Manaenkova, Deputy Secretary-General, World Meteorological Organization; Jian Liu, Acting Director, Chief Scientist, United Nations Environment Programme; Youssef Nassef, Director of Adaptation Programme, United Nations Framework Convention on Climate Change (UNFCCC); H.E. Kim Eunkyung, Minister of Environment of the Republic of Korea; Kim Jong-seok, Administration of Korea Meteorological Administration; and Park Nam-chun, Mayor of Incheon Metropolitan City. The main agenda topic was the approval of the Summary for Policymakers (SPM) of the IPCC Special Report on Global Warming of 1.5°C (SR15) and the acceptance of the underlying report. This IPCC Special Report addresses the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty. After intensive discussion and some work on re-wording of the SPM, the session adopted the SPM. The document contains four parts: (i) Understanding Global Warming of 1.5°C; (ii) Projected Climate Change, Potential Impacts and Associated Risks; (iii) Emission Pathways and System Transitions Consistent with 1.5°C Global Warming; and (iv) Strengthening the Global Response in the Context of Sustainable Development and Efforts to Eradicate Poverty. In addition, IPCC-48 accepted decisions on the IPCC Scholarship Programme and on the Ad Hoc Task Group on Financial Stability. It was decided that IPCC-49 would take place in May 2019 in Kyoto, Japan, and the Session should approve the 2019 Refinement of the 2006 Guidelines on National Greenhouse Gas Inventories. As this was the first time that IUGG attended IPCC Annual Meetings as an observer, it is important to mention that participation by the IUGG liaisons to IPCC can help the Union to understand better the latest progress and new actions of IPCC and to shape the Union's activities in the research area of climate and its variability. (Reported by Jianping Li, CCEC Vice-Chair.)

### **IAHS contributes to UN water-related programs**

The *World Water Development Report* (WWDR2018) was presented at the 8th World Water Forum held in Brasilia, Brazil on 19 March 2018. The International Association of Hydrological Sciences (IAHS) of IUGG contributed to the report as an official partner of UN Water. The WWDR2018 demonstrates how nature-based solutions (NBS) offer a vital means of moving beyond business-as-usual to address many of the world's water challenges while simultaneously delivering additional benefits vital to all

aspects of sustainable development. NBS for water are central to achieving the 2030 Agenda for Sustainable Development because they generate social, economic and environmental benefits, including human health and livelihoods, food and energy security, sustainable economic growth, decent jobs, ecosystem rehabilitation and maintenance, and biodiversity. Although NBS are not a panacea, they will play an essential role towards the circular economy and in building a more equitable future for all. The full version of the report and presentation can be found at UNESCO-IHP website: <http://www.unesco.org/new/en/natural-sciences/environment/water/wwap/wwdr/2018-nature-based-solutions/>

*The International Decade for Action: Water for Sustainable Development 2018-2028* was launched on 22 March 2018 (the World Water Day) by the United Nations. IAHS is member of the Task Force set up by UN Water to facilitate the planning and organisation of the Decade (<http://www.wateractiondecade.org/>). The new Decade will focus on the sustainable development and integrated management of water resources for the achievement of social, economic and environmental objectives and on the implementation and promotion of related programmes and projects, as well as on the furtherance of cooperation and partnership at all levels in order to help to achieve internationally agreed water-related goals and targets, including those contained in the 2030 Agenda for Sustainable Development.

# ACTIVITIES OF THE UNION ASSOCIATIONS

The following reports, prepared by the Secretaries General of the eight Associations of IUGG:

International Association of Cryospheric Sciences (IACS)  
International Association of Geodesy (IAG)  
International Association of Geomagnetism & Agronomy (IAGA)  
International Association of Hydrological Sciences (IAHS)  
International Association of Meteorology & Atmospheric Sciences (IAMAS)  
International Association for the Physical Sciences of the Oceans (IAPSO)  
International Association of Seismology and Physics of the Earth's Interior (IASPEI)  
International Association of Volcanology and Chemistry of the Earth's Interior (IAVCEI)

illustrate the impressive range of activities within each Association as well as their dedication to supporting science within developing countries.

# International Association of Cryospheric Sciences (IACS)



IACS website: [www.cryosphericciences.org](http://www.cryosphericciences.org)

*This report covers the period from February 2018 to January 2019.*

## INTRODUCTION

The International Association for Cryospheric Sciences (IACS) is the Association of the International Union of Geodesy and Geophysics (IUGG) that is concerned with snow and ice science and which provides expert advice on cryospheric issues to governmental and non-governmental organisations. The objectives of IACS are to:

- Promote studies of cryospheric subsystems of the Earth and solar system.
- Encourage research in the above subjects by members of the cryospheric community, national and international institutions and programmes, and individual countries through collaboration and international co-ordination.
- Provide an opportunity on an international basis for discussion and publication of the results of the above research.
- Promote education and public awareness on the cryosphere, and facilitate the standardisation of measurement or collection of data on cryospheric systems and of the analysis, archiving and publication of such data.

## ADMINISTRATION

A Bureau of 11 elected officers manages the business of IACS. The current IACS Bureau was elected at the IACS Plenary Administrative Meeting during the 26<sup>th</sup> IUGG General Assembly in Prague. It consists of *Regine Hock* (President), *Charles Fierz* (Immediate Past President), *Andrew Mackintosh* (Secretary General), *Stanislav Kutuzov* (Vice President, replaced Olga Solomina in May 2018), *Cunde Xiao* (Vice President), *Ian Allison* (Vice President), *Hiroyuki Enomoto* (Head, Sea Ice, Lake and River Ice), *Christine Schott Hvidberg* (Head, Planetary and other ices of the solar system), *Liss Marie Andreassen* (Head, Glaciers and Ice Sheets), *Ethan Greene* (Head, Snow and Avalanches), *Valérie Masson Delmotte* (Head, Cryosphere, Atmosphere and Climate), and *Anais Orsi* (Deputy Head, Cryosphere, Atmosphere and Climate).

To run the 'daily' business, the IACS Executive Committee (EC) consisting of President, Secretary General and Immediate Past President/President Elect holds regularly teleconferences, in which all Bureau members are welcome to join.

## ACTIVITIES

### IACS Individual Membership

In 2017, IACS established free individual membership. We now have 500 members, who have signed up in under two years. We hope that individual membership is helping to create a stronger community around IACS, promoting its activities and its relationship with IUGG and its other seven constituent associations. Specifically, IACS members receive regular information about IACS activities and opportunities, and are eligible to engage in IACS activities and bodies. This includes the possibility of receiving IACS sponsorship and financial support for workshops, training schools, and other IACS-sponsored activities, as well as for the IACS early-career scientist prize (if members qualify). More information about IACS membership can be found [here](#). Everybody is welcome to join, including members of other IUGG associations.

### New IACS website, Twitter account, and home for our archives

In early 2019, IACS launched a completely redesigned website <https://cryosphericsscience.org>, culminating from months of work. Hosted by the World Glacier Monitoring Service in Zurich, the new website is both more functional, modern and aesthetically pleasing, and we invite you to explore it. The website also displays IACS Twitter feed, from the IACS Twitter handle launched in September 2017. See <https://twitter.com/iacscryo>. Together, the website and twitter presence are helping to connect IACS to a larger community of engaged scholars and the public.

IACS archival documents were also recently moved from the National Snow and Ice Data Center in Boulder, Colorado, to their new home at the World Glacier Monitoring Service in Zurich, Switzerland (who are also now hosting our website).

### IACS Bureau Meeting, and POLAR2018 conference

The IACS bureau held its annual bureau meeting in Davos, Switzerland, during the POLAR2018 conference in July 2018. The bureau meeting was held over two days, and was attended in person by 4 bureau members, and via video link by a further four members including the President and Secretary General. The meeting ran remarkably well in this format and we intend to mimic it in later meetings, to better accommodate people's busy work schedules, home responsibilities, and to minimise greenhouse-gas impacts associated with air travel.

*From Entering the Field to Taking the Helm, Perspectives of Women in Polar Research" convened at the POLAR2018 conference on 20th June 2018 and supported by IACS. More than 300 participants representing 32*

*countries engaged in a vibrant, interactive dialog with the five panelists Susan Barr, HongKum Lee, Chandy Nath, Morgan Seag and Colleen Strawhacker (photo: S. Curtin).*

### IACS bureau members working on Intergovernmental Panel on Climate Change report

In 2018, a team of six IACS officers, present and past, have been writing the Intergovernmental Panel on Climate Change Special Report on the Oceans and Cryosphere in a Changing Climate. IACS officers attended two Lead Author meetings (in Quito, Ecuador and Lanzhou, China), and spent several intense months writing the report as part of the larger international team. The roles that IACS officers have played are as follows; IACS Head of Division IV Valerie Masson Delmotte is Co-Chair of IPCC Working Group I. IACS President Regine Hock is Coordinating Lead Author of Chapter 2 'High Mountain Regions'. IACS Secretary General Andrew Mackintosh is Lead Author of Chapter 3 'Polar Regions'. IACS Division III head Hiroyuki Enomoto is Lead Author of Chapter 1 'Framing and Context of the Report'. IACS Vice President Xiao Cunde is Review Editor for Chapter 3 'Polar Regions'. Former IACS President Georg Kaser is Review Editor for Chapter 2 'High Mountain Regions'.



*IACS Bureau members present and past and 'Yaks'. From left to right, Andrew Mackintosh, Ian Allison, Regine Hock, Hiroyuki Enomoto and Georg Kaser. The field trip was during the International Workshop on Cryospheric Changes and their Regional and Global Impacts, Dunhuang China, from July 31 - August 1, 2018. This followed the 3rd IPCC Lead Author meeting for the Special Report on the Cryosphere in a Changing Climate in Lanzhou, China, attended by several IACS Bureau members.*

### Working and Standing Groups

IACS facilitates the transfer of research methods and explores new avenues in cryospheric science through Standing Groups and Working Groups devoted to a theme or subject and composed of experts in the particular field of study. The currently active Working Groups (WG) of IACS are the *Randolph Glacier Inventory and Infrastructure for Glacier Monitoring Working Group* (2014-2019), the *Glacier Ice Thickness Estimation Working Group* (2014-2019) and the *Debris Covered Glaciers Working Group* (2018-2022). More information on all of our Working Groups can be found [here](#).

- The Randolph group was the first to provide a globally comprehensive glacier inventory; in 2017, it released version 6.0 of its database (<https://doi.org/10.7265/N5-RGI-60>). The inclusion of Randolph Inventory data into the GLIMS (Global Land Ice Measurements from Space) database is now complete, and the working group collaborates closely with the World Glacier Monitoring Service (WGMS; an IACS Service).

- The IACS Working Group on Glacier ice thickness has been extremely successful, and has just had its second scientific output published in the leading journal [Nature Geoscience](#).
- The debris cover working group was established in late 2018. Many global mountain ranges currently support debris-covered glaciers, and the proportion of the glacierized surface that is debris covered is expected to increase under future climate change. The overarching aim of the debris-covered glaciers working group is to advance our understanding of how debris impacts glacier response to climate at the local, regional, and global scale. This is a necessary precursor to accurately represent debris-covered glaciers in models of regional runoff and sea-level change projections.

The current Standing Groups (SG) are the *Joint Commission on Volcano-Ice Interactions* (with the International Association of Volcanology and Chemistry of the Earth's Interior - IAVCEI), *Glacier and Permafrost Hazards in Mountains* ([GAPHAZ](#), a joint SG with the International Permafrost Association IPA), and the *Steering Committee of the Global Terrestrial Network for Glaciers* (GTN-G). GAPHAZ also links IACS to the IUGG Union Commission on GeoRisk (M. Krautblatter is our representative). For a recent high-profile GAPHAZ output, please see their 2018 [Nature Geoscience paper](#) about a catastrophic glacier collapse in Tibet.

### Meetings and symposia

IACS supports events that are of interest to the cryospheric community. Our contributions are either to cover part of the travel costs of attendees (early career scientists and scientists from developing countries) or towards IACS awards for scientists in these categories. Recent sponsorships are listed below:

- *From Entering the Field to Taking the Helm; Perspectives of Women in Polar Research*. Panel Discussion at Polar2018 Meeting in Davos (15-26 June 2018). The panel discussion involved > 300 participants from 32 countries.
- *International Summer School in Glaciology*. IACS (along with IUGG) supported this summer school held in the small Alaskan village of McCarthy from June 5-15, 2018. The summer school was convened by IACS President Regine Hock, and included nearly 30 students from 25 universities and more than a dozen countries including Nepal, India, Peru and New Zealand.
- *International Workshop on Cryospheric Changes and their Regional and Global Impacts*, Dunhuang China, from July 31<sup>st</sup> to August 1<sup>st</sup>, attended by more than 200 scientists from around the world. IACS supported the early-career scientist prizes.
- *4th Nordic Workshop on Cosmogenic Nuclides*, 4-6 June 2018; Landscape development and geohazards. IACS supported participation by early-career scientists.
- *4th Snow Science Winter School* at Col du Lautaret, France, from 11-17 February 2018. IACS supported an early-career scientist to attend.

### IACS early career scientist award

- These prizes will be presented at bi-annual scientific assemblies (IACS, and IUGG General Assemblies). Information about the 2016 awardees can be found [here](#). The next round of awards will be made in time for the 2019 Montreal IUGG General Assembly (deadline March 1<sup>st</sup>, 2019).

## **FUTURE ACTIVITIES**

### 27<sup>th</sup> IUGG General Assembly, Montreal

IACS is looking forward to participating in the GA in Montreal, where we will support around 30 cryosphere-related symposia including many joint with other IUGG associations. All IACS bureau

positions (except for President) will be renewed, we will hold the IACS dinner known as *Festa Cryospherica*, and the winner of the IACS Early Career prize will be announced.

IACS have began planning for a joint meeting with IAMAS and IAPSO (MOCA-21) to be held in the Northern Hemisphere summer of 2021 in Busan, South Korea.

#### New Working Groups

We are currently looking to develop new Working Groups within IACS, particularly in Division I (Snow and Avalanches), Division III (Sea Ice, Lake and River Ice) Division IV (Cryosphere, Atmosphere and Climate) and Division V (Planetary and other Ices of the Solar System). IUGG Montreal will provide an opportunity for IACS Bureau members to develop new working group ideas within our community.

#### IACS sponsorship of forthcoming meetings

- ALERT Conference 2019 in Aussois, France (Workshop "Computational Methods in Snow and Avalanche Release Mechanics". IACS will support attendance by two early career researchers.

Andrew Mackintosh, IACS Secretary General



# International Association of Geodesy (IAG)



IAG website: [www.iag-aig.org](http://www.iag-aig.org)

## INTRODUCTION

Geodesy is the discipline that deals with the measurement and representation of the Earth (geometry, physics, and temporal variations). The mission of the International Association of Geodesy (IAG) is the advancement of geodesy by furthering geodetic theory through research and teaching, by collecting, analysing, modelling and interpreting observational data, by stimulating technological development, and by providing consistent, time-dependent geometric and physical parameters for global change research.

The structure of IAG comprises a number of components: four Commissions, the Inter-Commission Committee on Theory (ICCT), thirteen International Scientific Services, the Global Geodetic Observing System (GGOS), and the Communication and Outreach Branch (COB). The Commissions are divided into Sub-commissions, Study Groups and Working Groups. The ICCT investigates scientific geodetic problems in close cooperation with the Commissions. The Services generate scientific products by means of Operation, Data and Analysis Centres. One of the roles of the GGOS is the coordination of the different IAG components, related in particular to the maintenance of global reference frames for measuring and consistently interpreting global change processes, and to promote its use to the scientific community, policy makers and the public. The COB provides communication, public information and outreach links, in particular via the IAG Website and the monthly Newsletters.

The IAG General Assembly, the Council, the Executive Committee, and the Office carry out the administration of IAG. The Council is composed by the delegates appointed by the national adhering bodies; the Bureau comprises the IAG President, Vice-President and Secretary General; the Executive Committee consists of 16 elected members; and the Office assists the Secretary General in fulfilling his duties. The COB is the office responsible for the promotional activities of the IAG and the communication with its members. The detailed programme of the IAG is published in the quadrennial Geodesist's Handbook, and reports are published in the bi-annual IAG Reports (Travaux de l'AIG).

## ADMINISTRATION

### IAG Council

The IAG Office and the COB keep close contact to the Council by e-mails, Newsletters and publications. Council delegates and EC officers gain free access to IAG's Journal of Geodesy published by Springer.

## **IAG Executive Committee (EC)**

The EC held two meetings in 2018, in Vienna, Austria, April 13, and in Washington, DC, USA, December 10. Most important topics were the IAG strategy, the establishment of inter-association components (commissions or sub-commissions) a new service and product centre, and the preparation of the General Assembly 2019 including the appointment of a Nomination Committee for IAG Officers for the period 2019-2023 and a Review Committee for the Statutes and Bylaws. The EC meeting summaries are available at <https://iag.dgfi.tum.de/en/meeting-summaries/>.

## **IAG Bureau**

The IAG Bureau discussed the day-to-day decisions by e-mail exchange and met in person before the EC meetings. It decided, e.g., on IAG representations at external events and on travel award applications of young scientists for participation and presentation at IAG sponsored Symposia (see below).

## **IAG Office**

The IAG Office managed the current work of the Association including the finances, the activities concerning the IUGG, the IAG EC and Bureau, and the regular contact with the IAG components. The Secretary General started the organisation of the General Assembly in Montreal, Canada within the IUGG 2019 Scientific Program Committee. Minutes of the Council and EC meetings were written for internal use, and meeting summaries published at the IAG Homepage and in the IAG Newsletter (see COB below). The individual IAG membership and travel awards for young scientists were handled.

# **ACTIVITIES**

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

The four IAG Commissions (Reference Frames, Gravity Field, Earth Rotation and Geodynamics, Positioning and Applications), the Inter-Commission Committee on Theory (ICCT), and the thirteen Services maintain their individual websites (all accessible via the IAG Homepage). They held business meetings at several occasions (in general coinciding with AGU and EGU assemblies), and organised symposia and workshops together with their sub-components (Sub-Commissions, Working and Study Groups, and Coordinating Boards, Directing Boards or Governing Boards, respectively; see below).

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

The GGOS revised its general structure and updated its terms of reference correspondingly. At the annual GGOS Days from October 2 to 4, 2018 in Tsukuba, Japan, the GGOS Consortium (made up by representatives of the IAG Components) and the Coordinating Board (the elected decision making body) held their administrative meetings. The GGOS Bureaus (Networks and Observations, and Products and Standards) and the four GGOS Focus Areas (Unified Height Systems, Geohazards, Sea Level Change, and Geodetic Space Weather Research) presented their activities.

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

Main activities of the COB were the publication of the monthly Newsletters (distributed by e-mail and published in the Journal of Geodesy), and the maintenance of the IAG Homepage ([www.iag-aig.org](http://www.iag-aig.org)). The IAG Newsletter is sent to the IAG officers and individual members, to the Presidents and Secretaries General of the IUGG and its Associations, and to the sister societies (FIG, ICA, ISPRS etc.).

## Important Meetings of IAG Components and IAG Sponsored Meetings in 2018

- International Review Workshop on Satellite Altimetry Cal/Val Activities and Applications, Chania, Greece, April 23-26, 2018;
- EUREF Symposium 2018, Amsterdam, Netherlands, May 30 - June 01, 2018;
- 10th IVS General Meeting, Longyearbyen, Spitsbergen, Norway, June 3-8, 2018;
- 1st Workshop of the International Geodynamics and Earth Tide Service (IGETS), Potsdam, Germany, June 18-20, 2018;
- IX Hotine-Marussi Symposium on Mathematical Geodesy, Rome, Italy, June 18-22, 2018;
- 42nd COSPAR Scientific Assembly including IAG Commission 1 Symposium, July 14-22, 2018;
- IAG Commission 1 Symposium Reference Frames for Applications in Geosciences (REFAG2018), Pasadena, CA, USA, July 15-21, 2018;
- 8th UN-GGIM Session, New York, USA, August 1-3, 2018;
- XXXth General Assembly of the IAU, Vienna, Austria; August 20-31, 2018;
- 19th General Assembly of WEGENER, Grenoble, France, September 10-13, 2018;
- Gravity, Geoid and Height Systems (GGHS 2) Symposium, Copenhagen, Denmark, September 17-21, 2018;
- International DORIS Service (IDS) Workshop, Ponta Delgada, Azores, Portugal, September 24-26, 2018;
- GGOS Days 2018, Tsukuba, Japan, October 2-4, 2018;
- SIRGAS Symposium 2018, Aguascalientes, Mexico, October 9-12, 2018;
- SIRGAS Workshop on Vertical Reference System, Mexico, October 15-17, 2018;
- IGS 2018 Workshop, Wuhan, China, October 29 - November 2, 2018;
- International Workshop on GNSS Ionosphere (IWGI2018), Shanghai, China, November 4-6, 2018;
- 21<sup>st</sup> Workshop on Laser Ranging, Canberra, Australia, November 5-9, 2018.



*Attendees of the EUREF Symposium, Amsterdam, Netherlands, May 30 – June 1, 2018*



*Attendees of the IX Hotine-Marussi Symposium, Rome, Italy, June 18-22, 2018*



*Attendees of the Workshop on Hydrogeodesy, Wuhan, China, June 29-30, 2018*



*Attendees of the SIRGAS Symposium, Aguascalientes, Mexico, October 9-12, 2018*



*Attendees of the 21<sup>st</sup> Laser Ranging Workshop, Canberra, Australia, November 4-9, 2018*

### **Cooperation with other Organisations**

IAG maintains close cooperation with several organisations outside IUGG: Advisory Board on the Law of the Sea (ABLOS, presently with IAG presidency), Group on Earth Observation (GEO), ICSU Commission on Space Research (COSPAR, Sub-commission B2 and PSD), International Astronomical Union (IAU, Commission A2, with IAG presidency), International Standards Organisation (ISO, TC211 Geographic Information / Geomatics), United Nations Initiative on Global Information Management (UN-GGIM), United Nations GGIM Geospatial Societies (UN-GGIM-GS), United Nations Offices for Outer Space Affairs (UNOOSA, with Space-based Information for Disaster Management and Emergency Response, UN-SPIDER, and International Committee on Global Navigation Satellite Systems, ICG).

### **Individual IAG membership**

By the end of 2018, there were 176 regular members and 31 student members.

### **Publications**

The main publications in 2018 were the monthly issues of the Journal of Geodesy and the IAG Symposia Series (Vols. 147: Earth and Environmental Sciences for Future Generations and 148: International Symposium on Gravity, Geoid and Height Systems).

### **Awards, Anniversaries, Obituaries**

Travel awards with a total amount of US\$ 15000 were granted to 16 young scientists for participating and presenting research results at 8 IAG sponsored Symposia. 6 obituaries were published for former IAG officers and associates who passed away in 2018. The IAG President and Secretary General represented IAG in various symposia, meetings and anniversaries.

## FUTURE ACTIVITIES

Main activities in 2019 concern the preparation of the IAG symposia at the IUGG General Assembly in Montreal, Canada, the IAG strategy discussion with the IAG Council, the new structure of the IAG 2019-2023, and the cooperation in the Subcommittee on Geodesy of the United Nations Committee of Experts on Global Geospatial Information Management (UN-GGIM).

The strategy discussion, described in the strategy document 2019, lists visions and options that may lead to a revision of the present Statutes and Bylaws. Eventual changes must be formulated in order to have them approved by the IAG Council at the General Assembly 2019. The new structure of the IAG shall include inter-association commissions or sub-commissions, i.e. with IASPEI and IAVCEI.

IAG is represented in the UN-GGIM permanent Subcommittee on Geodesy. The main activity is the implementation of the Global Geodetic Reference Frame (GGRF). IAG strives to base the objectives on the IAG position paper, which is stating the geometric, gravimetric and height reference frames as the three principal components of the GGRF ([https://iag.dgfi.tum.de/fileadmin/IAG-docs/GGRF\\_description\\_by\\_the\\_IAG\\_V2.pdf](https://iag.dgfi.tum.de/fileadmin/IAG-docs/GGRF_description_by_the_IAG_V2.pdf)).

Hermann Drewes, IAG Secretary General

# International Association of Geomagnetism and Aeronomy (IAGA)



International Association  
of Geomagnetism and Aeronomy

IAGA website: [www.iaga-aiga.org](http://www.iaga-aiga.org)

## INTRODUCTION

**IAGA**, the International Association of Geomagnetism and Aeronomy (AIGA - Association Internationale de Géomagnétisme et d'Aéronomie) is one of the eight Associations of the International Union of Geodesy and Geophysics (IUGG). It is a non-governmental body funded through the subscriptions paid to IUGG by its Member Countries. IAGA has a long history and can trace its origins to the Commission for Terrestrial Magnetism and Atmospheric Electricity, part of the International Meteorological Organisation, which was established in 1873.

IAGA is the premier international scientific association promoting the study of terrestrial and planetary magnetism, and space physics. IAGA is concerned with the understanding and knowledge that result from studies of the magnetic and electrical properties of:

- the Earth's core, mantle and crust
- the middle and upper atmosphere
- the ionosphere and the magnetosphere
- the Sun, the solar wind, the planets and interplanetary bodies.

## ADMINISTRATION

Since 2015, IAGA is organised in six Divisions and four Inter-divisional Commissions, each led by a Chair and a Co-Chair. Each Division may form Working Groups in given specialised topics and elects officers to run the business of the Working Groups. During the XXVI IUGG General Assembly in Prague (2015), IAGA renewed its officers. The links below lead directly to lists of the Division/Inter-divisional Commission leadership and the Working Group names and officers: <http://www.iaga-aiga.org/about/>

IAGA is administered by an [Executive Committee](#) on behalf of IUGG [Member Countries](#) in accordance with the Association's Statutes and By-Laws. The current Executive Committee members are:

**President:** Eduard Petrovsky (Czech Republic)

**Vice-President:** Monika Korte (Germany)

**Secretary General:** Mioara Manda (France)

**Members:** Inez Batista (Brazil), Archana Bhattacharyya (India), Brian J. Fraser (Australia), Pieter Kotze (South Africa), Renata Lukianova (Russia), Alan Thomson (UK), and Andrew Yau (Canada).

IAGA communicates with Member Countries through National Correspondents nominated by appropriate national bodies. Member Countries are represented at IAGA Assemblies by accredited Chief Delegates who may vote on matters, according to the voting rules set out in the Statutes and By-Laws, at meetings of the Conference of Delegates. Information on the EC members and National Correspondents are found at: <http://www.iaga-aiga.org/about/>

## ACTIVITIES

### Sponsored Topical Meetings

IAGA sponsored several topical meeting during 2018. The main achievements are published in the last IAGA newsletters. The list of meetings are provided:

14-18 May	10th workshop on “Long-Term Changes and Trends in the Atmosphere”	Anhui, China	Jia Yue
2-6 July	7th Vertical Coupling Atmosphere-Ionosphere System	Potsdam, Germany	Koucká Knížová
24-29 June	18th Workshop on Geomagnetic Observatory (summer school)	Muggendorf, Austria	Roman Leonhard
19-23 March	8th workshop of the VLF/ELF RS of Iono Magnetosphere (VERSIM)	Apatity, Russia	Boris Kozelov
12-19 August	24th Electromagnetic Induction	Helsingør, Denmark	Stephan Thiel
18 - 24 Feb	IAU Symposium 340 - long term datasets	Jaipur, India	Dipankar Banerjee
10-16 June	16th Paleo, Rock and Environmental Geology	Chechyn, Poland	Tomasz Werner
28 May - 8 June	Coronal and Interplanetary Shocks: Data Analysis from SOHO, Wind, and e-CALLISTO Data	Mekelle, Ethiopia	Gebregiorgis Abraha
22 -26 October	15th ISEA International Symposium on Equatorial Aeronomy	Ahmedabad, India	Duggirala Pallamraju
9-13 July 9 - 13	SCOSTEP 14th Quadrennial Solar-Terrestrial Physics Symposium	Toronto, Canada	Marianna Shepherd
24-28 Sept	16th HAC Hvar Astrophysical	Zagreb, Croatia	Domagoj Ruzdjak

### Publications

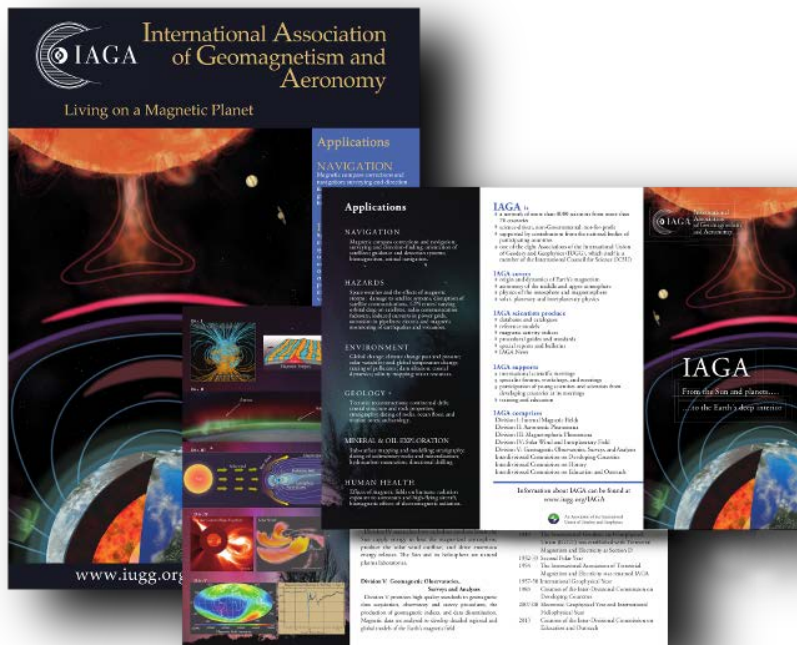
*IAGA Newsletters 55*

The last issue of IAGA Newsletters was distributed. It can be downloaded from the IAGA website [www.iugg.org/IAGA](http://www.iugg.org/IAGA).

*IAGA Flyer and Poster*

The version of the IAGA flyer is also available.





## FUTURE ACTIVITIES

2019 seems to be a successful and productive year for IAGA. The IUGG General Assembly programme is looking strong, varied and inviting.

The IUGG General Assembly in Montreal will give us the opportunity to celebrate the 100th anniversary of international cooperation in Earth and Space sciences. In addition to the IUGG Assembly, some other activities are planned. The most important will be the book “Geomagnetism, Aeronomy and Space Weather: A Journey from the Earth’s Core to the Sun” (edited by Mioara Manda, Monika Korte, Andrew Yau and Eduard Petrovský), to be published by the Cambridge University Press. This book includes contributions by top world researchers in geomagnetism, aeronomy and space weather. To celebrate the centenary, a paper will be published in HGSS (“Major role of IAGA in Understanding our Magnetic Planet” by Mioara Manda and Eduard Petrovský).

During 2019 IAGA will be involved in organising a few topical meetings.

Mioara Manda, IAGA Secretary General

# International Association of Hydrological Sciences (IAHS)



IAHS website: <http://iahs.info>

## INTRODUCTION

IAHS promotes the study of all aspects of hydrology through discussion, comparison, and publication of research results and through the initiation of research that requires international cooperation. IAHS Press publishes the Hydrological Sciences Journal, the Proceedings of IAHS (PIAHS, open access, successor of the Red Book Series), the Benchmark Paper series, and other specialised publications. IAHS maintains strong connections with the International Hydrological Programme of UNESCO and with the Hydrology and Water Resources Programme of the World Meteorological Organisation (WMO), and is partner of the UN Water coordination mechanism.

The following International Commissions, Working Groups and Initiative of IAHS conduct conferences, symposia, workshops, courses, and research programmes:

- International Commission on Continental Erosion (ICCE)
- International Commission on the Coupled Land-Atmosphere System (ICCLAS)
- International Commission on Groundwater (ICGW)
- International Commission on Remote Sensing (ICRS)
- International Commission on Snow and Ice Hydrology (ICSIH)
- International Commission on Statistical Hydrology (ICSH)
- International Commission on Surface Water (ICSW)
- International Commission on Tracers (ICT)
- International Commission on Water Quality (ICWQ)
- International Commission on Water Resources Systems (ICWRS)
- Working Group MOXXI on Measuring and Observing in the XXIst century
- Working Group CANDHY on Citizens AND HYdrology
- Working Group on Education
- Decadal Initiative Panta Rhei 2013-2022.

## ADMINISTRATION

Cate Gardner (UK) ended her transitional commitment as Treasurer and Kate Heal (UK) became the new Treasurer. Stacey Archfield (USA) joined as co-editor of Hydrological Sciences Journal.

The IAHS bureau set up a permanent mechanism to support early career scientists from disadvantaged countries to attend IAHS conferences, named SYSTA, after Murugesu Sivapalan (Sri Lanka, USA); as well as an Early Career Committee composed of one representative from every commission and chaired by Nilay Dogulu (Turkey); and a committee for Africa.

## ACTIVITIES

Highlights of 2018 are the following stand alone conferences:

- Panta Rhei Symposium on comparative socio-hydrology of floods, droughts and water management, Beijing, China, 26-28 April
- Remote sensing and Hydrology Symposium of ICRS, Cordoba, Spain, 8-10 May
- 8<sup>th</sup> International Water Resources Management Conference of ICWRS, Beijing, China, 13-15 June
- Summer school on PUB, Vienna, Austria, 1-6 July
- 2018 ICCE Symposium, Moscow, Russia, 27-31 August
- 4<sup>th</sup> IAHR-WMO-IAHS Training course on stream gauging, 2-4 September
- STAHY 2018 International workshop on Statistical Hydrology, Adelaide, Australia, 24-26 September
- International Symposium of Eco-hydrology and water security, Xi'an, China, 16-18 October
- 3<sup>rd</sup> IAHS International Conference in developing countries – Enhanced hydrological understanding for a better society, Harare, Zimbabwe, 25-27 October

and the following co-organized/sponsored conferences and sessions at other events:

- Panta Rhei and thematic sessions at the EGU Assembly, Vienna, Austria, 8-13 April
- UNESCO FRIEND International Conference on African Large River Basin Hydrology, Algiers, Algeria, 6-9 May
- 19<sup>th</sup> Waternet Symposium, Livingstone, Zambia, 31 October – 2 November



*IAHS Panta Rhei Conference, Harare, Zimbabwe*

A pivotal event of this inter-assembly year has been the IAHS strong involvement in the WMO Conference for Prosperity through Hydrological Services (HydroConference), in WMO Headquarters, Geneva, Switzerland, 7-9 May. The annual Prize ceremony was held on this occasion. Andreas Schumann (Germany) and Howard Wheater (UK, Canada) have been awarded the IAHS-UNESCO-WMO International Hydrology Prize, respectively the Volker and Dooge medals. Ryan Bailey (USA) and Saman Tavakoli Kivi (Iran) received the Tison Award for young scientists.

IAHS Press published Hydrological Sciences Journal *HSJ* in cooperation with Taylor and Francis, with stable performance indicators. Promotion by “features articles” continues, with details disseminated in press releases and via IAHS social media. Featured articles and Tison Award papers are made free to view. All papers in volumes more than two years old automatically become open access. Any other paper can be open access, on Author’s paying principle.

No special issues were included in *HSJ* vol. 63, and three have been launched:

- *Hydrological change in Chinese rivers*
- *Hydrological data: Opportunities and barriers*, in cooperation with WMO and UNESCO, and
- *Advancing socio-hydrology: a synthesis of coupled human-water systems across disciplines*.

A third joint editorial has been published in ten major hydrological journals including *HSJ* and *PIAHS*, with a focus on innovation and impacts of scientific publications:

- Quinn N. et al., 2018. Joint Editorial – Invigorating hydrological research through journal publications. *HSJ*, 63 (8), 1113 – 1117.

The continuation of the Panta Rhei initiative is well under way with a coordinating team for the 2017-2019 biennium, stand alone and joint events. Two papers were published in the Panta Rhei virtual series in *HSJ* and nine discussion and reply articles have been published on previous papers, in the frame and the spirit of the Panta Rhei opinion series.

Five volumes of the open access *PIAHS* have been published in 2018, in cooperation with Copernicus:

- Volume 376, *Water security and the food-water-energy nexus: drivers, responses and feedbacks at local to global scales*
- Volume 377, *Water quality and sediment transport issues in surface water*
- Volume 378, *Understanding spatio-temporal variability of water resources and the implication for IWRM in semi-arid eastern and southern Africa*

the latter three as follow ups of the 2017 IAHS Scientific Assembly in Port Elizabeth, South Africa ; and:

- Volume 379, *Innovative water resources management – Understanding and balancing interactions between humankind and nature*, out of the ICWRS conference in Beijing
- Volume 380, *Earth observation for integrated water and basin management: New possibilities and challenges for adaptation to a changing environment*, out of the ICRS conference in Cordoba

We coordinated the corporate process to identify a list of Unsolved Problems of Hydrology, led by Günter Blöschl, President (Austria), relying on an online forum, meetings and a Symposium in April within EGU assembly and in Vienna TU, articulation with IAH - AGU - EGU divisions of hydrology, and the collective writing of an agenda setting article to be published in *HSJ*.

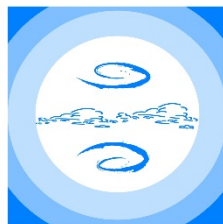
The close cooperation of IAHS with UNESCO, WMO and the UN Water mechanism has been continued. We have contributed to the World Water Development Reports WDRR 2018 (Nature-based solutions) and 2019 (Noone behind – preparatory meeting in Perugia, Italy), the UN-Task Force on Water and Climate; and attended the UNESCO IHP Bureau meeting and the intergovernmental council meeting (Paris, France), the WMO CHy Advisory Working Group Meeting (Geneva, Switzerland), the WMO HydroHub Innovation committee meetings (Geneva Switzerland, and remote), UN Water meetings (Roma, Italy, and remote), the HLPF meeting on progress of Agenda 2030 including Sustainable Development Goal 6 on Water (UN Headquarters, New York, USA). We have accompanied UNESCO IHP in the transition of the Kovacs colloquium towards the SPIC – Science Policy Interface Colloquium and provided a keynote on its first edition in June (Paris, France).

## **FUTURE ACTIVITIES**

Important preparations have been made for the IUGG 2019 General Assembly and IAHS programme therein in Montreal, Canada.

Christophe Cudennec, IAHS Secretary General

# International Association of Meteorology and Atmospheric Sciences (IAMAS)



IAMAS

International Association of Meteorology and Atmospheric Sciences

IAMAS website: [www.iamas.org](http://www.iamas.org)

## INTRODUCTION

IAMAS is the specialized association of the International Union of Geodesy and Geophysics (IUGG) that deals with all aspects of the gaseous envelope around the Earth and other planets. The main research work is carried out, coordinated and communicated through IAMAS's ten International Commissions (IC), which are in alphabetical order the:

- International Commission on Atmospheric Chemistry and Global Pollution (ICACGP)
- International Commission on Atmospheric Electricity (ICAE)
- International Commission on Climate (ICCL)
- International Commission on Clouds and Precipitation (ICCP) including the Committee on Nucleation and Atmospheric Aerosols (CNAA)
- International Commission on Dynamical Meteorology (ICDM)
- International Commission on the Middle Atmosphere (ICMA)
- International Commission on Planetary Atmospheres and their Evolution (ICPAE)
- International Commission on Polar Meteorology (ICPM)
- International Ozone Commission (IOC)
- International Radiation Commission (IRC)

All the ICs, and IAMAS as a whole, play a leading role in global coordination, communication and discussion of the latest research through organization of and participation in a wide range of scientific meetings that are open to all scientists.

## ADMINISTRATION

The 2018 physical meeting of the Bureau was held over 5-6 April 2018 at the British Antarctic Survey, Cambridge, UK, hosted by the IAMAS President John Turner. The Bureau discussed important issues relating to the management of IAMAS, including finances, the website, revisions of the statutes, and the production of an IAMAS Strategic Plan that would consider developments over the next few years. It was envisioned that the plan would consider possible new commissions, outreach via social media and other means, links with other organizations, improving the regional presence of IAMAS and engagement with early career scientists. The plans for future activities such as the IUGG 2019 assembly and the 2019 officer elections were also considered. The positions of President (2019-2023), Secretary General (2019-2027), two Vice-Presidents (2019-2023), and two Members-at-Large (2019-2027) will be open for election at the upcoming General Assembly in Montreal.



*IAMAS Bureau Members (from left): Steven Ackerman, Deputy SG; John Turner, President; Joyce Penner, Vice President; Athena Coustenis, Past President; Laura G. Klenner, Vice President; Teruyuki Nakajima, Secretary General.*

## ACTIVITIES

### The IAMAS Facebook presence and Early Career Scientists articles:

The IAMAS SG Office has launched a new IAMAS Facebook “Page” to provide valuable information, including the latest issue of IAMAS Newsletter, introduction of Early Career Scientists, their activity report and upcoming events more frequently. A special program is a series of articles featuring Early Career Scientists. To date, the SG Office has posted seven articles on the Facebook Page.

<https://www.facebook.com/IntAssociationMeteorologyAtmosphericSciencesIAMAS/>

### Publications:

*Advances in Atmospheric Sciences* (AAS)—the IAMAS associated journal

- Report on IAMAS Activity since 2015 and the IAPSO-IAMAS-IAGA Scientific Assembly—Good Hope for Earth Sciences
- The 12th Workshop on Antarctic Meteorology and Climate
- IAMAS president John Turner is a guest editor of ongoing special issue “Antarctic Meteorology and Climate: Past, Present and Future”, to be published in early 2020.

### **Highlights from the IAMAS International Commissions**

#### **ICACGP** (<http://www.icacgp.org/>)

iCACGP co-hosted the joint 14th iCACGP Quadrennial Symposium and 15th IGAC Science Conference in Takamatsu, Japan, in September 2018, which celebrated the 60th anniversary of the establishment of the Commission. Special activities included a keynote presentation on the history of iCACGP by Ian Galbally, and awarding of the inaugural Paul Crutzen Early Career Award to Manabu Shiraiwa. The Commission implemented new procedures for the transparent selection of commission members, developed a comprehensive succession plan and elected the new commission officers for 2019-2022. The commission also supported the 2018 Joint Early Career Course at the 14th iCACGP Quadrennial Symposium and 15th IGAC Science Conference and the School of Atmospheric Measurements in Latin America and the Caribbean: Atmospheric Particles in November 2018 in Puerto Rico.

**ICAE** (<http://icae.jp/>)

ICAE successfully held the 16th International Conference on Atmospheric Electricity over June 17-22 2018 at Nara, Japan. Nearly 200 scientists from all over the world attended and over 250 presentations were given at the conference.

**ICCL** (<http://www.iccl-iamas.net/>)

ICCL organized Session AS1-27-CL4-06 "The global monsoons in current, future and palaeoclimates and their role in extreme weather and climate events" at EGU 2018 in Austria, Session AS50 "Interactions Between Indo-pacific Ocean and Asian Monsoon" at AOGS 2018 in USA, and Session 4 "Influences of WPO on regional and global climate systems and their predictability" at 3rd Open Science Symposium on Western Pacific Ocean Circulation and Climate in China. Prof. Jianping Li, ICCL Executive Secretary-General and CCEC Vice-Chair, attended the 48th Session of the Intergovernmental Panel on Climate Change (IPCC-48) and the 1st Joint Session of Working Groups of the IPCC in October 2018 in Korea as the representative of IUGG. Dr. Qiuzhen Yin, ICCL member, received the Early Career Scientist Awards of IUGG.

**ICCP** (<http://www.iccp-iamas.org/>)

A workshop aimed at enhancing the understanding and at homogenizing/standardizing software algorithms that are used to derive cloud microphysical properties from airborne in-situ cloud probes was held in July 2018 at the University of British Columbia, Vancouver, British Columbia, Canada. This workshop was the 4th in a series and was sponsored by the International Commission on Clouds and Precipitation (ICCP), IUGG and IAMAS.

**ICDM** (<http://icdm.atm.ucdavis.edu/ICDM.html>)

ICDM added three new members (R. Caballero; S.-W. Son, S.; N. Žagar) and one member rotated off. The commission co-sponsored five Joint and seven IAMAS symposia for the 27th IUGG Assembly. The President assisted in developing the IAMAS Strategic Plan document. The commission promoted IAMAS and IUGG support for 'The 8th GEWEX Science Conference: Extremes and Water on the Edge' held in Canada on 6-11 May 2018. The commission also promoted the application for IAMAS and IUGG support for the first Multi-scale transport and exchange processes in the atmosphere over mountains – programme and experiment (TEAMx) workshop to be held in Italy on 28-30 August 2019.

**ICMA** (<http://icma.iaa.es/>)

ICMA sponsored two workshops; the 10th "Long-Term Changes and Trends in the Atmosphere" workshop, Hefei China in May 2018 and the 4th International "Antarctic Gravity Wave Instruments Network" (ANGWIN) Workshop, São José, Brazil in April 2018. ICMA is organizing two IAMAS-only symposia (M06 and M07) at IUGG2019 and is co-organizing a few other symposia with IAGA and IACS. ICMA has been awarded sponsorship for the "Atmospheric circulation in a changing climate - DynVarMIP" workshop to be held in October 2019, Madrid, Spain.

**IOC** (<http://www.io3c.org/>)

A scientific symposium for the celebration of 30th anniversary of the Montreal Protocol was held in France in September 2017, with the theme "From the safeguard of the ozone layer to the protection of the Earth climate". The proceedings were recently published in a special issue of Comptes-rendus Geosciences (<https://www.sciencedirect.com/journal/comptes-rendus-geoscience/vol/350/issue/7>). The International Ozone Commission provides strong support for continuation of long-term ozone observations.

**ICPAE** (<http://icpae.iaps.inaf.it/>)

ICPAE endorsed a proposal for funding of student travel support for the 74th Fujihara seminar, "International Conference on Venus" held in Niseko, Hokkaido, Japan during 11-14 September 2018. The conference covered all areas of Venus science with special focus on new results obtained from Japan's Venus Climate Orbiter "Akatsuki".



**ICPM** (<http://www.icpm-iamas.aq/>)

The 13th Workshop on Antarctic Meteorology and Climate (WAMC), co-hosted by the ICPM, was held in Madison, Wisconsin, USA, in July 2018. It included a session on the Year of Polar Prediction (YOPP). With support from IAMAS, the ICPM funded young scientists to attend the workshop. In June 2018, an overview of the 12th WAMC was published in *Advances in Atmospheric Sciences*. The ICPM is looking forward to the 100th IUGG Assembly and is co-hosting several sessions.

**IRC** (<http://www.irc-iamas.org/>)

The International Radiation Commission (IRC) Business Meeting 2018 was held on 10 July 2018 in Vancouver, Canada, in conjunction with the American Meteorological Society Radiation conference. At the meeting, the venue for the next quadrennial International Radiation Symposium, IRS2020, was decided. We are happy to announce that IRS2020 will be hosted by Aristotle University of Thessaloniki, in Thessaloniki, Greece, from 6-10 July 2020. IRC held discussions on how the current IRC Working Groups can be reformulated and what areas of atmospheric radiation research can be identified for initiating new working groups. The IRC made a resolution to pursue efforts of reformulating the Working Groups until IRS2020.

## FUTURE ACTIVITIES

IAMAS will hold a special symposium - Celebrating 100 years of IAMAS 1919 - 2019 - Past, Present and Future (M25) at the IUGG 2019 General Assembly in Montreal, Canada. All the commissions are engaged in the planning of the next IUGG General Assembly. IAMAS will lead ten joint sessions:

ID	Title of symposium
JM1	Adapting in the Anthropocene (Featuring of 'Anthropocene')
JM2	Anthropogenic changes in chemistry and physics of the Atmosphere: evidence and attribution studies
JM3	Advances and Frontier Challenges in Global Monsoon Studies: Dynamics, Convection and Interactions with Hydrological and Land Surface Processes
JM4	Hydrometeorologic and coastal extremes in current and future climates
JM5	Ocean-atmosphere mechanisms of variability, change and predictability
JM6	Recent advances in regional climate modelling
JM7	Artificial Intelligence and Big data in weather and climate science
JM8	Earth System Models: Assessing the Earth System's State and Fate from Regional to Planetary Scales
JM9	Satellite Remote Sensing: Vital Information on the Health of our Planet
JM10	Atmospheric Water Generation

IAMAS Bureau meetings will be held on 7th and 11th July, 2019.

The IAMAS Scientific Assembly 2021, MOCA 2021, will be held in Busan, South Korea in collaboration with IAPSO and IACS. Its organizing meeting will be held at the IUGG GA by the IAMAS bureau and the LOC.

Teruyuki Nakajima, IAMAS Secretary-General

# International Association for the Physical Sciences of the Oceans (IAPSO)



International Association  
for the Physical Sciences of the Oceans

IAPSO website: <http://iapso.iugg.org>

## INTRODUCTION

IAPSO has the prime goal of 'promoting the study of scientific problems relating to the oceans and the interactions taking place at the sea floor, coastal, and atmospheric boundaries insofar as such research is conducted by the use of mathematics, physics, and chemistry.' IAPSO works mainly through 1) biennial scientific assemblies; 2) working groups; 3) commissions; 4) services and 5) website information. Of special importance to IAPSO is the involvement of scientists and students from developing countries in oceanographic activities.

IAPSO maintains formal liaison with other scientific commissions and committees. These include the ICSU's Scientific Committee on Oceanic Research (SCOR), and UNESCO's Intergovernmental Oceanographic Commission (IOC).

For more information see <http://iapso.iugg.org/>.

## ADMINISTRATION

The 2015-2019 Bureau of IAPSO comprises:

President: Denise Smythe-Wright, (UK)  
Past President: Eugene Morozov, (Russia)  
Secretary General: Stefania Sparnocchia (Italy)  
Treasurer: Ken Ridgway (Australia)

The Executive Committee comprises the Bureau members and

Vice-Presidents: Dr Isabelle Ansorge (South Africa)  
Trevor McDougall (Australia)  
Members: Dr Agatha de Boer (Sweden)  
Dr Hans van Haren (The Netherlands)  
Prof Toshiyuki Hibiya (Japan)  
Dr Christa von Hildebrandt-Andrade (USA and Puerto Rico)  
Dr Chris Meinen (USA)  
Dr Satheesh Chandra Shenoi (India)

The IAPSO office is located at the Institute of Marine Science of the National Research Council of Italy, Trieste and day-to-day business is managed by Secretary General (SG), Stefania Sparnocchia. The SG is responsible for the IAPSO website and in July, 2015 a new IAPSO page was created in the Facebook social network, with the aim of facilitating the spreading of information in the community (see <https://www.facebook.com/iapso.iugg.org>). Together with the President, the SG also prepares and distributes a bi-annual Newsletter to IAPSO delegates and interested parties.

Financial management is presently split between Australia and Sweden. The previous Secretary General, Johan Rodhe, was co-opted by the IAPSO executive to assist the Treasurer, Ken Ridgway, with day to day banking until the Assembly in Montreal, Canada, in 2019.

IAPSO business meetings were conducted by email.

## ACTIVITIES

### 2019 Assembly

The principal activity during 2018 was preparing for the IUGG 2019 General Assembly to be held in Montreal, Canada, from 8 to 18 July, 2019. The Secretary General has been active in the planning process and participated in several video conference of the Scientific Programming Committee and attended in-person a meeting in Vienna, Austria, on 8 April, 2018. IAPSO is sponsoring or co-sponsoring 31 symposia covering a wide range of topics. The program details can be found on the Assembly's website: <http://www.iugg2019montreal.com/p.html>

### IAPSO Early Career Scientist Working Group

An important initiative during 2018 was the establishment of the IAPSO Early Career Scientist Working Group. As one of the leading international associations in ocean physics and chemistry, IAPSO will provide a significant platform for early career scientists to network and integrate into the scientific community. In November 2017, the President invited expressions of interest in setting up such a network and three suitable candidates were identified at the end of January 2018 and have been asked to take the initiative forward. Alejandra Sanchez-Franks (United Kingdom) is chairing the WG with the vice-chairs Robert Graham (Norway) and Malin Ödalen (Sweden).

The Terms of References of this group are:

1. To form an IAPSO early career network; one that will be open to anyone that self identifies as an early career scientist in physical or chemical sciences of the oceans. Using the IAPSO website and social media, an IAPSO early career network will allow early career scientists to follow IAPSO developments, while also sharing opportunities and experiences.
2. To provide advice from the early career network to the IAPSO executive committee, and to communicate key agenda points resulting from the IAPSO directive back to the IAPSO early career network.
3. To maximize impact and connectivity of the IAPSO early career network by liaising with other national and international networks (e.g. AGU, EGU, IIOE-2, Challenger Society, etc.).
4. To organize early career events at bi-annual IAPSO assemblies that may include mentoring, outreach activities, and maximizing networking between early career scientists and senior researchers. In turn this will increase visibility of the IAPSO bi-annual assemblies to the early career network and optimize attendance.
5. To promote diversity as actively as possible and to create awareness on the associated gaps/challenges and discrimination that currently exist.

The first IAPSO ECS networking event is scheduled during the IUGG 2019 General Assembly.

### **Prince Albert I Medal 2019**

The Prince Albert I Medal is an award offered by the Foundation Rainier III of Monaco to a scientist who has made outstanding contributions to the enhancement and advancement of the physical and/or chemical sciences of the oceans. It is awarded every two years to a most prominent scientist chosen by a specially appointed IAPSO Award Committee.

The Secretary General called for nominations for the 2019 award on 7 July, 2018. Nominations were accepted until 6 October, 2018. The Award Committee was appointed following the protocol (<http://iapso.iugg.org/awards-and-honors/the-prince-albert-i-medal25.html>) and was chaired by Trevor McDougall (IAPSO Vice-President, Australia). The Members of the Committee were Isabelle Ansorge (past Chair, IAPSO Vice-President, South Africa), Lynne Talley (2017 medalist, USA), Sabrina Speich (France) and Rik Wanninkhof (USA). The selection procedure is lasting until January 2019. The Prince Albert I Medal 2019 will be presented during the IUGG 2019 General Assembly.

### **IAPSO Early Career Scientist Medal 2019**

The IAPSO Early Career Scientist Medal was established this year by the IAPSO Executive Committee and will be awarded for the first time during IUGG 2019. The Medal honours Early Career Scientists for their outstanding research in the physical or chemical sciences of the oceans, and for their cooperation in international research. It will be presented by the IAPSO President, every two years, at the biannual IAPSO Assembly, where the Awardee will be expected to give a talk on a scientific topic of their choice. Financial assistance to attend the Assembly will be available. The Secretary General called for nominations for the 2019 award on 1 October, 2018 and nominations will be accepted until 31 January, 2019.

### **SCOR Administration**

IAPSO has maintained its formal relations with SCOR during the year. The EC members were involved in the evaluation of the 2018 Working Group proposals and the President, Denise Smythe-Wright participated in the SCOR Annual Meeting in Plymouth, UK, 4-7 September 2018.

While much of the business centered around reports from current SCOR working groups and affiliated organizations, substantial time was devoted to the evaluation of nine working group proposals submitted for the 2018 round of funding. The IAPSO President presented the IAPSO views alongside those of other organizations and after robust discussion it was decided to fund two proposals:

- Active Chlorophyll fluorescence for autonomous measurements of global marine primary productivity. See <https://scor-int.org/group/156> for further details
- Toward a new global view of marine zooplankton biodiversity based on DNA metabarcoding and reference DNA sequence databases (MetaZooGene). See <https://scor-int.org/group/157/> for further details

### **IUGG/IAPSO support to scientific meetings**

IAPSO endorsed three scientific meetings that were supported by IUGG in 2018:

- The **2<sup>nd</sup> IndOOS Review Workshop** was held in Jakarta, Indonesia from 21 to 23 March, 2018. The goal of IndOOS (Indian Ocean Observation System) is to provide sustained high-quality oceanographic and marine meteorological measurements to support knowledge-based decision

making through improved scientific understanding, weather and climate forecasts, and environmental assessments. The review seeks critical assessment of what is working well and what is not with the present Indian Ocean observing system, and advise on fruitful future directions for IndOOS. The workshop consisted of 25 review presentations based on the IndOOS review chapter, along three themes: Operational drivers; IndOOS components and new technologies; and Science drivers for future IndOOS. This was followed up by a review board session and break-out session, which brought out the key recommendations for the future IndOOS that will be considered by the review board. IUGG funds were used towards travel expenses for one scientist from India to attend the workshop that gathered 40 participants

- The **International Conference ‘Understanding the Problems of Inland Waters: Case Study for the Caspian Basin’**, held in Baku, Azerbaijan, from 12 to 14 May 2018. The conference was organized by the Institute of Geography of the Azerbaijan National Academy of Sciences and the Inter-Islamic Science and Technology Network on Oceanography. The aim of the conference was to increase the exchange and cooperation between different international organizations and scientific teams (‘communities’) dealing with studies of the Caspian Sea, Aral Sea, and Urmia and Van lakes. About 140 scientists and students from more than 55 organizations, including about 50 delegates from foreign countries, including France, Germany, Iran, Italy, Russia, Switzerland, Turkey, Turkmenistan, and the USA, participated in the conference. In addition to the conference, IUGG funds were used to support the one-day International Student Workshop, organized on 11 May 2018, whose aim was to help students and early career scientists increase their knowledge of geoscience and on the application of remote sensing to studies of environmental problems related to the Caspian Basin. 31 students and young researchers and nine international and local experts specializing in remote sensing and geoscience lectured at the workshop.
- The **X Jornadas Nacionales de Ciencias del Mar** (Conference on Science of Seas), was hosted by the University of Buenos Aires, Argentina, and held from 30 July to 3 August 2018. The main goal of this conference was to create an adequate framework for the exchange of opinions among the various national and foreign experts, and to increase cooperation among professionals with the aim of understanding, assessing and solving problems related to the care of the marine environment. The program activities included conferences, courses, and presentations in oral sessions and panels, all of them covering an ample spectrum of subjects and points of view. Thematic areas addressed included diversity and conservation, populations and communities, ecosystems, natural and anthropogenic processes, renewable/non-renewable resources, climate change, geology, oceanography, education, and legal aspects. More than 800 people attended, including students, educators, and researchers belonging to institutes and universities from across Argentina. The meeting also had important international participation, with presentations by researchers or students from Belgium, Brazil, Canada, Chile, France, Uruguay, and the USA.



*Participants of the X Jornadas Nacionales de Ciencias del Mar, Buenos Aires, Argentina, 30 July - 3 August 2018 (photo: M. Saraceno).*

122 presentations were delivered in oral format, 413 as posters, and 8 as plenary lectures. Additionally, there were seven workshops, one six-hour course, and eight exhibition booths representing local and foreign universities, private companies, and government institutions. All abstracts were peer-reviewed before being accepted for presentation and will become a part of an electronic book. IUGG funds were used to support subsistence expenses of 90 registered students.

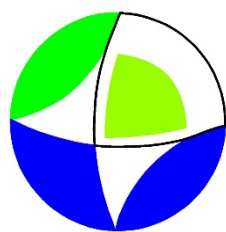
## **FUTURE ACTIVITIES**

The following activities are scheduled for 2019 and beyond:

- Participation in the 27th IUGG General Assembly, July 8-18, 2019, at the Palais des Congrès in Montréal, Québec, Canada.
- Participation in the 2019 SCOR Annual Meeting in Toyama, Japan, from 23 to 25 September 2019
- Organization of the next Joint Assembly with IAMAS and IACS in Busan, Republic of Korea, in 2021.

Stefania Sparnocchia, IAPSO Secretary General  
Denise Smythe-Wright, IAPSO President

# International Association of Seismology and Physics of the Earth's Interior (IASPEI)



IASPEI

International Association of Seismology  
and Physics of the Earth's Interior

IASPEI website: <http://iaspei.org>

## INTRODUCTION

The International Association of Seismology and Physics of the Earth's Interior (IASPEI) is the leading international association promoting studies in seismology, earthquake processes, and structure and ongoing geodynamical processes within the Earth's interior. IASPEI achieves its goals primarily through scientific conferences organized by IASPEI and its Commissions, but also sponsors other international initiatives, fosters international cooperation, both in monitoring of seismic sources and research, and education activities, especially in countries that are working towards full scientific development.

Most of the IASPEI efforts during 2018 were directed towards the General Assemblies of IASPEI's four Regional Commissions, which were sponsored by IASPEI and IUGG.

## ADMINISTRATION

### EC & Bureau meetings

The IASPEI Bureau met via phone conference in December 2016. Several e-mails regarding important questions on financial support or business to be solved immediately have been exchanged with the members of the Bureau and ExeCom throughout the year.

### Other matters

Website. The IASPEI website has the address <http://iaspei.org>.

Statutes. The statutes were not changed. IASPEI is registered as a Norwegian organization (Norwegian Org. Number 916 047 495).

Newsletters. IASPEI Newsletters have been regularly sent as pdf-file attachments to more than 3000 e-mail addresses. The Newsletters are also available for downloading from the IASPEI website. Five issues were distributed in 2018.

## ACTIVITIES

### Scientific Assemblies, Workshops/Symposia etc.

- The 2<sup>nd</sup> General Assembly of the African Seismological Commission (AfSC) was held in Al Hoceima, Morocco, 23 – 25 April 2018. The assembly had about 150 participants and was followed by three training courses on “Seismotectonics”, “Analysis of Seismic Signals” and “Usage of Radar Images” (26 – 27 April 2018).
- The 12<sup>th</sup> General Assembly of the Asian Seismological Commission (ASC) was held in Chengdu, China, 12 – 14 May 2018, jointly organized with the International Conference for the Decade Memory of the Wenchuan Earthquake, and as part of the 4<sup>th</sup> International Conference on Continental Earthquakes. The assembly had 1408 participants with 129 signing in with ASC as their affiliation. A pre-conference, four weeks long training course entitled “The North-Central Asian Earthquake Observation Techniques” was presented from April 16 to May 11, 2018.
- The 3<sup>rd</sup> General Assembly of the Latin America and Caribbean Seismological Commission (LACSC) had been planned to be in Puerto Rico, jointly with the Seismological Society of America (SSA). However, due to the devastating impacts of hurricanes Irma and Maria in September 2017, LACSC and SSA decided to move the meeting to Miami, USA, 14 – 17 May 2018. The assembly had 743 participants with 122 from LACSC countries.
- The 36<sup>th</sup> General Assembly of the European Seismological Commission (ESC) was held in Valletta, Malta, 2 – 7 September 2018. The assembly had 802 participants. The one-week Peter Bormann Young Seismologist Training Course, entitled “Array Seismology”, was organized before the assembly (27 – 31 August 2018).

*Participants of the 2nd AfSC General Assembly in Al Hoceima, Morocco, 2018 (photo: H. El Talibi)*



*Participants of the Closing Ceremony of the 12<sup>th</sup> ASC General Assembly in Chengdu, China, 2018 (photo: L. Li)*

*LACSC participants of the 3<sup>rd</sup> LACSC General Assembly and First LACSC-SSA Joint Meeting in Miami, USA, 2018 (photo: SSA).*



*Participants of the Peter Bormann Young Seismologist Training Course during the week before the 36<sup>th</sup> ESC General Assembly in Valletta, Malta, 2018 (photo: P. B. Mäntyniemi).*

### **Activities of Association Commissions, Working Groups, Divisions, Services etc.**

Some 2,000 hard copies of the first printed edition of the IASPEI New Manual of Seismological Observatory Practice (NMSOP, 2002) are currently being used in more than 100 countries at seismological observatories, data and analysis centers, and for teaching, research, and field applications. In addition, it is used as basic material within national and international seismology training courses, or by private enterprises and individual scientists. In 2014, a rigorously updated and amended electronic second edition, NMSOP-2, was completed and put online, thanks to the efforts of the late Peter Bormann. This version, as well as future ones, are professionally maintained, further developed and edited by the GFZ German Research Centre for Geosciences under a long-term commitment and the auspices of IASPEI and its Commission on Seismological Observation and Interpretation (CoSOI). All versions are freely available and downloadable from the web-site of the GFZ Library (<http://bib.telegrafenberg.de/publizieren/vertrieb/nmsop/>).

### **Scientific Programs, Projects, Publications**

The IDEA (International Digital Earthquake Archives) project of the Committee for Preservation of WWSSN and Historical Seismograms (also called *Seismoarchives: Seismogram Archives of Significant Earthquakes of the World*), continued its mission. The Incorporated Research Institutions for Seismology (IRIS) is archiving the scanned seismograms. During the General Assembly in Prague it was decided that Graziano Ferrari (Istituto Nazionale di Geofisica e Vulcanologia (INGV), Italy) takes over the IDEA Project from W.H.K. Lee.

## **Awards/Anniversaries/Obituaries**

*Awards.* The **IASPEI Medal** is awarded for distinguished contributions in seismology: for sustaining IASPEI goals and activities and for scientific merits in the field of seismology and physics of the Earth's interior. The Medal is awarded every 2<sup>nd</sup> year during the IASPEI Assemblies.

In 2016, the IASPEI Bureau established an IASPEI Early Career Scientist Award program aimed at engaging excellent young researchers in the IASPEI community. Each of the four IASPEI Regional Commissions was asked to select one Early Career researcher (graduate student, postdoctoral research, pre-tenure faculty member) from their commission at each even-year Assembly of that Regional Commission. In 2018, the first awards were given by the AfSC to Sofia Benamri, Morocco, by the LACSC to Esteban Chaves, Costa Rica and by the ESC to Roseanne Clement, UK.

*Obituaries* for prominent scientists were regularly published in the IASPEI Newsletters and on the IASPEI web-page.

## **FUTURE ACTIVITIES**

- In 2018, the main focus will be on the General Assemblies of the four regional commissions of IASPEI (AfSC, ASC, ESC, LACSC), which will be held in Morocco (April), China (May), USA (May) and Malta (September).
- Another main activity in 2018 will be preparational work for the 2019 Centennial General Assembly in Montreal, Canada.
- The 2021 Scientific Assembly of IASPEI is planned as a joint Assembly together with IAGA, which will be held in Hyderabad, India in August 2021.

Johannes Schweitzer, IASPEI Secretary General

# International Association of Volcanology and Chemistry of the Earth's Interior (IAVCEI)



International Association of Volcanology  
and Chemistry of the Earth's Interior

IAVCEI website: [www.IAVCEIvolcano.org](http://www.IAVCEIvolcano.org)

## INTRODUCTION

At the First General Assembly of IUGG (Rome, 1922), the *Section de Vulcanologie* became one of the constituent sections of the Union. This name was changed into *Association Internationale de Vulcanologie* at the Fourth General Assembly (Stockholm, 1930). It took its present name at the Moscow General Assembly (1971).

The IAVCEI is the primary international focus for research in volcanology and for efforts to mitigate volcanic disasters. Scientists also participate in IAVCEI research in closely related disciplines, such as igneous geochemistry and petrology, geochronology, volcanogenic mineral deposits, and the physics of the generation and ascent of magmas in the upper mantle and crust. Work is carried out in the following special Commissions:

- Chemistry of Volcanic Gases
- Cities and Volcanoes
- COSIV-Statistics in Volcanology
- Arcs Magmatism
- Collapse Calderas
- Explosive Volcanism
- Large Igneous Provinces
- Monogenetic Volcanism
- Remote Sensing
- Submarine Volcanism
- Tephra Hazard Modelling
- Volcanic Lakes
- Volcanic Hazards and Risk
- Volcanogenic Sediments
- Volcano Geoheritage and Protected Volcanic Landscapes
- Volcano Geology
- Volcano Geodesy
- International Volcanic Health Hazard Network
- Working Group on Volcano Acoustics
- World Organisation on Volcano Observatories

The members of the Executive Committee for the 2015-2019 term are:

President	Donald Bruce Dingwell	GERMANY
Secretary General	Roberto Sulpizio	ITALY
Vice-President	Patrick Allard	FRANCE
Vice-President	Shanaka Da Silva	USA
Immediate Past President	Raymond Cas	AUSTRALIA
Members	Eliza Calder	UK
	Jan Lindsay	NEW ZEALAND
	Michael Ort	USA
	Lizzette Rodriguez	PUERTO RICO

## ADMINISTRATION

### IAVCEI Executive Committee activities

- Revision of IAVCEI Finances, funding support, and potential funding sources and strategies.
- Update of the IAVCEI Commissions and Working Groups, conducted by the two Vice-Presidents and approved by the EC, in which active commissions have been identified and several inactive commissions have been deactivated.
- Creation of subdomains in the IAVCEIvolcano domain for hosting the commission’s websites.
- Continuous updating of website. Publication of a Facebook page and Twitter messages.
- Update of the Editorial Board of Bulletin of Volcanology.
- Creation of a sub-domain for BV in the IAVCEIvolcano domain.
- Revision and publication of rules for IAVCEI prizes and awards.

### Discussion on the current state of IAVCEI and its relationships with IUGG

- Adoption of the Principle of Freedom of Participation in Learned Societies following the submission of Proposal to Modernise IUGG and ICSU to IUGG and ICSU, focussing on adoption of self-governance of the associations;
- Agreement of the need to reintroduce compulsory individual membership fees along the lines of the AGU membership fee structure, to ensure the dramatic decline in financial reserves between end 2013 and 2014 is arrested.

## ACTIVITIES

### Members

In 2018 the IAVCEI membership remained stable with more than 1000 members, compared to the end of 2017. Among them, the life members are 100, around 600 regular members and around 300 student members.

### Website

After the complete redrawn of website in 2015, the refurbishment of IAVCEI website has been continued, and now the site contains more info about IAVCEI activity, structure and initiatives.

## Newsletters

Four issues of the newsletter "IAVCEI News" have been published through the website, during 2018.

## 2018 Meetings, workshops and courses

The following meetings, workshops, and courses have been (co-) organised or sponsored by one (or more) of the IAVCEI commissions in 2018:

- 7th International Maar Conference, May 21-28, 2018, Olot, Catalunya, Spain
- 1st IAVCEI/GVM Workshop "From volcanic hazard to risk assessment", 27 – 28 June 2018, Geneva, Switzerland
- 11<sup>th</sup> International AIV summer school, August 28-September 4, 2018, Bolsena, Italy
- IAVCEI COV10, September 2-7, 2018, Naples (Italy)
- 7th International Workshop on Collapse Calderas, September 21-28, 2018, Toba, Indonesia
- 1<sup>st</sup> IASPEI/IAVCEI Inter-Association Commission on "Volcano Seismology & Acoustics", September 29<sup>th</sup> – October 4<sup>th</sup>, 2018, La Réunion, France
- 7<sup>th</sup> International Post-graduate Course of Volcanology, 12-25 October 2018, Olot, Girona, Spain  
[http://www.gvb-csic.es/CURSO/CURSO\\_OLOT/Home.html](http://www.gvb-csic.es/CURSO/CURSO_OLOT/Home.html)



*Final ceremony at COV10, Naples*

## FUTURE ACTIVITIES

Foreseen activities for 2019:

- Publication of 4 IAVCEI newsletters;
- Revision of Commission activity and definition of minimum requirement for a commission to be considered active;
- Funding of workshops and meetings;
- Completion of IAVCEI website.

Meetings in 2019:

- IUGG meeting, July 8-18 2019, Montreal, Canada.
- 5th Volcanic Geology Workshop, Palmerston North and Ohakune (New Zealand) 25 February – 4 March 2019, [www.massey.ac.nz/iavcei2019](http://www.massey.ac.nz/iavcei2019)
- 12th International AIV summer school, September 2-9, 2018, Bolsena, Italy
- 8th INTERNATIONAL POST-GRADUATE COURSE IN VOLCANOLOGY (in Spanish), Date: Venue: Olot, Spain e-mail: [ageyertraver@gmail.com](mailto:ageyertraver@gmail.com), website: <http://www.gvb-csic.es/CURSO/Home.html>
- IAVCEI Developing Nations Network Working Group meeting: “Fostering developed-developing country partnerships for the advancement of global volcano science” 4-7 June 2019, University of the West Indies, St. Augustine Campus, Trinidad

Roberto Sulpizio, IAVCEI Secretary General

# ACTIVITIES OF THE UNION COMMISSIONS

The following reports illustrate the impressive range of activities within each Union Commission as well as their dedication to supporting science within developing countries. Each Union Commission has a website where much more information can be found.

## Union Commission on Climate and Environmental Change (CCEC)



CCEC website: [www.ccec-iugg.org](http://www.ccec-iugg.org)

### INTRODUCTION

The history and purpose of CCEC may be found on the CCEC website at: [www.ccec-iugg.org](http://www.ccec-iugg.org)

### ADMINISTRATION

Officers and members of the Commission may be found in the IUGG Yearbook. The Chair is Tom Beer (Australia), the Vice-Chair is Jianping Li (China) and the Secretary-Treasurer is Keith Alverson (USA).

CCEC Executive Committee Member and IUGG Fellow Eigil Friis-Christensen passed away on 21st September 2018 after severe illness. The October 2018 IUGG Newsletter published an obituary that notes, amongst other things, that “between 2007 and 2011 he served as President of IAGA and was a member of IUGG Executive Committee. Even after he had served his term as President of IAGA, he continued to represent IAGA on the Commission for Climatic and Environmental Change (CCEC), and was completing a chapter for the forthcoming CCEC book "Global Change and Future Earth" at the time of his death. Eigil's quiet and kind personality, combined with his dedication to science and his ability to inspire his younger colleagues and promote their individual careers, will be remembered by all who had the privilege to work with him. We have lost an outstanding scientist and a remarkable person.”

We offer our condolences to his family and friends.



## ACTIVITIES

### Global Change and Future Earth published

When the International Council for Science (ICSU) initiated its new program called “Future Earth” by amalgamating a number of its interdisciplinary research efforts ([www.futureearth.org/](http://www.futureearth.org/)), the main CCEC research effort was to examine how our activities could be included in Future Earth. We ran a series of symposia titled: Weather, Climate and Food Security, and persuaded the contributors to those symposia, as well as other leaders of international scientific unions, to write chapters for the third IUGG monograph that was published on 18 October 2018 as “Global Change and Future Earth: the geosciences perspective”.

Further information is available on the Cambridge University Press website at: <https://www.cambridge.org/core/books/global-change-and-future-earth/EC2EB6C188AF4915AABA5BF63B9F05EA>

If purchasing a copy, be aware that there is a 20% discount for IUGG members accessible through: <https://www.cambridge.org/au/academic/collections/iugg-members-page>

### 2018’s IUGG Centennial Celebration Activities in China (20-27 August 2018, Beijing & Lanzhou)

The Year 2019 is the 100th anniversary of IUGG. CCEC received funding from the IUGG Grants Program for activities under “2018’s IUGG Centennial Celebration Activities in China, 20-27 August 2018, Beijing & Lanzhou, China”, and collaborated with the Chinese National Committee for IUGG to organize successfully a high-level International Earth Sciences Summit, titled Earth Sciences and Sustainable Development. Through this summit, scientists and sustainable development managers together reviewed IUGG contributions globally and regionally using China, a big developing country as a case study, summarized the advantages of Earth Sciences and their role in serving society in a sustainable way, and summed up major challenges for the future.



*Closing Ceremony of the International Summit on Earth Sciences*

## **48th Session of the Intergovernmental Panel on Climate Change (IPCC-48)**

Prof. Jianping Li, CCEC Vice-Chair and ICCL Executive Secretary-General, attended the 48th Session of the Intergovernmental Panel on Climate Change (IPCC-48) and the 1st Joint Session of Working Groups I, II and III of the IPCC from 1 to 6 October 2018 at Incheon, Republic of Korea as the representative of IUGG and an observer in the sessions.

## **FUTURE ACTIVITIES**

### **Montreal General Assembly**

The website for the Montreal General Assembly in July 2019 has opened for abstract submission, registration, housing, and travel grants application (<http://iugg2019montreal.com/>). CCEC is coordinating Union Session U01 “Achieving Sustainable Development: The Role for Earth Sciences”. Speakers from all IUGG associations and earth systems disciplines whose work is relevant to measuring progress towards, or helping to achieve, sustainable development goals are expected to participate. CCEC is organizing several other symposia as well, including JM01 (IAMAS, IAHS, IACS) “Adapting in the Anthropocene”, JM03 (IAMAS, IAHS) “Advances and Frontier Challenges in Global Monsoon Studies: Dynamics, Convection and Interactions with Hydrological and Land Surface Processes” and M20 (IAMAS) “EL NIÑO/Southern Oscillation and its Regional and Global Impacts”.

CCEC will also hold a Business Meeting during the General Assembly to elect a new Executive.

Tom Beer, CCEC Chair

# Union Commission on Mathematical Geophysics (CMG)

## INTRODUCTION

During 2018 the commission organized and held the 32nd biennial CMG meeting in Nizhny Novgorod, Russia during June 23-28. The local organizing committee was affiliated with the Federal Research Center Institute of Applied Physics of the Russian Academy of Sciences (IAP RAS). The commission was also soliciting proposals for organizing the 33rd CMG meeting in 2020 and organizing the Union Symposium of the 2019 IUGG General Assembly.

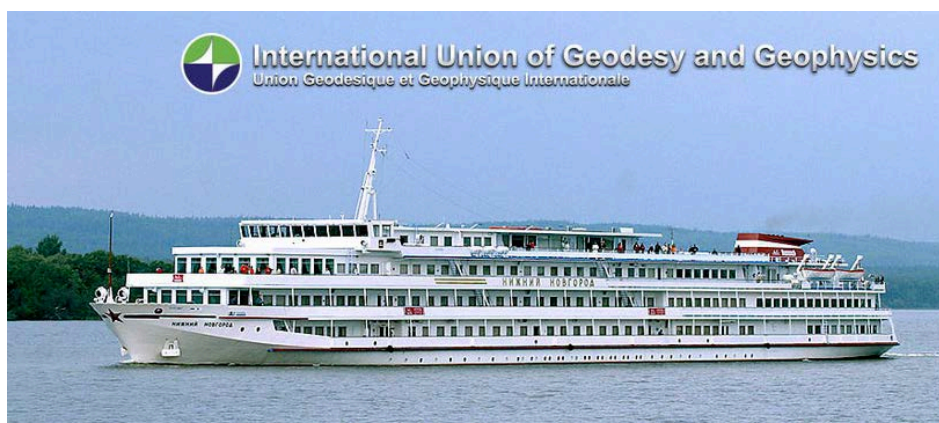
## ADMINISTRATION

*Membership.* The CMG membership remained the same in 2017. **Chair:** Yehuda Ben Zion (USA); **Vice-Chairs:** Einat Aharonov (Israel) and Claudia Pasquero (Italy); **Secretary:** Ilya Zaliapin (USA); **Past Chair:** Dan Rothman (USA).

## ACTIVITIES

### 32<sup>nd</sup> CMG biennial meeting 2018 in Nizhny Novgorod, Russia

The IUGG Commission on Mathematical Geophysics (CMG) held its 32<sup>nd</sup> meeting during June 23-28. The local organizing committee was affiliated with the Federal Research Center Institute of Applied Physics of the Russian Academy of Sciences (IAP RAS). The conference took place on a boat that cruised the Volga River with daily stops at historic sites. The meeting covered a range of current research topics in mathematical geophysics. The conference aimed at discussing key theoretical and observational aspects of solid earth, ocean, atmosphere, cryosphere, climate and other contemporary topics.



The scientific program included 8 special sessions: *Earth system modeling, Modeling and prediction of geophysical extremes, Global climate variability at different time scales, Mathematics of geophysical flows, Advances in analysis of continuous seismic and acoustic wavefields, Dynamics of earthquakes and faults, Computational Seismology and Geodynamics, and Mathematical modeling and Statistical Learning in Geosciences.* The meeting featured invited plenary talk by Alexey Gvishiani, Director of the Geophysical Center of Russian Academy of Sciences, member of the Scientific Coordinating Council of the Federal Agency of Scientific organizations of Russia (FASO) and the Expert Council of the Russian Scientific Foundation, titled “*Significant, strong and strongest earthquake-prone areas recognition: systems analysis aspects*”.

Each session included talks by several invited speakers, as well as contributed talks and posters. The participants presented 70 talks, including 23 invited, and 15 poster presentations. The meeting was

attended by over 70 researchers, postdocs, and students from 13 countries, including Russia (30), USA (14), Germany (5), France (4), and UK (4). The social program included a chamber music concert and multiple city tours.

#### *CMG 2018 Meeting participants*

Additional information and book of abstracts is available at <http://cmg2018.iapras.ru/>.

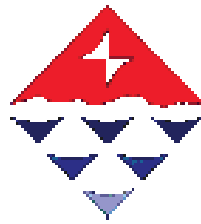
## **FUTURE ACTIVITIES**

The Commission is organizing the 33<sup>rd</sup> CMG meeting. During 2018, organization proposals have been solicited from five groups. The commission will discuss the proposals and select the winner in 2019.

The Commission is organizing the Union Symposium 03 “*Mathematics of Planet Earth: The Science of Data*” at the 27<sup>th</sup> General Assembly of IUGG that will take place in Montreal, Canada during July 8-18, 2019. Lead Convener: Ilya Zaliapin (CMG, USA) Co-Conveners: Yehuda Ben-Zion (CMG, USA), Malcolm Sambridge (IASPEI, Australia), Gordon Swaters (IAPSO, Canada), Shin-Chan Han (IAG, Australia). Scope: This symposium will highlight the elemental role that mathematical and statistical ideas play in the geosciences and encourage further research answering fundamental questions about our planet and dynamic environment. The symposium will showcase how different elements of Earth System science – including observations, data analysis, mathematical, physical, and computer modeling – facilitate a predictive understanding the Earth’s surface, interior, oceans and atmosphere. A particular focus will be on the emergence of data science and the ways artificial intelligence and machine learning play in data-driven geophysical knowledge discovery. The symposium will contribute to the international program Mathematics of Planet Earth. Invited Speakers: Felix Herrmann (Canada), Kenneth Golden (USA), Jurgen Kusche (Germany), Simon Papalaxiou (Canada), Anya Reading (Australia), Michel Stein (USA).

Ilya Zaliapin, CMG Secretary

# Union Commission on Geophysical Risk and Sustainability (GRC)



GRC website: [www.iugg-georisk.org](http://www.iugg-georisk.org)

## INTRODUCTION

The IUGG Commission on Geophysical Risk and Sustainability (IUGG GeoRisk Commission, or GRC) established by the IUGG Bureau in August 2000 is dedicated (i) to promoting scientific studies applied to the reduction of risk from natural hazards in an increasingly urbanized world and sustainability and (ii) to reducing death and destruction from natural and technological hazards by providing hazards data and information to emergency managers, policy-makers, scientists and the general public in the most timely and effective manner as possible. This includes the integration of knowledge concerning environmental, social and economic processes. The fundamental scope of this Commission is to facilitate communications between scientists via meetings, workshops and publications, as well as between scientists and decision makers, between scientists and the public, and between scientists and schools.

## ADMINISTRATION

The IUGG Bureau renewed the GRC Executive Committee on 1 November 2017. The current Executive Committee membership is:

**Chair:** John LaBrecque (IAG, USA)  
**Vice-Chair:** Vyacheslav Gusiakov (IAPSO, RUSSIA)  
**Vice-Chair:** Alan Thomson (IAGA, UK)  
**Secretary-Treasurer:** Paula Dunbar (IAPSO, USA)

### Members:

- **Past Chairs:**
  - Joan Marti (IAVCEI, SPAIN)
  - Kuniyoshi Takeuchi (IAHS, JAPAN)
- Mohsen Ghafory-Ashtiany (IASPEI, IRAN)
- Michael Krautblatter (IACS, GERMANY)
- Christa von Hillebrandt-Andrade (IAPSO, PUERTO RICO)
- Chun-Chieh Wu (IAMAS, CHINA: ACADEMY OF SCIENCES IN TAIPEI)

### Members in Active Advisory Capacity:

- Tom Beer (Honorary Member), IAMAS, Australia,
- Harsh Gupta (Advisory Board), IASPEI, India
- Alik Ismail-Zadeh (Honorary Member), IASPEI, Germany/ Russia
- Katia Kontar (Early Career Scientist Disaster Diplomacy), IACS, IAHS, USA
- Vladimir Kossobokov (Past GRC Vice Chair), IASPEI, Russia
- Gordon McBean (Advisory Board), IAMAS, Canada
- Ramesh P. Singh (Honorary Member), IASPEI, USA
- Linda Rowan (Advisory Board), IAG, USA

### Business Meeting:

No formal GRC business meeting was held during 2018 but regular interaction was held via email and other communications with the GRC Executive Committee and Advisory Committees. A formal business meeting is planned during the IUGG General Assembly 2019 in Montreal, Canada.

### Treasurers Report for 2018:

<b>IUGG Georisk Commission Cash Flow Report December 2018</b>			
<b>Date</b>	<b>\$ USD</b>	<b>\$ USD</b>	<b>Income - Allocations</b>
Dec 2017	4,764.10		Balance as of December 31, 2017
Nov 2018	10,000.00		IUGG 2018 allocation
	<b>\$14,764.10</b>		<b>Total Allocations</b>
			<b>Expenses</b>
May 2018		198.75	H. Jenkins, Webyclopedia 2018
May 2018		45.00	Wire fees for Webyclopedia
Nov 2018		10.00	Incoming Wire fee
		<b>\$253.75</b>	<b>Total Expenses</b>
<hr/>			
	<b>\$14,510.35</b>		<b>Balance as of December 31, 2018</b>

The GRC financial statement for 2018 reflects a \$10,000 allocation from the IUGG and a payment for the Webcyclopedia (the GRC website) as well as associated wire transfer fees. The balance as of April 1, 2019 is \$14510.35.

## **ACTIVITIES**

- The GRC participated in GTEWS 2017: GNSS Tsunami Early Warning Workshop in Sendai, Japan on July 25-27, 2017 co-sponsored by the IAG/GGOS, NASA, APRU, and the NEID of Tohoku University. The workshop explored the status and implementation of the GNSS Enhancement to Tsunami Early Warning as recommended by the 2015 IUGG General Assembly’s Resolution #4. Resolution #4 calls for the enhancement of “existing tsunami early warning systems with the augmentation of GNSS network observational systems. Resolution #4 recommends a focus upon the Pacific region because the high frequency of tsunami events constitutes a large risk to the region’s large populations and economies, by developing a prototype system, together with stakeholders, including scientific, operational, and emergency responders.

A report of the GTEWS 2107 workshop including presentation viewgraphs and videos can be accessed on the website of the Association of Pacific Rim Universities at:

<http://apru.org/resource/gnss-early-warning-report/>

- An updated report on GNSS Augmentation to Tsunami Early Warning as endorsed by the IUGG 2015 General Assembly Resolution #4 has been accepted for publication in the GAR-19 report of the UNISDR with an expected release date of May, 2019.
- The GRC participated in the development of an MOU with AGU-IUGG-US National Academy for jointly sponsored meetings on Disaster Science during AGU 2018 Fall meeting and the IUGG 2019 General Assembly. The two meetings are intended as commemorate the Centennial celebrations of the AGU and IUGG and their growing importance to insuring the safety and sustainability of global society.

- The GRC led the development of a Memorandum of Understanding between the IUGG and the Science Diplomacy Center, Fletcher School of Law and Diplomacy of Tufts University to strengthen our efforts to build a global society more resilient to natural disasters by fostering international collaborations among natural hazards experts, while simultaneously strengthening diplomatic ties between countries with shared risks.
- The GRC worked closely with the AGU and the US National Committee for Geology and Geophysics to organize and effect the **AGU-IUGG Centennial Symposium on Disaster Science: Risk Reduction, Resilience, Response, and Recovery**. The agenda, video recordings and a brief summary of the findings of the Centennial Workshop can be accessed here:

<https://www.dropbox.com/s/rsdr6jd1gg7lmnd/DisasterScienceSymposium%20Draft%20Summary.docx?dl=0>

Images from the AGU-IUGG Centennial Symposium on Disaster Science: Risk Reduction, Resilience, Response, and Recovery, December 9, 2018 during the American Geophysical Union's 2018 Fall Meeting:

*Welcoming introductions were presented at the AGU-IUGG Centennial Symposium on Disaster Science: Risk Reduction, Resilience, Response, and Recovery by Michael Sideris, President of the International Union of Geodesy and Geophysics and by Eric Davidson, President of the American Geophysical Institution. A stimulating keynote presentation by Marcia McNutt President of the National Academies of Science of the United States provided a strong introduction to the Workshop Agenda.*

*Panel on Science in Disaster Risk Appraisal and Management. Left to Right: Ester Sztein, Laura Kong, Carlo Doglioni, Alik Ismail-Zadeh, Susan Cutter, David Applegate, John LaBrecque (Meeting Moderator).*

*Panel on Science for Risk Reduction, Resilience and Response to Disasters. Left to Right: Diego Melgar, John Ludden, Timothy Dixon, Yekaterina Kontar, Leah Salditch, Seth Stein.*

*Panel on Dealing with Cascading Hazards That May Lead to a Regional or Global Disaster. Left to Right: Jay Wilson, Fernando Echavarria, Harold Magistrale, Anne Hoefler, Stephen McNutt, Linda Rowa.*

*Panel on Understanding the Societal Impact of Severe Weather. Left to Right: Efi Foufoula-Georgiou, Alice Hill, Stéphane Hallegatte, Bill Murtagh, Alan Thomson, Rick Murnane.*

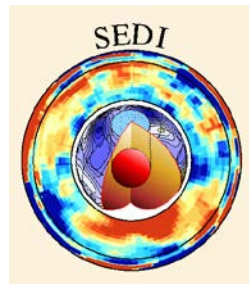
## **FUTURE ACTIVITIES**

The GRC is leading the development of the sequel joint AGU-IUGG-US National Academy meeting to be held as a daylong Union Symposium during the IUGG General Assembly in Montreal on July 14, 2019.

John LaBrecque, GRC Chair



# Union Commission on the Study of the Earth's Deep Interior (SEDI)



SEDI website: [www.sedigroup.org](http://www.sedigroup.org)

## INTRODUCTION

**SEDI** is an international scientific organization dedicated to the **Study of the Earth's Deep Interior**. The scope of SEDI includes the core and lower mantle, but interest may extend to the surface. The scientific questions and problems of interest to SEDI include: 1) the investigation of the origin, evolution, structure, geochemical and mineralogical composition of the inner core, outer core, mantle and crust, 2) the theoretical and observational investigation of core magnetohydrodynamics at all time scales, and the more general investigation of fluid rotational dynamics that can affect the core, 3) the investigation of mantle dynamics, both from a theoretical point of view and observational point of view, 4) the investigation of mechanical, electromagnetic, thermal and chemical interactions between the inner-core, outer core, mantle, crust and possibly the oceans and atmosphere on a planetary scale, with a particular emphasis on region boundaries, with the aim of understanding the Earth as a globally interacting system, 5) the thermodynamics of the Earth and the investigation of its long-term thermal evolution, and how it differs and compares to other planetary bodies.

Since 1987, SEDI has been a Union Commission of the International Union of Geodesy and Geophysics ([IUGG](http://www.iugg.org)). As such, it cuts across the traditional discipline-oriented bounds of the Associations of the IUGG [such as the International Association of Geodesy ([IAG](http://www.iag.org)), the International Association of Geomagnetism and Aeronomy ([IAGA](http://www.iaga.org)), the International Association of Seismology and Physics of the Earth's Interior ([IASPEI](http://www.iaspei.org)), and the International Association of Volcanology and Chemistry of the Earth's Interior ([IAVCEI](http://www.iafcei.org))], which normally study the Earth from a particular point of view. The intent of SEDI is to amalgamate all sources of data and all points of view to generate the most coherent and consistent picture of the workings of the Earth's deep interior.

## ADMINISTRATION

SEDI is currently chaired by Jonathan Aurnou (UCLA, USA), vice-chaired by Christine Thomas (U. Münster, Germany), with Michael Bergman (Simon's Rock College, USA) acting as Secretary-General. It has a membership of about 600, as recorded on the email list used to broadcast information related to SEDI activities, upcoming meetings, funding opportunities, and academic openings.

## ACTIVITIES

### SEDI MEETING 2018

The 2018 SEDI meeting was held in Edmonton, Canada from 8 to 13 of July, 2018. The lead local organizers at the University of Edmonton were Matthieu Dumberry and Moritz Heimpel, with 141 scientists in attendance. (<https://sedi2018.sciencesconf.org>)



*2018 SECI Meeting group photo*

## **FUTURE ACTIVITIES**

At this summer's IUGG 2019 Centennial meeting in Montreal, there will a union session (U05) on Discoveries in the Deep Earth as well as multidisciplinary session (JA01) linked between IAGA/IASPEI/IAG. These sessions are co-chaired by Jon Aurnou (USA, IAG), Mike Bergman (USA, IAG), Carla Braitenberg (Italy, IAG), George Helffrich (Japan, IASPEI) and Christine Thomas (Germany, IASPEI). We will have our Business Meeting at IUGG 2019 as well. There, elections will be held for Christine Thomas to become SEDI Chair and for Mathieu Dumberry (University of Alberta, Canada) to become SEDI Vice-Chair.

In 2020, the SEDI meeting will be held at the in Tapei, Taiwan at the Institute of Earth Sciences (Academia Sinica). The local organizing committee is comprised of Frederic Deschamp and Ban-Yuan Kuo (co-leads) along with Wen-Che Yu, Wen-Pin Hsieh and Kenny Vilella. This is SEDI's first meeting held in Taiwan.

Jonathan Aurnou, SEDI Chair  
Christine Thomas, SEDI Vice-Chair  
Mathieu Dumberry, SEDI Vice-Chair Elect  
Michael Bergman, SEDI Secretary General

# Union Commission on Data and Information (UCDI)



UCDI website: [www.iugg-ucdi.org](http://www.iugg-ucdi.org)

## INTRODUCTION

In 2008 the IUGG established the Union Commission on Data and Information (hereafter UCDI) to provide IUGG's eight Associations an entity to deal with data and information issues at the Union level and engage with similar bodies in other Unions and Societies. Accordingly, UCDI is expected to enable a high level of cooperation within and between scientific communities. This cooperation is needed in order to ensure the availability of modern data and information systems and services, which are globally distributed, provide universal open access, and are sustainable. Hence, UCDI targets to provide a focused and single voice within IUGG, connecting all IUGG Associations and inter-Association bodies, connect IUGG and its scientists to other bodies/agencies/initiatives that have interest and responsibility on matters of geo-data, advocate and facilitate research and development in the growing field of informatics to improve data and information systems and practices, and promote open access to data and adoption of interoperable data sets.

## ADMINISTRATION

**Membership:** Following the approval of the Bureau of IUGG, the President of IUGG appointed the following members on the Union Commission on Data and Information (UCDI) vide letter dated 13 February 2017.

Chair: Satheesh Shenoi (India, IAPSO)  
Vice-Chair: Anatoly Soloviev (Russia, IAGA)  
Members: Sonia Maria Alves Costa (Brazil, IAG)  
Ellen Clarke (UK, IAGA)  
Michelle Guy (USA, IASPEI)  
Robert M. Key (USA, IAPSO)  
Silvia Massaro (Italy, IAVCEI)  
Yasuhiro Murayama (Japan, IAMAS)  
Bruce H. Raup (USA, IACS)  
Co-opted members: Aude Chambodut (France), WDS Executive Committee  
Alena Rybkina (Russia), CODATA Executive Committee

**Business Meetings:** No formal business meeting was held during the year, but extensive discussions over email were held on specific issues and topics.

## ACTIVITIES

(i) UCDI Chair, Dr. Satheesh Shenoi attended the "Data and management workshop" held at the International Indian Ocean Science Conference 2018 in Jakarta, Indonesia during 18-23 March 2018. The workshop discussed about the ocean data management, common data formats, QC procedures and standards, interoperability and free exchange of data sets, etc.

(ii) UCDI Co-chair Anatoly A. Soloviev visited the Federal Research Center “Institute of Applied Physics of the Russian Academy of Sciences” in Nizhny Novgorod, Russia (<http://www.iapras.ru/>). The aim was to reveal the institute’s capabilities in the field of unique physical data assimilation and sharing with the broad scientific community, as well as to discuss prospects on equipping existing geophysical observatories with new instruments, developed by the institute.

(iii) A.A. Soloviev participated in the 32nd Conference on Mathematical Geophysics (CMG) of the International Union of Geodesy and Geophysics (IUGG). The conference is held every two years, and in 2018 the venue was the ship “Nizhny Novgorod”, which cruised along Volga River from Nizhny Novgorod to Kalyazin and back (<http://cmg2018.iapras.ru/>) with the overall duration of 7 days. A.A. Soloviev delivered invited talk on the mathematical tools for analysis of ground based and satellite geomagnetic data streams for advanced monitoring of the Earth's magnetic field. The CMG conference traditionally focuses on the exchange of ideas and information in all areas of geophysics with an emphasis on the application of mathematics, statistics and computer science to geophysical problems. CMG promotes the development and application of mathematical methods and corresponding theoretical approaches for solving problems of the entire spectrum of geophysical disciplines.



*Dr. A. Soloviev (UCDI vice chair, Russian national correspondent to IAGA), Prof. A. Gvishiani (Russian national delegate in IUGG) and Prof. A. Feygin (FRC IAP RAS) visiting multipetawatt femtosecond laser facilities at FRC IAP RAS (Nizhny Novgorod, Russia).*

(iv) A.A. Soloviev is actively involved with The Earth Science Data Base project (<http://esdb.wdcb.ru/>) being developed in cooperation with the CODATA Task Group “Data Citation Standards and Practices”. The project aims at assigning Digital Object Identifiers (DOI) to geophysical and other relevant data sets (geomagnetism, seismology, space physics, etc.).

(v) Participation in the International CODATA 2018 Conference in Botswana during 5-8 November 2018. Ms. Silvia Massaro represented UCDI at the Conference and session on "Data collection and analysis for the study of the Earth’s system".

(vi) Drs. Aude Chambodut and Yasuhiro Murayama participated in "Latin America and the Caribbean Scientific Data Management Workshop" at Brazilian Academy of Science, Rio de Janeiro, for 17-18 April 2018 (<http://lacworkshop.icsu-wds.org/>). It was organized by ICSU-World Data System for discussions on the best practices in data management from both regional and global perspectives. Dr. Aude Chambodut played a role of a session chair at the workshop.

(vii) Michelle Guy participated in the U.S. Geological Survey ISO Metadata Standard Workshop to propose content specifications to assist in authoring metadata records in the ISO 19115 family of

standards for the U.S. Geological Survey and as a proposal for the broader scientific community. The Workshop was held in Fort Collins, Colorado, USA during July 10 through July 12, 2018 and included members from the U.S. Geological Survey, U.S. National Oceanic and Atmospheric Administration, and the U.S National Center for Atmospheric Research. Workshop description and outcomes are available at <https://www.sciencebase.gov/catalog/item/5acd27a0e4b0e2c2dd155e01>.

## FUTURE ACTIVITIES

(i) Organisation of union symposium (U04) titled "Data-driven science for Earth and Space exploration" (U04) at the XXVII General Assembly of the IUGG together with IAPSO, IAG, IAGA, IASPEI, IAVCEI, IAMAS, IACS, IAHS.

Convenors – Dr. Satheesh Shenoj (IAPSO/UCDI, India), Sonia Costa (IAG, Brazil), Ellen Clarke (IAGA, UK), Michelle Guy (IASPEI, USA), Robert M. Key (IAPSO, USA), Silvia Massaro (IAVCEI, Italy), Yasuhiro Murayama (IAMAS, Japan), Bruce Raup (IACS, USA), Ashish Sharma (IAHS, Australia).

(ii) Organization of Association Symposium (A18) titled "Dependable, Long-Term Geomagnetic Indices and Modern, Index-Based Services: 70th Anniversary Of the Kp Index".

Convener – Jurgen Matzka (Germany), Co-conveners – Anatoly Soloviev (Russia), Jeff Love (USA)

(iii) Organization of Association Symposium (A22) titled "Significant Achievements in Magnetic Field Studies Induced by IUGG over Its 100-Year History".

Convenors – Justin Mabie (USA), Roman Krasnoperov (Russia)

(iv) Organization of inter-Association Symposium (JA07) "Geoscience Data Licensing, Production, Publication, and Citation".

Lead Convener – Masahito Nosé (Japan, IAGA), Co-conveners – Simon Flower (UK, IAGA), Yasuhiro Murayama (Japan, IAMAS), Helle Pedersen (France, IASPEI), Attilio Castellarin (Italy, IAHS), Gabriel Guimarães (Brazil, IAG), Toru Suzuki (Japan, IAPSO), Aude Chambodut (France, UCDI), Giuseppe Puglisi (Italy, IAVCEI)

Satheesh Shenoj, UCDI Chair

# Union Commission on Planetary Sciences (UCPS)

UCPS website: <http://202.127.29.4/geodesy/ucps>

## INTRODUCTION

The IUGG Union Commission on Planetary Sciences (UCPS) was established by the IUGG Executive Committee in June 2015 to promote and coordinate scientific (physical, chemical, and mathematical) studies of planets in the solar system and around other stars. UCPS intends to advance planetary science through advocacy of solar system and extrasolar exploration, seeking insights on the origin, formation and evolution of planets and systems, including a search for habitable worlds beyond Earth. The UCPS together with other IUGG associations will share knowledge through scientific research and comparative studies between planetary objects and the Earth in the fields of atmosphere, surface and interior science.

Additional information about UCPS can be found at <http://202.127.29.4/geodesy/ucps>.

### Objectives

- To advance and foster the study of scientific problems in the planetary sciences;
- To promote and coordinate international cooperation in planetary science, and promote planetary science activities in developing countries;
- To facilitate, on an international basis, discussion and publication of the results of the studies, research and work indicated above;
- To contribute to coordinating activities for future space missions.

## ADMINISTRATION

### Executive Committee

- Shuanggen Jin (IAG, China) (Chair)
- Athena Coustenis (IAMAS, France) (Vice-Chair)
- Joern Helbert (IASPEI, Germany) (Vice-Chair)
- Scot Rafkin (IAMAS, USA) (Secretary/Treasurer)

## ACTIVITIES

[International Symposium on Asteroids and Comet Gravity and Interiors](#) as Co-Chair, 17-18 December 2018, Wuhan, China

Asteroids and comets were leftovers from the formation of our solar system about 4.6 billion years ago. Shattered remnants of accreted planetesimals, or even made of never heated pristine materials, which contain important clues about the early our solar system and the origin of water and life on Earth. Studying on Asteroids and comets Gravity and Interiors is among the hottest topics in deep space exploration. The Rosetta spacecraft built by European Space Agency (ESA) finished its mission on 2016. The OSIRIS-REx mission operated by National Aeronautics and Space Administration (NASA) was launched on 2016 to study the asteroid 101955 Bennu, a carbonaceous asteroid, and return a sample to Earth in 2023. The Japan Aerospace Exploration Agency (JAXA) launched Hayabusa2 mission in 2014, which reached near-Earth asteroid 162173 Ryugu in 2018 and will also return a sample to

Earth in 2020. A Chinese asteroid mission has also been put on the agenda, and several targets have been preliminary selected.

The first International Symposium on Asteroids and comets Gravity and Interiors (SAGI 2018) was held on December 17-19, 2018, Wuhan, China.

**Co-Chairmen:**

- Prof. Long Xiao, China University Geoscience, China
- Prof. Shuanggen Jin, Shanghai Astronomical Observatory, CAS, China
- Prof. Jean-Pierre Barriot, Geodesy Observatory of Tahiti, Tahiti

**Organizers:**

- State Key Laboratory of Information Engineering in Surveying, Mapping and Remote Sensing, Wuhan University
- Planetary Science Institute, China University of Geoscience (Wuhan)
- International Association of Planetary Science (IAPS)
- IUGG Union Commission on Planetary Sciences (UCPS).

The topics were focused on precision orbit determination of the solar system asteroid probes, asteroid orbit determination (ephemeris), asteroid gravity field, internal structures and geological evolution. About 120 participants attended SAGI 2018 with two-day oral talk. The SAGI 2018 provided a very good platform for communication and discussion on Asteroids and comets Gravity and Interiors.



Group photo of [International Symposium on Asteroids and Comet Gravity and Interiors](#) in December 2018, Wuhan, China.

**AOGS Session: Science and Exploration of Mars and Venus, 2-10 June 2018, Honolulu, Hawaii, USA,**  
<http://www.asiaoceania.org/aogs2018>

This session covers the study of the ionosphere, atmosphere, surface and interior of Mars and Venus. We invite abstracts on results from ground-based observations as well as recent and ongoing missions to Mars and Venus (for eg., ExoMars Mars Express, Venus Express, Mars Odyssey, MRO, MERs, Phoenix, Mars Science Laboratory, MAVEN, Indian Mars mission, etc.)

We envisage having presentations on measurements and theoretical models dealing with the ionospheric environment and its interaction with the solar wind; the atmospheric composition, dynamics and climate; the surface morphology, geology, geochemistry and mineralogy; the deep interior and subsurface structure of both Mars and Venus.

The session will also include presentations on various aspects (like their scientific goals, long-term plans, technology etc.) of future missions and missions about to be launched to Mars and Venus (e.g , InSight, ExoMars Rover, Mangalyan-2, 2020 Chinese Mars Mission, Mars 2020, etc.). We also invite abstracts on comparative planetology of terrestrial planets. Both solicited talks and contributed presentations will be included in the program.

Conveners:

- Dr. Varun Sheel (Physical Research Laboratory, India)
- Prof. Shuanggen Jin (Chinese Academy of Sciences, China)
- Dr. Takeshi Imamura (The University of Tokyo, Japan)

Prof. Dr. Shuanggen Jin attended Asia Oceania Geosciences Society (AOGS) Annual Meeting and was appointed as President of AOGS Planetary Science Section, 2-10 June 2018, Honolulu, Hawaii, USA,  
<http://www.asiaoceania.org/aogs2018>



*AOGS Council Meeting in Honolulu, Hawaii, USA*



## **Special Issue of Planetary and Space Science on interdisciplinary observation and understanding of the Solar System**

Planetary science is an increasingly interdisciplinary field of research propelled forward by advances in space exploration and ground based studies. Detailed characterization of planetary environments within and beyond our Solar System requires collaborative studies across the fields of geology, atmospheric science, geophysics, geodesy, seismology, aeronomy, planetary origins, chemistry and astrobiology. The 1st IUGG Symposium on Planetary Science (IUGG-PS2017): Interdisciplinary observation and understanding of the Solar System will be held on July 3-5, 2017, Berlin, Germany. The IUGG-PS2017 aims to bring together international scientists and engineers focused on an interdisciplinary work on exploration and science of the solar system and seeking life beyond Earth. Topics include planetary geodesy, remote sensing, atmosphere, ionosphere/plasma physics, magnetic and gravity field, geomorphology, geophysics, geodynamics, geology, petrology, volcanology, geochemistry, interior physics, Life & Astrobiology. All objects from the terrestrial and giant planets to exoplanets, including small bodies are welcome.

This special issue of Planetary and Space Science (PSS) was published as Volume 163, Pages 1-114 (15 November 2018). More information can be seen at <https://www.sciencedirect.com/journal/planetary-and-space-science/vol/163>.

## **FUTURE ACTIVITIES**

### **Session: Science and Exploration of Mars and Venus at AOGS 16th Annual Meeting, Jul 28- Aug 02, 2019, Singapore**

This session covers the study of the ionosphere, atmosphere, surface and interior of Mars and Venus. We invite abstracts on results from ground-based observations as well as recent and ongoing missions to Mars and Venus (for eg., ExoMars Mars Express, Venus Express, Mars Odyssey, MRO, MERs, Phoenix, Mars Science Laboratory, MAVEN, Indian Mars mission, etc.). We envisage having presentations on measurements and theoretical models dealing with the ionospheric environment and its interaction with the solar wind; the atmospheric composition, dynamics and climate; the surface morphology, geology, geochemistry and mineralogy; the deep interior and subsurface structure of both Mars and Venus. The session will also include presentations on various aspects (like their scientific goals, long-term plans, technology etc.) of future missions and missions about to be launched to Mars and Venus (e.g , InSight, ExoMars Rover, Mangalyan-2, 2020 Chinese Mars Mission, Mars 2020, etc.). We also invite abstracts on comparative planetology of terrestrial planets. Both solicited talks and contributed presentations will be included in the program.

Conveners:

Dr. Varun Sheel (Physical Research Laboratory, India)

Dr. Takeshi Imamura (The University of Tokyo, Japan)

Prof. Shuanggen Jin (Shanghai Astronomical Observatory, CAS, China)

Shuanggen Jin, UCPS Chair  
Jörn Helbert, UCPS Vice-Chair

# THE INTER-ASSOCIATION WORKING GROUP: Electro-magnetic Studies of Earthquakes and Volcanoes (EMSEV)



EMSEV website: [www.emsev-iugg.org/emsev](http://www.emsev-iugg.org/emsev)

## INTRODUCTION

EMSEV ('Electromagnetic Studies of Earthquakes and Volcanoes') is an Inter-Association Working Group of the International Union of Geodesy and Geophysics ([IUGG](http://www.iugg.org)). The three International IUGG Associations of Geomagnetism and Aeronomy ([IAGA](http://www.iaga.org)), Volcanology and Chemistry of the Earth's Interior ([IAVCEI](http://www.iavcei.org)), and Seismology and Physics of the Earth's Interior ([IASPEI](http://www.iaspei.org)) powerfully support EMSEV and promote its activities.

During the past 20 years of activity, EMSEV has continuously investigated tectonic and geological setting of active faults and active volcanoes and has constantly worked for a better knowledge of the physical and dynamical processes leading to fault rupture and volcanic eruptions. Based on the expertise of a worldwide community of more than 320 researchers, engineers and students, EMSEV sustains innovative research and findings in electromagnetism (EM), integration of new EM methodologies with other geophysical data to describe, monitor, analyse, and model fault systems and volcanoes.

EMSEV scientists have really expanded methodologies, increased ground observations, satellite data and carried out laboratory measurements to understand earthquake and volcanic processes.

EMSEV objectives are: (1) evaluation and endorsement of advanced studies in the electromagnetic field through international cooperation, conferences and workshops, and high levels international publications, (2) integration of electromagnetic methods together with other geophysical techniques to identify physical processes on all scales before, during and after earthquakes and volcanic eruptions, (3) organization and management of international and regional workshops including sponsorship of sessions at international meetings that describe these results and (4) participation in educational programs relating observed results to reduction of earthquake and volcanic hazards.

## ADMINISTRATION

As scheduled during the International EMSEV meeting held in Lanzhou in September 2016 (China), it was decided to renew EMSEV bureau and its bulk during the 2018 International EMSEV meeting in Potenza (Italy) (<http://web.unibas.it/emsev2018/index.php/en/>).

From 1999, date of EMSEV building, The EMSEV body consists of the 1) Executive Bureau, 2) Working Group Members that include all scientists interested and involved in EMSEV activities, 3) National Representatives (about two per country) and 4) EMSEV collaborators that include all interested scientists from other geophysical disciplines. The executive bureau is elected every four-years.

From 2007 to 2018, every four years Chairperson (J. Zlotnicki), Vice-Chairperson (M.J.S. Johnston), and Secretary (T. Nagao) were elected for driving EMSEV bureau and community. J. Zlotnicki and M.J.S. Johnston asked to renew the bureau and a new election was organized during and after the biennial 2018 EMSEV meeting in Italy.

The EMSEV body will now consist of the 1) Executive Bureau, 2) Country Liaison Members, 3) EMSEV members and 4) EMSEV Collaborators.

**EMSEV bureau.** Toshi Nagao was nominated as new EMSEV Chairperson (Japan), Valerio Tramutoli was elected as Vice-Chairperson (Italy), and Jann-Yeng Liu was selected as Secretary (Taiwan).

Takeshi Hashimoto from Hokkaido University (Japan) will be the IAVCEI liaison member, Qinghua Huang from Beijing University the IASPEI liaison member (China), Jann-Yeng Liu from the National Central University (Taiwan) the IAGA liaison member, Katsumi Hattori from Chiba University (Japan) and Dimitar Ouzounov from Chapman University (USA) the liaison members of the Chinese Satellite mission (CSES).

Bureau members were also revised and limited to eight researchers: Valery Korepanov (Ukraine), Vincenzo Lapenna (Italy), Sergey Pulnits (Russia), Nicolas Sarlis (Greece), Ramesh Singh (India), Filipos Valliatanos (Greece), Malcolm Johnston (USA, remaining IUGG liaison member), and Jacques Zlotnicki (France, remaining IUGG liaison member).

**Country liaison members.** Country liaison members are representative scientists from each country (approx. two per country) who promote electromagnetic studies related to earthquakes and volcanoes and contribute to EMSEV activities in their country. 36 scientists from 16 countries represent this EMSEV sub-body.

**EMSEV Members.** An EMSEV Member is anyone who has an interest and participates in EMSEV activities. Exchange of information is operated thorough EMSEV meetings, which are organized every two years, and/or IUGG General Assemblies (including IAGA, IASPEI, and IAVCEI meetings) and EMSEV mailing list.

**EMSEV Collaborators.** These are active scientists working in Natural Hazards in any related field of research whose expertise's does not primarily belong in the EM field but who are interested in and contribute to development of new geophysical knowledge. They are interested in participating in EMSEV activities, including analysis of observations and understanding of physical processes from different perspectives. Two collaborators, one in Seismology and one in Geochemistry, are already active. This group will be developed in the next future.

From March 2019, this new EMSEV structure is active and will be effective during next IUGG General Assembly that will be held in Montreal (Canada) in July 2019 (<http://iugg2019montreal.com/>).

Business meetings will continue to be regularly organized at the EMSEV meetings and International General Assemblies. Minutes of the meetings will be distributed through EMSEV mailing list as usual. Information, activities, and annual and business meetings reports are kept on the EMSEV website that is mainly managed by T. Nagao ([webmaster@emsev-iugg.org](mailto:webmaster@emsev-iugg.org)). Messages and information on activities are distributed by T. Nagao through the EMSEV mailing list.

## ACTIVITIES

EMSEV activities during 2018 continued to be numerous and rewarding for the benefit of the scientific community. EMSEV was involved in several international meetings, organizing sessions devoted to EM phenomena. EMSEV pay attention that researches achieved and published in international journals with sponsorship of EMSEV clearly mention the support of IUGG and EMSEV.

### MEETINGS AND WORKSHOPS

Among the sessions in international conferences sponsored, organized, or including a high level of participation by EMSEV members, some are:

- *AOGS-EGU, New dimension for Natural Hazards in Asia, February 4-8, 2018, Tagaytay (Philippines)*
  - NH-A070 Hazards Resulting From A Future Large Eruption At Taal Volcano In Philippines. EMSEV Participation: J. Zlotnicki, Y. Sasai, M. Johnston, G. Vargemezis and the PHIVOLCS team.
- *EGU, April 8-13, 2018, Vienna (Austria)*
  - NH4.5/EMRP4.27/SM3.03: Short-term Earthquake Forecast (StEF) and multi-parametric time-Dependent Assessment of Seismic Hazard (t-DASH) (Co-sponsored by JpGU) (co-organized). Conveners: V. Tramutoli, P.F. Biagi, K. Hattori, J-Y. Liu, G. Martinelli, G. Papadopoulos, M. Parrot, S. Pulinets, F. Vallianatos.
- *International Conference for the Decade Memory of the Wenchuan Earthquake with the 4th International Conference on Continental earthquakes (<http://www.4thicce.com/>), May 12-14, 2018, Chengdu, China*
  - S2-4-3 Multi-parameters observations of pre-earthquake signals and their potential for prediction. Conveners: D. Ouzounov, X. Shen, F. Huang, K. Hattori.
- *JpGU-AGU-2018, May 20-24, 2018, Chiba (Japan)*
  - M-IS04: Interdisciplinary studies on pre-earthquake processes. Conveners: J.Y. Liu, D. Ouzounov, Q. Huang, and K. Hattori.
- *IWEP5, International Workshop on Earthquake Preparation Process - Observation, Validation, Modeling, Forecasting, May 25 -27, 2018, Chiba (Japan)*
  - International Workshop on Earthquake Preparation Process: Observation, Validation, Modeling, Forecasting. Conveners: K. Hattori, D. Ouzounov, M. Nakatani.
- *AOGS June 3-8, 2018, Honolulu Hawaii, (USA)*
  - IG22: Pre-earthquake Anomalies, Earthquake Predictability, 10-Year Commemoration of the 2008 M8.0 Wenchuan Earthquake, Kickoff Chinese Seismo-electromagnetic Satellite. Conveners: J-Y. Liu, K. Hattori, D. Ouzounov.
- *The 16th International Conference on Atmospheric Electricity (ICAE2018), June 17-22, 2018, Nara (Japan)*
  - Participating Organizer: M. Komogawa (<http://icae2018.saej.jp/vidates.php>)
- *36th General Assembly of the European Seismological Commission (GA ESC), 2 to 7 September, 2018 in Valletta, Malta*
  - Advances in models, observations and verification towards Operational Earthquake Forecasting. Conveners: A. Peresan, D. Ouzounov, V. Kossobokov, A. De Santis, G. Papadopoulos, S. Pulinets.
- *International EMSEV meeting, September 17-21, 2018, Potenza (Italy)*
  - Integrating geophysical observations from Ground to Space for Earthquakes and Volcanoes investigations. Chairperson: J. Zlotnicki; Co-Chairs: V. Tramutoli, M.J.S. Johnston, T. Nagao, S. Xuhui.
- *AGU, December 10-15, 2017, New Orleans (USA)*

- NH13D: Pre-Earthquake Processes: A Multidisciplinary Approach to Earthquake Prediction Studies. Convenors: D. Ouzounov, K. Hattori, P. Taylor, S. Pulinetis.

### International 2018 EMSEV meeting

Our major event was the 2018 biennial International Workshop organized by the IUGG EMSEV Inter-Association Working Group on Electromagnetic Studies of Earthquakes and Volcanoes (<http://emsev-iugg.org/>) and held in Potenza, Italy, from September 17 to 21 (<http://web.unibas.it/emsev2018/>). This workshop was supported by IAGA, IAVCEI and IASPEI Associations, and was hosted by the University of Basilicata and the Institute of Methodologies for Environmental Analysis of the Italian National



Research Council with the strong support of the National Institute of Geophysics and Volcanology. Professor Valerio Tramutoli in association with Professor Nicola Pergola efficiently organized the four-day meeting with a powerful local organizing committee. The workshop primary focused on the observation and understanding of various kinds of electromagnetic phenomena associated with earthquakes and volcanic eruptions, particularly from a multidisciplinary point of view. This meeting was also the first opportunity to discuss the preliminary observations issued from the new Chinese micro-satellite Zhangheng 1 (also called CSES-1) put on a solar polar orbit above the Earth in February 2018. Several themes were successively developed and discussed: (1) Electromagnetic methods for seismicity and volcano monitoring, (2) Theoretical and laboratory studies for understanding seismic and volcanic phenomena, (3) Satellite observations for volcanic and seismic hazard assessment and monitoring, (4) Earthquake and volcano related phenomena investigation by multi-disciplinary and multi-parametric approaches, (5) Magnetospheric, ionospheric and atmospheric phenomena associated with seismic activities, and (6) Electromagnetic signals associated with earthquakes and volcanic eruptions.

More than 110 participants from 25 different countries coming from 4 continents attended the meeting and presented their most up-to-date results in oral presentations and with posters.



*EMSEV International Workshop in September 2018 at Potenza (Italy).*

## JOINT INTERNATIONAL ACTIVITIES

### EMSEV activity on volcanoes

A cooperative program on Taal volcano between EMSEV and the Philippines Institute of Volcanology and Seismology (PHIVOLCS <http://www.phivolcs.dost.gov.ph/>) began in 2003.

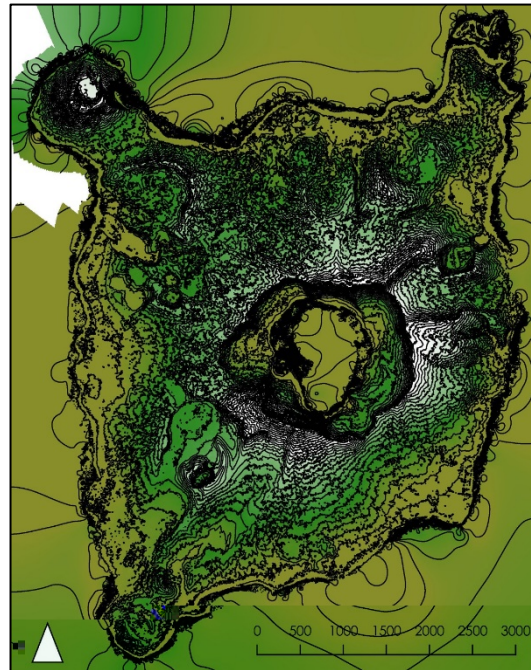
Electromagnetic methods were used first for imaging the 3-dimensional structure of the volcano then combined later with other geophysical monitoring systems to monitor the ongoing activity. A shallow magmatic source is located at a depth between 4 and 6 km below the current Main Crater Lake on Volcano Island. A huge hydrothermal system stands under the Main Crater Lake, the top of which can be clogged up by mineralisation with time. The thermo-dynamical system can abruptly give rise to phreatic, phreato-magmatic, and even plinian surges.



*Teams from France, Greece, Japan and United States with PHIVOLCS team on Taal volcano (2010).*

To monitor this system, EMSEV and PHIVOLCS have installed a number of multi-parameter stations sending data to the local Buco Observatory and to PHIVOLCS headquarters every two seconds. Magnetic, electric, tilt, resistivity, ground and water temperature data were recorded at field sites and telemetered to PHIVOLCS (leading EMSEV team, J. Zlotnicki, Y. Sasai, M.J.S. Johnston, T. Nagao). The latest results clearly indicate that the longer the inter-eruption period is, the more likely the next eruption will be large ( $VEI \geq 4$ ) and more likely the eruption may occur from subsidiary cones surrounding the Main Crater (AOGS, 2018). This international cooperative program has involved teams from Japan, France, USA, Greece, Italy, and Belgium. During these past 15 years of cooperative work, EMSEV provided training to PHIVOLCS members. Further education of the PHIVOLCS team has included scholarships in Japan (PhD in Japan directed by T. Nagao and Y. Sasai) and Belgium.

Since 2016, thanks to the EMSEV activity, the Japanese group succeeded to get a three-years JSPS KAKENHI Grant Number 16H05651 in FY2016 (research head: T. Nagao). Through this financial support, we made not only electromagnetic researches but also seismic, geochemical and gravity surveys. Technology transfer to PHIVOLCS for gravity analysis (2D inversion and 3D forward modelling) was performed in 2018.



*Digital topographic map of the volcano island by a drone survey (10 m contour interval).*

## **EMSEV activity related to Earthquake Processes**

In 2011, EMSEV started a new research effort focused on understanding fault failure and the failure mechanisms of earthquakes. This was developed through a cooperative research program with the Bishkek Research Station (Bishkek RS) in Kyrgyzstan under the Russian Academy of Sciences where some outstanding research on the relation between EM phenomena and electrical resistivity changes with earthquakes has been being carried out during the last 30 years.

This cooperative agreement between EMSEV and the Bishkek Research Station was signed in November, 2011 and renewed during EMSEV workshop in Athens in April 2015. A paper titled, "Seismic Electric Signals in seismic prone areas" was published in 2017 (Sarlis et al., 2017). Further efforts in the development of joint field studies and data analysis were completed in 2017. EMSEV also participated in the 7th International Symposium on: *Problems of Geodynamics and Geoecology of Intracontinental Orogens*. During this visit, EMSEV and Bishkek RS upgraded the two EMSEV stations that record the electric field in different horizontal directions and added seismic monitoring.

It should be noted that the Bishkek Research Station has a very advanced electrical current system that is able to inject more than 700A of electrical current into 4.2 km long electrical lines. Monitoring these lines can provide information on:

- Changes of the electrical resistivity of the ground in relation to crustal stress and regional seismicity,
- Effects of large current injection on the induced local seismicity which may provide insights into controlling earthquakes,
- Disturbances of the long term behaviour of the magnetic field,
- Pre and post seismic electrical signals.

EMSEV will continue to make efforts for sustaining the Bishkek research station and in analysing of data.

The state of the cooperation leads EMSEV to make new efforts in processing incoming data and publish synthesis of the findings obtained during the last years in addition to the two papers already published.

## **Chinese Seismo-Electric Satellite mission and EMSEV**

Following the promising results obtained during the DEMETER mission between 2006 and 2010 (<https://demeter.cnes.fr/en/DEMETER/index.htm>, <http://demeter.cnrs-orleans.fr/>) on the possible statistical significant occurrence of disturbances of the ionosphere a few hours prior to large earthquakes (Magnitude above 5), the Chinese Earthquake Administration has implemented a new satellite monitoring program in which a flotilla of dedicated satellites should be regularly launched. The first EM satellite has been launched from China in February 2018. Professor Xuhui Shen, Head Scientist and Coordinator of China Earthquake-related Satellite Missions and Director of the Center of Earthquake Observation from Space, is an EMSEV Country liaison member.

In fact, since 2016, EMSEV and Professor Shen are working to merge the Chinese and EMSEV scientific community in order to develop joint programs and analyses, as well as to promote the exchange of researchers.

A Memorandum of Agreement between Institute of Crustal Dynamics (CEA) and EMSEV was signed during the *International Conference for the Decade Memory of the Wenchuan Earthquake* held in Chengdu in May 2018 (<http://www.4thicce.com/>).

The purpose of this Agreement is to provide scientific and technical interaction between the two Sides for collaborative research on active faults and volcanoes, for theoretical and experimental investigations into physical processes related to earthquakes and volcanic eruptions, for promoting new investigations using electromagnetic and other geophysical methods and to enhance data processing and analyses.

The Agreement will promote the development of scientific relations between participants for solving fundamental problems related to the generation of earthquakes and volcanic eruptions and on ways to monitor and mitigate them. Other similar studies in the scope of the Agreement will be discussed by ICD-CEA and EMSEV and be tentatively included under this collaboration.



*Memorandum of Agreement signed by ICD-CEA and EMSEV on May 12, 2018 at the International Conference for the Decade Memory of the Wenchuan Earthquake, Chengdu (China).*

## **FUTURE ACTIVITIES**

In 2019 EMSEV plan to deeply work in two directions. The first one is to keep a strong participation in International meetings as EGU, AOGS, JpGU-AGU, IWSEP, CSES-meetings, AGU... In addition, a number of EMSEV members will organized or co-organized regional meetings and educational workshops as in Philippines or Kyrgyzstan. EMSEV is also already in the preparation of the next 2020 EMSEV International meeting in Taiwan (J-Y. Liu) and the International meeting on Earthquakes processes in Chania (F. Valliatanos). The second direction is to strengthen EMSEV activities through international cooperation's. This will be achieved by the pursuit of the cooperation with Philippines (JPSP-KAKENHI program), Bishkek-Research station, Russian Academy of Sciences (EMSEV), and the development of EMSEV's involvement in the Chinese satellite mission (CSES mission).

- J. Zlotnicki, Past EMSEV Chair
- T. Nagao, EMSEV Chair
- M.J.S. Johnston, Past EMSEV Vice-Chair
- V. Tramutoli, EMSEV Vice-Chair
- J-Y Liu, EMSEV Secretary



# THE INTER-UNIONS COMMISSION: International Lithosphere Programme (ILP)



ILP website: <https://www.scl-ilp.org/>

## INTRODUCTION

The International Lithosphere Program (ILP) is a joint project of IUGG and IUGS and receives additional funding from several member states (see financial report). ILP seeks to elucidate the nature, dynamics, origin and evolution of the lithosphere through international, multidisciplinary geoscience research projects –Task Forces (TF) and Regional Coordinating Committees (CC) addressing **major ILP themes: I. Geoscience of global change, II. Contemporary dynamics and deep processes, III. Continental lithosphere, IV. Oceanic lithosphere**

All TF and CC are led by international teams and supported by ILP with 4,000 Euro per year over a period of 5 years. This “seed money” is used by the project leaders to raise additional funds and build strong interfaces with other projects (ICDP, TOPO-EUROPE, MEDYNA, etc.).

## ADMINISTRATION

ILP operates on the base of terms of reference and has an international Bureau. They meet regularly to monitor the progress and to select new projects in close consultation with the representatives of National Committees. The Bureau is chaired by the President with support from the Secretary General. The ILP Secretariat is located in the German Research Centre for Geosciences in Potsdam (GFZ-Potsdam) and is headed by the Executive Secretary A. Rudloff (Germany). The current ILP Bureau membership is presented below:

President:	H. Thybo	Turkey
Secretary General	M. Scheck-Wenderoth	Germany
Representative of IUGG	H. Gupta	India
Representative of IUGS	K. Asch	Germany
Chair Committee National Representatives:	A. Tibaldi	Italy

On decision of the Bureau 2018 an Advisory Board to ILP has been established that includes the following members: Ö. Adiyaman Lopes (UNESCO), S. Dong (China), C. Ebinger (USA), D. Mueller (Australia), H. Sato (Japan).

### **Bureau and Business meetings of ILP, Vienna, Austria, 2018**

An ILP bureau meeting was held that was attended by the president, the SG, the Executive Secretary, the representatives of IUGG and IUGS and the past president of ILP. Major decisions taken include the establishment of a scientific advisory board, the procedure of awarding the E. Burov medal and actions

to be taken throughout the year to implement the road map. The next bureau meeting will take place Monday, 8 April 2019 at EGU in Vienna.

The annual business meeting was held following the meeting of the ILP bureau at EGU. It was attended by most of the PIs in ILP as well as by guests from IUGG and IUGS. The minutes are available on request. A short report has been given by the president and SG as well as by representatives of IUGG and IUGS on new developments and all active TF and CC reported on their activities and future plans. The first E. Burov medal (2018) was awarded to Francesca Funicello from Rome Tre's experimental tectonics group. The Flinn Hart Awardee for 2017 was awarded to Fabio Luca Bonali from Milan University Bicocca. The minutes were distributed among the Bureau Members and are available on request. The next business meeting at EGU 2019 in Vienna, Austria is scheduled for Monday, 8 April 2019, 18:00 - 19:30 h (listed as Splinter Meeting SMI1).

## ACTIVITIES

**Scientific meetings, developments for the different TF and CC** (selected publications: see Appendix):

As every year most of the ILP TF and CC have been visible at the large international meetings EGU AGU, etc. Moreover, most TF and CC contributed to specific conferences within their thematic fields and held dedicated smaller international workshops. The publication activity was significant for most teams and some TF and CC produced Special Issues in peer-reviewed journals. One special issue of *Global Planetary Change (Coupled Deep Earth and Surface Processes)*, Eds.: S. Cloetingh, L. Matenco, F.H. Nader, B.v. Wijck de Vries, A. Tibaldi and L. Dobrzhinetskaya) assembled results from TF2, TF4, TF6 and CC TopoEurope

**TF2** Structural and rheological constraints on magma migration, accumulation and eruption through the lithosphere (Chairs: A. Tibaldi, Italy and A. Gudmundsson, U.K.): Major efforts were devoted to create links among the various involved scientists. Results have been published in 72 peer reviewed papers, and two books (see the complete list: [www.ilptaskforce2.unimib.it](http://www.ilptaskforce2.unimib.it)). Several projects submitted to international and national funding agencies have been approved and two international summer schools were organized: Geo-hazard Summer School, University of Portsmouth (UK), and Volcanic Hazard Summer School, Santorini Island (Greece).

**TF 3** The seismic cycle at continental transforms from seismological observation and forward simulation (Chairs: M. Bohnhoff, Germany and O. Heidbach, Germany): The scientific paper that accompanies the new World Stress Map database release 2016 was published as invited review paper in *Tectonophysics* (Heidbach et al.). The special section on "Stress at active plate boundaries – measurement and analysis, and implication for seismic hazard", edited by M. Savage, S. Lamb, M. Bohnhoff, and Liu, M. was published in *JGR Solid Earth* (V123). Several results from the ICDP-GONAF observatory in the Sea of Marmara were published related to the nucleation process of a M4 event (Malin, et al., *Nat. Sci. Rep.*), a new seismicity catalogue for the Marmara region (Wollin, et al., *Tectonophysics*), and the stress field orientation in the Marmara region (Wollin, et al., *PAGEOPH*).

**TF 4** *Fate of the subducted continental lithosphere: insight through analytical mineralogy and microstructures* (Chairs: L. Dobrzhinetskaya, U.S.A. and J. Zhang, China): Several key papers were published, e.g. Dobrzhinetskaya L.F., et al: Moissanite (SiC) with metal-silicide and silicon inclusions from tuff of Israel: Raman spectroscopy and electron micro-scope studies (*Lithos*); Machev P., et al: Not all moissanites are created equal: New constraints on moissanite from metamorphic rocks of Bulgaria (*EPSL*); Shi F., et al.: Lower-crustal earthquakes in southern Tibet are linked to eclogitization of dry metastable granulite (*Nat. Com.*).

**TF 6: *Sedimentary Basins*** (Chairs: L. Matenco, Netherlands and F. H. Nader, France): The 13th Workshop of the TF Sedimentary Basins, took place as session “Evolution of sedimentary basins: from deep structures to surface processes” by M. Malo (INRS, Québec), L. Matenco (Utrecht University), F.-H. Nader (IFPEN, Paris) at the International Sedimentological Congress 2018, Quebec, Canada. A Special Volumes dedicated to the TF6 meeting in Cyprus 2017 was completed: Nader F.H, et al: Dynamics of sedimentary basins and underlying lithosphere at plate boundaries: The Eastern Mediterranean. OGST – Revue d’IFP EN.

**TF 8: *Lithosphere dynamics: interplays between models and data*** (Chair: T. Gerya, Switzerland): The Tectonophysics Special Volume 746 “Understanding geological processes through modelling - A Memorial Volume honouring Evgenii Burov” was published and is composed of 46 high-quality papers available online. Proposal preparation for the new European Research Infrastructure project GALaCTiC (GeodynAmics Lithosphere CommuniTy Code) was discussed at a dedicated meeting organized by Laetitia le Pourhiet in Paris.

**TF 9: *Subduction across scales (SAS)*** (Chair: P. Agard, France): A new EU-ITN proposal was submitted: CRISP: "Chemistry and Rheology of Intraslab Processes": This project proposal led by S. Rondenay, Univ. Bergen follows on the EU-ITN ZIP (Zooming In between Plates, P. Agard, 2013-2017) joining new researchers and industry partners

**CC MEDYNA:** (Chairs: Carlos J. Garrido, Spain and J.-L. Bodinier, France): Among many research activities, IRSES MEDYNA scientists carried out a study of the seismicity of Algeria and the NW African Margin based on a new database of earthquake events, including historical and instrumental records and a morphological analysis and geochronological characterization of the Algerian Atlas and Rif (Morocco) mountain belts.

**CC TOPOEUROPE:** (Chairs: S. Cloething, Netherlands and S. Willett, Switzerland): Novel research on integrated numerical/analogue modelling of subduction zones (ITN SUBITOP), integrated 2D and 3D modelling studies of plume-lithosphere interactions and the initiation of the TOPO-TRANSYLVANIA Project. The research contributed also to new insights in resource potential of geothermal energy. An international workshop is planned to be held in Spain in spring 2019

## FUTURE ACTIVITIES

- Further implement science plan developed during the 35th ILP Anniversary Workshop and the subsequent Bureau Meeting for 2016-2020
- Invite new Task Forces/Coordinating Committees
- Several sessions with TF and CC contributions at EGU-GA Vienna, 2019
- Several workshops of individual task forces
- ILP Business and bureau meetings at EGU-GA in Vienna, April 2019
- First E. Burov medal lecture at EGU 2019
- Strengthen links with other IUGG and IUGS programs

## BUDGET REQUEST FOR 2019

To assure continuity and enable us to support our Task Forces and Coordinating Committees we ask for the annual IUGG subvention of 15,000.00 USD.

Hans Thybo, ILP President  
Magdalena Scheck-Wenderoth, ILP Secretary General  
Alexander Rudloff, ILP Executive Secretary

# IUGG FINANCIAL REPORT

## INTRODUCTION

In short, this report describes the status of the IUGG finances for the year 2018, the third year of the IUGG quadrennium 2016-19. The report will be discussed at the business meetings in Montreal.

The 2016-19 budget was approved at the Council meeting in Prague, July 2015.

The price of 1 unit in 2018 was \$1,975.

By the end of 2018/beginning of 2019 IUGG has 72 members representing 275 units. 15 members are now associate members. On page 119 one can find more details about memberships.

The membership dues paid by members are the economical basis for the activities of IUGG. The situation is right now relatively steady in the sense that the union has a constant number of members and thereby also a constant income basis. There is an ongoing debate of value for money regarding memberships of scientific organizations like IUGG. Therefore, IUGG must continue to have focus on the membership issue in the foreseen future.

The IUGG accounts are audited by a chartered auditor, PricewaterhouseCoopers (PwC).

The accounting method is a cash flow system, with the money kept in three bank accounts. Therefore, the 4-year accounting for the full budget period gives a more precise description of the financial status of the union than the individual account-tings year by year.

A student assists me with keeping order in my files, writing letters etc. I have not had an Assistant Treasurer in 2018.

### Content:

Summary of the IUGG accounts in US dollars for 2018	page 115
General comments and highlights	page 116
Overview of IUGG grants and allocations	page 118
Membership information and statistics	page 119

# SUMMARY OF THE IUGG ACCOUNTS IN US DOLLARS FOR 2018



## SUMMARY OF IUGG ACCOUNTS 2018

US dollars	Accounts	Budget
<b>RECEIPTS</b>		
1. Membership Subscription	538.565,96	545.400,00
2. ICSU Grants	0,00	
3. Assembly Surcharge	0,00	
4. Sales of Publications	0,00	200,00
5. Miscellaneous		
a. Interest	0,00	
b. Gain on exchange		
c. Other	0,00	
d. Associations, surcharge	0,00	
6. Total Receipts	538.565,96	545.600,00
7. Cash in hand	753,76	0,00
8. Bank balance on 1/1 2018	773.286,48	518.700,00
9. Check Sum	1.312.606,20	1.064.300,00
<b>EXPENDITURES</b>		
11. Administration		
11.1 Personnel	11.946,54	15.000,00
11.2 Equipment	306,08	1.000,00
11.3 Supplies	166,08	4.000,00
11.4 Communications	0,00	4.000,00
11.5 Travel, Administration only	70.239,75	65.000,00
11.6 Miscellaneous	2.472,87	1.000,00
11.6a surcharge	0,00	0,00
11.7 Travel, representation	987,99	
12. New initiatives		
12.1 Education and outreach	21.638,16	20.000,00
12.2 Science	20.045,04	20.000,00
13. General Assemblies		
13.1 Organization	0,00	
13.2 Travel	0,00	
14. Symposia	18.532,34	20.000,00
15. Annual allocations		
15.1 Annual allocations	268.349,20	267.300,00
16. Dues and Grants		
16.1 ICSU	27.291,90	30.000,00
17. ICSU grants		
17.1	0,00	0,00
18. Union activities		
18.1 GRC, SEDI, CMG, UCIDI	34.000,00	26.000,00
18.2 Inter-Union Science (ILP)	15.000,00	15.000,00
18.3 Liaison Officers	9.579,05	10.000,00
18.4 International Scientific Programs	0,00	6.000,00
18.5 New commissions	0,00	5.500,00
19. Countries in need		
19.1 Travel Grants, General Assemblies	0,00	
20. Fees		
20.1 Professional services	6.718,75	5.000,00
20.2 Bank fees	2.974,49	3.000,00
21. Contingencies	0,00	2.500,00
22. Loss on exchange	2.746,35	
23. Total Expenditures	512.994,59	520.300,00
24. Balance on 31/12 2018	799.611,62	544.000,00
25. Check sum	1.312.606,20	1.064.300,00
Check sum balance	0,00	

	USD/DKK	
January 1, 2019	Exchange rates Line 8	6,232 =DEC 31, 2017
Aksel Walløe Hansen	Line 22	6,536 =DEC 31, 2018
	Other:	6,326 average
	USD/EUR	
	Line 8	0,837 =DEC 31, 2017
	Line 22	0,876 =DEC 31, 2018
	Other:	0,849 average

## GENERAL COMMENTS AND HIGHLIGHTS

The annual balance of the IUGG economy is of the same size or bigger than 1 year's turnover. In 2018 IUGG ended up with a surplus of the order \$25K.

It should be emphasized as also stated above that we do the accounting as a cash flow system. Therefore, the summary for a full period will be a more robust sign of the economy of IUGG than the individual years.

The summary of the IUGG accounts is shown in USD. It is the sum of three different Danske Bank accounts in USD, EUR and DKK respectively. In addition, IUGG also has a Mastercard account which is used mostly in connection with traveling and I have a little cash in hands too.

A new account has been opened to handle the economy of the IUGG commission on climate, CCEC. But this account is not included in the present report. The balance on December 31, 2018 was \$19,532.

Since 2008 the EUR account allows European members to pay dues directly in EUR and IUGG to do relevant transfers in EUR (several associations have accounts in EUR).

### Some highlights:

#### Receipts

##### **Line 1, Membership Subscription**

Right now (February 14, 2019) IUGG has received payments equivalent to a total of 255 units for 2018. This number also includes payments received in 2019 for 2018. But this money is not included in the account summary shown here. The 255 units should be compared to the until now accumulated numbers for the three previous years 2015-2017: 268, 262 and 261 respectively. Therefore, the number 255 is expected to increase when members pay dues in arrears. As will the numbers for the years 2015 – 2017.

##### **Line 3, Assembly Surcharge**

No income

##### **Line 4, Sales of Publications**

No income in 2018

##### **Line 5.a, Interest**

There is no interest paid to the union accounts in 2018.

##### **Line 5.b, Gain on exchange**

This line together with the corresponding line 22 is used to balance the accounts for the particular year. In reality the loss/gain is not necessarily realized in the given year. For instance, in 2016 there was a loss on exchange. In 2017 we had a gain. And now in 2018 another loss. Therefore, in the long run the gain/loss will level out. We lose on exchange when we keep money in EURO and Danish Kroner when the dollar goes up. It should also be noticed that I use an averaged exchange rate during the year.

## Expenditures

By and large there is a good correspondence between accounting and budget although there are some specific deviations.

### **Line 11, Administration**

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### **Line 12, New Initiatives**

Four grants have been paid in 2018, all related to centennial celebrations, line 12.2. In line 12.1 there are two payments: one for the book project together with Cambridge University Press and one for the agreement with ICTP.

### **13, General Assemblies**

--

### **Line 14, Symposia**

A total of 16 grants were allocated to various symposia and workshops organized by the associations.

### **Line 15.1, Annual allocations to Associations**

The annual IUGG allocation to the associations (50% of the dues paid the year before) is installed when the financial reports for the previous year are received. The distribution percentages for the period 2016-2019 and the allocations in 2018 are shown in the following table:

	%	2018 amount according to the applied algorithm
IACS	10.46	\$28,899
IAG	11.68	\$32,270
IAGA	15.19	\$41,967
IAHS	12.39	\$34,231
IAMAS	15.81	\$43,680
IAPSO	10.82	\$29,894
IASPEI	13.19	\$36,441
IAVCEI	10.46	\$28,899
		<u>\$276,281</u>

By definition IACS will get the same contribution as that of IAVCEI.

The amount shown in line 15.1 of the account summary, page 118, differs from the amount shown here due to the way I handle the fluctuating exchange rates over a year.

### **Line 17, ICSU grants**

No ICSU grant was received in 2018.

### **Line 18, Union activities**

In 2018 6 travel reimbursements were paid. The total number of liaison officers travelling on behalf of IUGG may be higher, but in some cases people are able to other sources of funding. IUGG appreciates this very much.

See page 118 for more details.

### **Line 22, Loss on exchange**

See line 5.b for explanatory details.

## OVERVIEW OF IUGG GRANTS AND ALLOCATIONS

IUGG is supporting science in different ways:

- i) Annual allocation to Associations, line 15 (see further comments on page 117)
- ii) New initiatives, line 12
- iii) Smaller scientific meetings, line 14
- iv) Special grants with ICSU, line 17
- v) Union activities, line 18
- vi) Travel grants in connection with General Assemblies, line 13.2 and line 19.1

Here follow some main figures for the amounts allocated in 2018:

<b>i) Line 15.1 (Associations)</b>		
8 Associations		<b>\$ 276,281</b>
<b>ii) Line 12 (New initiatives)</b>		
12.1 ICTP training course activities	\$ 15,000	
12.1 Cambridge University Press, IUGG book	\$ 6,707	
12.2 4 IUGG grants, in connection with centennial year	<u>\$ 20,000</u>	
Total		<b>\$ 41,707</b>
<b>iii) Line 14 (Symposia grants)</b>		
5 grants paid in the calendar year 2018	<u>\$ 18,532</u>	
Total		<b>\$ 18,532</b>
<b>iv) Line 17 (ICSU grants)</b>		
No ICSU grant in 2018	€ <u>0</u>	
Total		<b>\$ 0</b>
<b>v) Line 18 (Union activities)</b>		
18.1 GRC, SEDI, CMG, CCEC	\$ 34,000	
18.2 ILP	\$ 15,000	
18.3 Liaison officers	\$ 9,579	
18.4 No payment in 2018	\$ 0	
18.5 UCPS	<u>\$ 0</u>	
Total		<b>\$ 58,579</b>
<b>vi) Lines 13.2 and 19.1 (Grants in connection with General Assemblies)</b>		
No payments in 2018		<b>\$ 0</b>



## MEMBERSHIP INFORMATION AND STATISTICS

As of December 31, 2018 IUGG has 72 members representing 275 units. There have been a few changes since last year. Serbia and Uruguay were admitted as cat. A members. And two former cat. 1 members, Bulgaria and Nicaragua were moved to cat. A too.

As of January 1st, 2019, 57 members are paying members, 15 members are in associate status. 16 paying members representing 33 units were in observer status on that day. As of today, February 14th, 2019 four observers have already paid their dues in arrears. They are not listed here. Consequently, 12 members are today in observer status, representing 19 units.

In 2018 IUGG could welcome Algeria back as paying member. And of January 1<sup>st</sup>, 2019, New Zealand moved from cat. 1 to cat. 2.

### In category 1, 7 members, 7 units

Iran (8. year as observer)                      special situation  
 Azerbaijan (4. year as observer)  
 Indonesia (4. year as observer)  
 Vietnam (3. year as observer)  
 Jordan (2. year as observer)  
 Croatia (1. year as observer)  
 Romania (1. year as observer)

### In category 2, 3 members, 6 units

Nigeria (5. year as observer)  
 Saudi Arabia (3. year as observer)  
 Pakistan (1. year as observer)

### In category 3, 2 member, 6 units

Brazil (3. year as observer)  
 Argentina (1. year as observer)

In summary, the membership overview is

Category	No. of members	No. of units/ member	Total units
11	1	35	35
8	3	20	60
7	1	15	15
6	5	10	50
5	3	7	21
4	6	5	30
3	5	3	15
2	16	2	32
1	17	1	17
A	15	0	0
In total	72		275

# ADDITIONAL UNION MATTERS

## Awards and Honors

The International Hydrology Prize is awarded annually by the International Association of Hydrological Sciences (IAHS) of IUGG together with UNESCO and the World Meteorological Organization (WMO), to two people, who have made outstanding contributions to hydrological science. The 2018 recipients of the International Hydrology Prize are: **Howard Wheeler** (University of Saskatchewan, Canada) who will receive the Dooge medal for fundamental contributions to the science of hydrology, and **Andreas Schumann** (Ruhr University, Bochum, Germany) who will receive the Volker medal for outstanding applications of hydrological science for the benefit of society at large. The award ceremony will be held on 18 May 2018 at the Global conference 'Prosperity through hydrological services' organized by the World Meteorological Organization at the WMO Headquarters in Geneva, Switzerland, and co-sponsored by IAHS (<http://hydroconference.wmo.int/en/conf>).

**Giuliano F. Panza**, President of the Italian National Committee for Geodesy and Geophysics, received an honorary professorship of the Beijing University of Civil Engineering and Architecture (China).

**Shuanggen Jin**, Chair of the IUGG Union Commission on Planetary Sciences (UCPS), was elected a Member of European Academy of Sciences in June 2018. Also he was awarded the First-class Prize of Overseas Chinese Contribution Award and appointed President of Asia Oceania Geosciences Society (AOGS) Planetary Sciences Section.

The following IUGG scientists were honored by the American Geophysical Union (AGU):

**Olivier Bachmann** (Switzerland), former Chair of the IAVCEI Commission on Arc Magnetism, was awarded the Joanne Simpson Medal for Mid-Career Scientists;

**Daniel N. Baker** (USA), former Member of the IAGA Executive Committee, was awarded the William Bowie Medal.

**Timothy Druitt** (France), former Editor, IAVCEI Bulletin of Volcanology, was awarded the Norman L. Bowen Award and will deliver the Norman L. Bowen Lecture (Volcanology, Geochemistry, and Petrology Section).

**Richard S. Gross** (USA), Chair of the IAG Global Geodetic Observing System (GGOS), was awarded the Ivan I. Mueller Award for Distinguished Service and Leadership (Geodesy Section).

**Bruce Houghton** (USA), former Member of the IAVCEI Executive Committee, was elected AGU Fellow.

**Kimitaka Kawamura** (Japan), former Vice-President of the IAMAS Commission on Atmospheric Chemistry and Global Pollution (ICACGP), was elected AGU Fellow.

**Philippe Lognonné** (France), Executive Committee Member of UCPS, was elected AGU Fellow.

**Trevor McDougall** (Australia), Vice-President of IAPSO, was elected AGU Fellow.

**Alberto Montanari** (Italy), Italian National Correspondent for IAHS, was awarded the William Kaula Award.

**Paul A. Newman** (USA), Vice-President of the IAMAS International Ozone Commission (IO3C), will deliver the Jules Gregory Charney Lecture (Atmospheric Sciences Section).

**Giuliano F. Panza** (Italy), President of the Italian National Committee for IUGG, was bestowed the International Award.

**Stephen E. Schwartz** (USA), former Chair of IAGA Division IV on Solar Wind and Interplanetary Field, will deliver the Stephen Schneider Lecture (Global Environmental Change Section).

**Lisa Tauxe** (USA), U.S. National Correspondent for IAGA, will deliver the Edward Bullard Lecture (Geomagnetism, Paleomagnetism, and Electromagnetism Section).

**Donald J. Wuebbles** (USA), Former Director of Information of the IAMAS International Ozone Commission (IO3C), was awarded the Bert Bolin Global Environmental Change Award and will deliver the Bert Bolin Global Environmental Change Lecture (Global Environmental Change Section).

The following IUGG scientists were honored by the European Geosciences Union (EGU):

**Daniel N. Baker** (USA), former Member of the IAGA Executive Committee, was awarded the Hannes Alfvén Medal;

**Günter Blöschl** (Austria), President of IAHS, was awarded the John Dalton Medal;

**Andreas Kääh** (Norway), former Member of the GRC Executive Committee, was awarded the Louis Agassiz Medal;

**Tonie van Dam** (Luxembourg), Member of the CCEC Executive Committee, was awarded the Vening Meinesz Medal.

IUGG announced the ten winners of the **Early Career Scientist Awards 2019** for their outstanding research in Earth and space sciences and for international research cooperation:

**Juan Carlos Afonso** (Australia; seismology)

**Amir AghaKouchak** (USA; hydrology)

**Emilie Capron** (UK; climatology)

**Ira Didenkulova** (Russia; oceanography)

**Marie Dumont** (France; cryospheric sciences)

**Binbin Ni** (China; aeronomy)

**Katrin Schröder** (Italy; oceanography)

**Flavia Tauro** (Italy; hydrology)

**Takeshi Tsuji** (Japan; seismology)

**Qiuzhen Yin** (Belgium; climatology)

The IUGG Early Career Scientist Awards will be presented at the 27<sup>th</sup> IUGG General Assembly in Montréal, Canada, on 13 July 2019 during an Award Ceremony. The awardees will give a talk at the

Union Symposium U9 “Celebrating Early Career Scientists” to be held on 12-13 July 2019. All Assembly delegates are welcome to attend the symposium.

The IUGG Gold Medal is bestowed on **William Richard Peltier** (University of Toronto, Canada) for “his scientific contributions that have been pioneering and profound in deep earth physics and climate system processes, and for his unselfish contributions to international scientific collaboration”.

## Helmut Moritz' 85<sup>th</sup> Birthday



Helmut Moritz (born in Graz, Austria on 1 November 1933) is a distinguished physical geodesist. His work is in the fields of general geophysics, geodynamics, gravimetry, theoretical mechanics, and the theory of relativity. He graduated from the Graz University of Technology (TUG) in 1956 and obtained his doctorate degree in 1959 (TUG). Since 1955 he has held various positions at TUG, Geodetic Service of Austria, Ohio State University (USA), Technical University Hannover (Germany), and Wuhan University (China). He was Professor of Physical Geodesy at Technical University Berlin (Germany, 1964-1971), then Professor of Geodesy at the TUG Institute of Navigation (1971-2002) becoming Professor Emeritus at TUG.

Moritz was President of the International Association of Geodesy (1979-1983), IUGG Bureau Member (1983-1991), and IUGG President (1991-1995). He was elected to the Austrian Academy of Sciences and several national academies and societies including the Finnish Academy (1970), Accademia Nazionale die Lincei (1974), Hungarian Academy of Sciences (1983), Royal Swedish Academy of Engineering Sciences (1984), Royal Spanish Academy of Sciences (1984), Academy of Sciences of the German Democratic Republic (1984, now the Leibniz Society of Sciences in Berlin), Royal Astronomical Society (1985), German National Academy of Sciences Leopoldina (1987), Polish Academy of Sciences (1988), Academia Europaea (1992), Croatian Academy of Sciences (1994), and Chinese Academy of Sciences (1998). Moritz received honorary doctorate degrees from the Technical University of Munich (1981) and Ohio State University (1992), honorary professorship of the Wuhan Technical University of Surveying and Mapping (China, 1993), and the Russian Order of Friendship (2014). Moritz is an IUGG Fellow. Congratulations to Helmut Moritz on reaching his 85<sup>th</sup> year!

## A. F. Spilhaus, Jr. (1938-2018)



Athelstan Fredrick (Fred) Spilhaus, Jr., long-time Executive Director of the American Geophysical Union (AGU; 1970-2009), died on 30 April 2018 in Washington, D.C., after an extended illness. He was born in Boston, Massachusetts, on 21 May 1938. He held three degrees from the Massachusetts Institute of Technology, including a Ph.D. in physical oceanography. For more than three decades, Fred's career was intertwined with IUGG. In 1967, when he joined the staff of AGU as Assistant Executive Director, AGU was formally a part of the U.S. National Committee for Geodesy and Geophysics (USNC/IUGG) established by the U.S. National Academy of Sciences in 1919 to adhere to IUGG.

Even before Fred settled into his AGU office, he was off to Zurich, Switzerland, for the IUGG General Assembly. He often commented that being immersed in the international geophysical community of scientists for two weeks so early in his tenure was an amazing experience and one that would help shape his philosophy for how AGU could operate as a part of the global science scene. When his predecessor, Waldo Smith, retired in 1970, Fred became AGU's Executive Director and also became the Secretary to the USNC/IUGG. Two years later it became clear that AGU, and the USNC/IUGG should be separate organizations. The ties between the two remained close. Fred continued to serve as Secretary to the USNC/IUGG until 2003 and arranged for the committee to receive logistical support from AGU. Fred was an elected member of the IUGG Finance Committee from 1987 to 1995 and chaired the committee from 1999 to 2003. Fred was somewhat surprised that the United States was chosen as the site of the 1995 IUGG General Assembly so soon after the GA in Vancouver, Canada. Nonetheless, he threw his energy and the support of the AGU staff into making the Boulder, Colorado, meeting one to be remembered. While respecting the long-term traditions of IUGG, he and the host committee added touches that were reminiscent of an AGU meeting. At every IUGG General Assembly, Fred could be seen cultivating relationships with the leaders of the other delegations. He truly enjoyed scientific diplomacy and was good at it. He envisioned a strong network of scientific organizations around the world collaborating to advance our understanding of our home planet.

Fred's outgoing personality, boundless energy, and love of good food and wine were legendary. He often seemed bigger than life. He was passionate about AGU and the integrity of science, making both his mission in life. Everyone who saw the growth of AGU both in numbers and in importance know that its success was in no small measure due to Fred. His outstanding and selfless contributions to the promotion of the Earth and space sciences worldwide were recognized by many honors, including the Waldo Smith Medal from AGU in 2010. He was especially moved when IUGG Fellowship was conferred upon him in 2015 ... The world was a richer place because Fred Spilhaus was a part of it. Sadly, his passing has left a great hole.

*(written by Judy C. Holoviak, former Director of Publications of the AGU)*

## Eigil Friis-Christensen (1944-2018)



IUGG Fellow Eigil Friis-Christensen passed away on 21st September 2018 after severe illness. Friis-Christensen received a Magisterkonferens (Ph.D. equivalent) in Geophysics from University of Copenhagen in 1971, and was appointed a geophysicist at the Danish Meteorological Institute in 1972. Between 1976 and 1997, he was the principal investigator of the Greenland Magnetometer Array. From 1991 to 1997, he was Head of the Solar-Terrestrial Physics Division, Danish Meteorological Institute. He was appointed Director of the Danish Space Research Institute in 1997, which in 2004 changed its name to the Danish National Space Center.

In 2007 this became DTU Space, an Institute at the Technical University of Denmark, for which Eigil was Director until his retirement in 2012. In 1992, he was also the Project scientist on the first Danish satellite, Ørsted, which was launched in February 1999. He was an Adjunct Professor of Geophysics and Space Physics at the Niels Bohr Institute of University of Copenhagen from 1996 to 2006. Eigil authored over 140 research articles and books.

Eigil had tremendous impact as a scientific leader, working tirelessly throughout his career to promote interdisciplinary approaches and international collaboration. His scientific achievements include ground-breaking studies of the interaction between Earth's magnetic field and the solar wind, in particular using data from the Greenland magnetometer chain that he initiated and installed in the 1970s; the Oersted and Swarm satellite missions to explore Earth's magnetic field, and investigations of the connection between global temperature and the length of the solar cycle. He was highly regarded and recognized internationally for his many achievements. To list just a few: in 2009 he was awarded the Petrus Peregrinus Medal of the European Geosciences Union for "his fundamental contributions to our knowledge of the Earth's magnetic field from space and his innovative leadership in geomagnetism" and also was elected a fellow of the American Geophysical Union for "his pathbreaking cross-disciplinary scientific research and multi-national leadership in initiating new space-based research missions". Eigil was elected as Honorary Fellow of the UK's Royal Astronomical Society and Foreign Member of the Royal Swedish Academy of Sciences. He devoted considerable energy to the IUGG and its Associations. In 1997 he initiated the "Decade of Geopotential Field Research" within the IUGG; he was Executive Committee member of the International Association of Geomagnetism and Aeronomy (IAGA) from 1993 to 2015 and between 2007 and 2011 he served as President of IAGA and was a member of IUGG Executive Committee. Even after he had served his term as President of IAGA, he continued to represent IAGA on the Commission for Climatic and Environmental Change (CCEC), and was completing a chapter for the forthcoming CCEC book "Global Change and Future Earth" at the time of his death. Eigil's quiet and kind personality, combined with his dedication to science and his ability to inspire his younger colleagues and promote their individual careers, will be remembered by all who had the privilege to work with him. We have lost an outstanding scientist and a remarkable person.

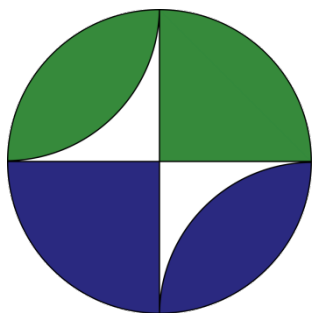
*(written by Nils Olsen and Chris Finlay, DTU Space, Technical University of Denmark;  
Therese Moretto Joergensen, University of Bergen, Norway)*

# LIST OF ACRONYMS

AAAS	American Association for the Advancement of Science
AGU	American Geophysical Union
AOGS	Asia Oceania Geosciences Society
APECS	Association of Polar Early Career Scientists
CAST	China Association for Science and Technology
CCEC	Commission on Climatic and Environmental Changes
CCTF	Consultative Committee for Time and Frequency
CEA	China Earthquake Administration
CMG	Commission on Mathematical Geophysics
CNC-IUGG	Chinese National Committee for Geodesy and Geophysics
CODATA	Committee on Data for Science and Technology
COSPAR	Committee on Space Research
CTBTO	Comprehensive Nuclear-Test-Ban Treaty Organization
DFG	German Research Foundation
EGU	European Geosciences Union
EMSEV	IAGA/IASPEI/IAVCEI Inter-Association Working Group on Electromagnetic Studies of Earthquakes and Volcanoes
GEO	Group on Earth Observation
GGOS	Global Geodetic Observing System
GOOS	Global Ocean Observing System
GRC	Commission on Geophysical Risk and Sustainability
IACS	International Association of Cryospheric Sciences
IAEA	International Atomic Energy Agency
IAG	International Association of Geodesy
IAGA	International Association of Geomagnetism and Agronomy
IAHS	International Association of Hydrological Sciences
IAMAS	International Association of Meteorology and Atmospheric Sciences
IAPSO	International Association for the Physical Sciences of the Ocean
IASPEI	International Association of Seismology and Physics of the Earth's Interior
IAU	International Astronomical Union
IAVCEI	International Association of Volcanology and Chemistry of the Earth's Interior
ICACGP	International Commission on Atmospheric Chemistry and Global Pollution
ICAE	International Commission on Atmospheric Electricity
ICAO	International Civil Aviation Organization
ICCL	International Commission on Climate
ICCP	International Commission on Clouds and Precipitation
ICDM	International Commission on Dynamical Meteorology
ICMA	International Commission on the Middle Atmosphere
ICPAE	International Commission on Planetary Atmospheres and their Evolution
ICPM	International Commission on Polar Meteorology
ICSU	International Council for Science
ICTP	Abdus Salam International Centre for Theoretical Physics
IGCP	International Geoscience Programme
IGOS-P	Integrated Global Observing Strategy Partnership
IGU	International Geographical Union
IHP	International Hydrological Programme
ILP	International Lithosphere Program
INQUA	International Union for Quaternary Research



INTERMAGNET	International Real-time Magnetic Observatory Network
IOC	UNESCO Intergovernmental Oceanographic Commission
IOC	International Ozone Commission
IRC	International Radiation Commission
IRDR	Integrated Research on Disaster Risk
ISC	International Science Council
ISC	International Seismological Centre
ISPRS	International Society for Photogrammetry and Remote Sensing
ISSC	International Social Sciences Council
IUGG	International Union of Geodesy and Geophysics
IUGS	International Union of Geological Sciences
IUSS	International Union of Soil Sciences
IUTAM	International Union of Theoretical and Applied Mechanics
JBGIS	Joint Board of Geospatial Information Societies
NKGG	German National Committee for Geodesy and Geophysics
OECD	Organisation for Economic Co-operation and Development
ÖNK	Austrian National Committee for IUGG
PAIGH	PanAmerican Institute of Geography and History
PHIVOLCS	The Philippines Institute of Volcanology and Seismology
ROA	ISC Regional Office for Africa
ROAP	ISC Regional Office for Asia & the Pacific
ROLAC	ISC Regional Office for Latin America and the Caribbean
SCAR	Scientific Committee on Antarctic Research
SCOR	Scientific Committee on Ocean Research
SCOSTEP	Scientific Committee on Solar-Terrestrial Physics
SEDI	Study of the Deep Interior of the Earth
UCDI	Union Commission on Data and Information
UCPS	Union Commission on Planetary Sciences
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNISDR	United Nations International Strategy on Disaster Reduction
UNOOSA	United Nations Office for Outer Space Affairs
UN-SPIDER	United Nations Platform for Space-based Information for Disaster Management and Emergency Response
URSI	International Union of Radio Science
WCRP	World Climate Research Programme
WDS	ISC World Data System
WMO	World Meteorological Organization
WPMG	Western Pacific Geophysics Meeting
WSF	World Science Forum
VAACs	Volcanic Ash Advisory Centers
VASAG	Joint WMO-IUGG Volcanic Ash Scientific Advisory Group



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