

27th IUGG General Assembly Assemblée Générale de l'UGGI

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International Union of Geodesy and Geophysics | Union Géodésique et Géophysique Internationale



COMPTES RENDUS





UNION GEODESIQUE ET GEOPHYSIQUE INTERNATIONALE
INTERNATIONAL UNION OF GEODESY AND GEOPHYSICS

XXVII General Assembly
8 - 18 July 2019
MONTRÉAL, CANADA

COMPTES RENDUS

IUGG XXVII GENERAL ASSEMBLY
8 - 18 July 2019, Montréal, Canada

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PART I

PROCEEDINGS OF THE GENERAL ASSEMBLY

OFFICERS OF THE UNION, ASSOCIATIONS, AND COMMISSIONS FOR 2015-2019

Bureau of the Union

<i>President:</i>	Michael G. Sideris	CANADA
<i>Vice-President:</i>	Kathryn Whaler	UNITED KINGDOM
<i>Secretary General:</i>	Alik Ismail-Zadeh	RUSSIA/GERMANY
<i>Treasurer:</i>	Aksel W. Hansen	DENMARK
<i>Members:</i>	Isabelle Ansorge	SOUTH AFRICA
	Pierre Hubert	FRANCE
	Chris Rizos	AUSTRALIA

Executive Committee of the Union

According to Article 10 of the Statutes of IUGG the Executive Committee consists of:

- the Bureau (see above),
- the Retiring President of the Union, Harsh Gupta (INDIA)
- the Presidents of the International Associations:

<i>IACS:</i>	Charles Fierz (2015-2017)	SWITZERLAND
	Regine Hock (2017-2019)	USA
<i>IAG:</i>	Harald Schuh	GERMANY
<i>IAGA:</i>	Eduard Petrovsky	CZECH REPUBLIC
<i>IAHS:</i>	Hubert Savenije (2015-2017)	NETHERLANDS
	Günter Blöschl (2017-2019)	AUSTRIA
<i>IAMAS:</i>	John Turner	UNITED KINGDOM
<i>IAPSO:</i>	Denise Smythe-Wright	UNITED KINGDOM
<i>IASPEI:</i>	Thorne Lay	USA
<i>IAVCEI:</i>	Donald Dingwell	GERMANY

Finance Committee of the Union

<i>Chair:</i>	David Collins (2015-2016)	UNITED KINGDOM
	Jan Krynski (2016-2019)	POLAND
<i>Members:</i>	Nasser M. Abou Ashour (2016-2019)	EGYPT
	Jan Krynski (2015-2016)	POLAND
	Corina Risso	ARGENTINA
	Virendra Tiwari	INDIA

Secretaries General of the International Associations

<i>IACS</i>	Andrew Macintosh	NEW ZEALAND
<i>IAG:</i>	Hermann Drewes	GERMANY
<i>IAGA:</i>	Mioara Manda	FRANCE
<i>IAHS:</i>	Christophe Cudennec	FRANCE
<i>IAMAS:</i>	Teruyuki Nakajima	JAPAN
<i>IAPSO:</i>	Stefania Sparnocchia	ITALY
<i>IASPEI:</i>	Johannes Schweitzer	NORWAY
<i>IAVCEI:</i>	Roberto Sulpizio	ITALY

Union Commissions

Union Commission on Climatic and Environmental Change (CCEC):

www.ccec-iugg.org

<i>Chair:</i>	Tom Beer	AUSTRALIA
<i>Vice-Chair:</i>	Jianping Li	CHINA
<i>Secretary-Treasurer:</i>	Keith Alverson	USA/JAPAN

Union Commission on Mathematical Geophysics (CMG):

<i>Chair:</i>	Yehuda Ben-Zion	USA
<i>Vice-Chairs:</i>	Einat Aharonov	ISRAEL
	Claudia Pasquero	ITALY
<i>Secretary:</i>	Ilya Zaliapin	USA

Union Commission on Geophysical Risk and Sustainability (GRC):

www.iugg-georisk.org

<i>Chair:</i>	John LaBrecque	USA
<i>Vice-Chairs:</i>	Vyacheslav Gusiakov	RUSSIA
	Alan Thomson	UNITED KINGDOM
<i>Secretary/Treasurer:</i>	Paula Dunbar	USA

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

www.sedigroup.org

<i>Chair:</i>	Jonathan Aurnou	USA
<i>Vice-Chair:</i>	Christine Thomas	GERMANY
<i>Secretary:</i>	Michael Bergman	USA

Union Commission on Data and Information (UCDI):

www.iugg-ucdi.org

<i>Chair:</i>	Satheesh Sheno	INDIA
<i>Vice-Chair:</i>	Anatoly Soloviev	RUSSIA

Union Commission on Planetary Sciences (UCPS):

<http://202.127.29.4/geodesy/ucps/index.html>

<i>Chair:</i>	Shuanggen Jin	CHINA
<i>Vice-Chairs:</i>	Athena Coustenis	FRANCE
	Jörn Helbert	GERMANY
<i>Secretary/Treasurer:</i>	Scot Rafkin	USA

IUGG Working Group on History (WGH):

<i>Chair:</i>	Hans Volkert	GERMANY
<i>Vice-Chair:</i>	Claude Boucher	FRANCE

Inter-Unions Commission

Inter-Union Commission on the Lithosphere: The International Lithosphere program

www.scl-ilp.org

<i>President:</i>	Hans Thybo	NORWAY/TURKEY
<i>Secretary General:</i>	Magdalena Scheck-Wenderoth	GERMANY
<i>Bureau Members:</i>	IUGG: Harsh Gupta	INDIA
	IUGS: Christine Asch	GERMANY
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<i>Executive Secretary:</i>	Alexander Rudloff	GERMANY

IUGG Liaison Officers with Intergovernmental Organizations

<i>The United Nations Geospatial Information Section:</i>	Hermann Drewes	GERMANY
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	Claude Boucher	FRANCE
<i>Group on Earth Observations (GEO):</i>	Alik Ismail-Zadeh	GERMANY/RUSSIA
	Claude Boucher	FRANCE
	Mioara Manda	FRANCE

XXVII General Assembly of the International Union of Geodesy and Geophysics
Officers of the Union, Associations, and Commissions for 2015-2019

	Peter Fox	USA
	Richard Gross	USA
	Göran Ekström	USA
<i>International Civil Aviation Organization (ICAO):</i>	John Eichelberger	USA
	Arnau Folch	SPAIN
<i>Pan-American Institute of Geography and History (PAIGH):</i>	Laura Sanchez	GERMANY/ COLOMBIA
<i>United Nations Educational, Scientific and Cultural Organization (UNESCO)</i>		
<i>International Hydrological Programme (IHP):</i>	Christophe Cudennec	FRANCE
	Georg Kaser	AUSTRIA
<i>International Oceanographic Commission (IOC):</i>	Stefania Sparnocchia	ITALY
	Eugene G. Morozov	RUSSIA
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	Arnau Folch	SPAIN
	Joyce E. Penner	USA
	Alan Thomson	UNITED KINGDOM
<i>Partner Advisory Committee (PAC) of the Global Framework for Climate Services (GFCS):</i>	Roger Pulwarty	USA

IUGG Representatives on ICSU/ISC Committees and Regional Offices

<i>Committee on Data for Science and Technology (CODATA):</i>	Alexei Gvishiani	RUSSIA
	Bernd Richter	GERMANY
<i>Committee on Space Research (COSPAR):</i>	Andrew W. Yau	CANADA
	Geoffrey Blewitt	USA
<i>Programme on Integrated Research on Disaster Risk (IRDR):</i>	Harsh Gupta	INDIA
<i>Scientific Committee on Antarctic Research (SCAR):</i>	Ian Allison	AUSTRALIA
	John Turner	UNITED KINGDOM
<i>Scientific Committee on Oceanic Research (SCOR):</i>	Denise Smythe-Wright	UNITED KINGDOM
	John Turner	UNITED KINGDOM
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	Richard Essery	UNITED KINGDOM
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	Ruth E. Neilan	USA
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<i>Regional Office for Asia & the Pacific (ROAP):</i>	Sukanta Roy	INDIA
<i>Regional Office for Latin America and the Caribbean (ROLAC):</i>	Jaime U. Fucugauchi	MEXICO

XXVII General Assembly of the International Union of Geodesy and Geophysics
Officers of the Union, Associations, and Commissions for 2015-2019

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XXVII General Assembly of the International Union of Geodesy and Geophysics
Report of the Chair of the Local Organizing Committee

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Ms. Claire CALSINA, Staffing Coordinator
Mr. Alain CARBONNEAU, Director of Sales
Ms. Marie-Josée TALARICO, Operations Director
Mr. Jean-Paul DE LAVISON, President

REPORT OF THE CHAIR OF THE LOCAL ORGANIZING COMMITTEE

FIONA DARBYSHIRE

The XXVIIth General Assembly of the IUGG was held in Montréal, Canada in from July 8 to 18, 2019, and was co-hosted by two Canadian societies whose research interests overlap with those of IUGG:

- Canadian Geophysical Union (CGU; research themes corresponding to IACS, IAHS, IAG, IAGA, IASPEI, IAVCEI)
- Canadian Meteorological and Oceanographic Society (CMOS; research themes corresponding to IAMAS, IAPSO)

The two societies usually hold their own annual meetings, but they decided to join with the IUGG General Assembly for 2019, and they played an active role in the preparation and administration of the meeting.

Overall, we had almost 4000 registrants, of whom over 800 were student delegates, with 95 different countries represented. The event attracted a good showing of conference exhibitors, with over 30 booths in place. We were able to obtain some government, academic and industry sponsorship, as well as significant support from the Palais des Congrès de Montréal (the conference venue) and from Tourisme Montréal, whose generous financial contributions allowed travel support to several scientists from developing countries.

The bid to host the 2019 IUGG General Assembly was spearheaded by Gordon Young, then Executive Director of CGU, with the aid and cooperation of Marc-André Gemme and his team at the Palais des Congrès de Montréal. In 2016 and early 2017, initial planning was carried out by a Canadian steering committee in conjunction with IUGG's planning of the scientific program committee. Bids from local professional conference organisers (PCO) were reviewed in the first half of 2017, and plans were made for the autumn 2017 IUGG business meetings to be held in Montréal. The Local Organising Committee (LOC) was assembled in summer 2017, at the same time that the company JPdL International was chosen as the local PCO. JPdL, CGU and CMOS joined forces to create a legal entity partnership for the administration of the IUGG General Assembly. This process was completed in early 2018, at which time the work to put together the conference began in earnest.

A new process for the conference organisation was introduced by IUGG for this General Assembly: the division of work between two professional conference organisers. JPdL handled all the logistical aspects of the conference organisation and the delegate registrations, whereas Czech company C-IN (who acted as PCO for the 2015 Prague General Assembly) was tasked with handling all aspects related to the scientific program management, including abstract submissions, travel-grant applications, and the final publication of the online scientific program, abstract database and mobile app for the conference. This new initiative, along with the active participation of the Canadian co-hosts CGU and CMOS, required a great deal of care in terms of keeping the lines of communication open between a large number of different organisations, and ensuring that no tasks were either duplicated unnecessarily or inadvertently omitted.

Observations

The Palais des Congrès de Montréal is a very good venue for a conference of this size. Registration and help desks were prominent in the entrance hall, and the large ground floor hall gave us a spacious venue for poster sessions, coffee breaks, poster socials and exhibits. Oral presentations and business meetings took place on the main upper floor, with rooms set up for audiences ranging from a few tens for the smaller events to >2000 for the events in the plenary hall. The 7th floor hall and terrace provided an ideal venue for the post-ceremony receptions and other social events. The Palais is also ideally located in the city centre, easy walking distance from the vast majority of the conference hotels, a wide variety of restaurants and food courts, and the city's main tourist attractions. Thanks to all of the staff of the Palais for their hard work in making the conference run smoothly.

The Opening, Closing and Award ceremonies and accompanying receptions were largely a success. Particular thanks go to Dennis Trudeau (a well-known Canadian broadcaster) our master of ceremonies for the opening ceremony, the members of Québec troupe *Danse Cadence* for their lively performances of traditional music and dance, and the students of the McGill University jazz program for their excellent contributions to our musical entertainment. We had good delegate attendance at all of the ceremonies.

As observed for previous assemblies, the overall length of the conference makes it expensive to attend for many delegates, even though most Associations have their main presence over a period of 5-6 days rather than the full 9 days of scientific sessions. The full delegate registration fees were not significantly more expensive than those of the 2015 General Assembly when exchange rates are taken into account, though the higher cost of living in Montréal versus Prague made the conference attendance overall more expensive. We reduced the student registration fee to ~50% of the full delegate fee, instead of the >60% of previous General Assemblies, and also introduced a one-day registration option. The separation of abstract-submission fee from registration fee was required due to the different jurisdictions of the two professional conference organisers, and caused some initial confusion due to the different currencies (Euros for abstract submission and Canadian dollars for registration).

Registration in general, and registration by presenting authors in particular, required a more flexible approach than originally anticipated. This was at least in part governed by the current political climate, in which government scientists (e.g. from the US and Canada) face a long wait for permission to attend conferences, meaning that they often cannot register until a few weeks before the conference. The US government shutdown may also have prevented some potential delegates from attending, given that it coincided with the main abstract submission period. The current political climate also caused some issues for international delegates, with several visa delays and some refusals, which resulted in a number of last-minute cancellations.

Thanks to the hard work of LOC members and JPdL staff, we were able to offer over 20 workshops to the scientific community before and during the General Assembly, and the vast majority of them received sufficient interest to go ahead. Unfortunately, a lack of numbers meant that very few of the offered field trips were able to run. The field trips and workshops that went ahead were very successful and well received.

The General Assembly's volunteer program was a great success, and special thanks are due to the LOC's volunteer coordinator who organised over 100 participants to help with the running of the Assembly over its 9-day period (plus the business-meeting days). The majority of the volunteers were students and postdocs from Montréal universities, but we also welcomed a number of people from government science institutions and other universities across Canada and internationally. Volunteers were given free registration to the conference in exchange for their work, and their timetables were organised to permit them to attend the scientific sessions in which they were most interested. The volunteers assisted with registration and poster organisation, monitored each room where oral presentations were taking place, helped with troubleshooting of technical issues, and helped to guide delegates around the conference venue. Each volunteer's badge included the languages that they spoke, and this information was greatly appreciated by our international delegates.

Overall the scientific program ran very smoothly despite a number of last-minute changes. The plenary talks given by the 9 Union Lecturers, as well as Association-specific keynote presentations, were all very successful. Coordination of the program between the Scientific Program Committee, associate PCO C-IN and local PCO JPdL sometimes presented some challenges, especially in the period leading up to the conference, when the program and mobile app were being finalised, but the vast majority of these challenges were overcome. We occasionally found ourselves at a crossroads in terms of expectations for the presentation of the scientific program information. Large annual conferences like AGU and EGU have been entirely paperless for a number of years, relying solely on their websites and mobile apps. We provided a hard-copy program-at-a-glance, but after discussion with the IUGG

executive and examination of the number of requests made, decided not to create a hard-copy full program book as per previous Assemblies. This step was welcomed by some delegates but unpopular with others, and future meetings should examine the best way to proceed.

Communication between the LOC, SPC, IUGG and the two professional conference organisers was largely successful, though there are still some issues to resolve and clarify. The division of tasks was not always clear, resulting in some grey areas that required extra discussion. We tried to make the conference website as seamless as possible for the delegates via links to the associate PCO's portals. Although this simplified some processes, it sometimes led to a certain degree of confusion from the delegates as to who they should contact for different queries. If the use of two PCOs is kept in future assemblies, we recommend a more clear discussion at the start of the process in order to establish more explicitly the division of tasks and responsibilities.

Acknowledgments

The success of the XXVIIth IUGG General Assembly was thanks to the hard work and dedication of a large number of individuals and organisations. I would particularly like to thank the following individuals and groups:

- the members of the Local Organising Committee.
- the members of the Scientific Program Committee, including Chair Spiros Pagiatakis.
- the executive committees of CGU and CMOS.
- Gordon Young and Marc-André Gemme for the bid preparation and presentation.
- the IUGG Bureau and Executive, and Executive Secretary Franz Kuglitsch for all his information, advice, and participation in our exhibition booths at AOGS and AGU.
- the staff of JPdL International for an incredible amount of work: pre-conference organisation, day-to-day running of the Assembly (including rapid troubleshooting), and ongoing post-conference logistics. Adriana Bonacci and Alain Carbonneau were most closely involved with the LOC through the entire process, but all the team members played an active and invaluable role.
- the staff of C-IN for their important role in the scientific program management, abstract submission system and travel grant application system.
- the staff of the Palais des Congrès de Montréal, Capital Traiteur and Freeman Audiovisual.
- all the IUGG2019 volunteers.

Finally I would like to thank the almost 4000 conference attendees who joined us in Montréal for this General Assembly, and I wish the organisers of the XXVIIIth General Assembly all the best.

REPORT OF THE CHAIR OF THE SCIENCE PROGRAM COMMITTEE SPIROS PAGIATAKIS

1. Foundation and Composition

The Scientific Programme Committee (SPC), chaired by Spiros Pagiatakis, Professor of Geodesy at the Department of Earth and Space Science and Engineering, York University, Toronto, Canada commenced its work in September 2017 and comprised the following members:

- Andrew Mackintosh, Secretary General of the International Association of Cryospheric Sciences (IACS),
- Hermann Drewes, Secretary General of the International Association of Geodesy (IAG),
- Mioara Manda, Secretary General of the International Association of Geomagnetism and Aeronomy (IAGA),
- Christophe Cudennec, Secretary General of the International Association of Hydrological Sciences (IAHS),
- Teruyuki Nakajima, Secretary General of the International Association of Meteorology and Atmospheric Sciences (IAMAS),
- Stefania Sparnocchia, Secretary General of the International Association for the Physical Sciences of the Oceans (IAPSO),
- Johannes Schweitzer, Secretary General of the International Association of Seismology and Physics of the Earth's Interior (IASPEI),
- Roberto Sulpizio, Secretary General of the International Association of Volcanology and Chemistry of the Earth's Interior (IAVCEI),
- Alik Ismail-Zadeh, Secretary General of the Union,
- Michael Sideris, President of the Union (non-voting member), and
- Franz Kuglitsch (Executive Secretary/Assistant Secretary General of the Union, non-voting member).

On several occasions, Charles Fierz (IACS) and Steve Ackerman (IAMAS) joined the Committee meetings to represent their Associations on behalf of their Secretaries General.

2. Meetings

The SPC met face-to-face for the first time on September 22, 2017 at the Palais des Congrès (Venue of the General Assembly) in Montreal. After the opening remarks by the Chair of SPC, and the acceptance of the agenda, Alain Carboneau (JPdL – Professional Conference Organizer (PCO)), Pavel Susak (C-IN – Associate PCO, Prague) and Marc-André Gemme (Palais des congrès) updated the SPC on matters related to the organization of the General Assembly, the role of C-IN in the organization of the scientific program and the details on the venue. Consequently, the SPC discussed and established the roadmap and timeline of its activities up to the date of the General Assembly. The SPC explored and debated the first ideas and propositions related to the scientific program by providing draft lists of the Union symposia and lectures, Inter-association symposia, Association symposia, special lectures, panel discussions and workshops. This very preliminary program formed the basis for jump-starting the work on the scientific program, naturally with many changes along the way. Following the composition of the preliminary program, the Chair of LOC, Prof. Fiona Darbyshire provided information on the LOC composition, its plan of collaboration with the JPdL (PCO) and C-IN (A-PCO) and on the co-sponsoring of the General Assembly by the Canadian scientific organizations namely, the Canadian Meteorological and Oceanographic Society (CMOS) and the Canadian Geophysical Union (CGU). Finally, the SPC brainstormed on the theme of the General Assembly.

The second face-to-face meeting of the SPC was held on April 8, 2018, at the Technical University of Vienna, Austria, prior to the European Geosciences Union Scientific Assembly. At this meeting, the SPC discussed thoroughly the timetable and made a few modifications based on input provided by

several associations. Subsequently, Union symposia (titles, descriptions, lead conveners) were revised and finalised. Sponsorship of a limited number of speakers at the Union symposia was discussed, information on the Union Lectures was presented, and options to organize Association ceremonies and plenaries were offered. After a long discussion and debate, the list of Inter-Association symposia was modified and approved. The modifications included among others, merging of symposia of similar objectives, revision of titles and descriptions, and updates on lead conveners. Likewise, the Association symposia were revisited and updated. Next, the Associations declared the days when their symposia would be held within the 9-day scientific program; this formed the basis for the next iteration of the scientific program.

The third face-to-face meeting of the SPC was held on April 7, 2019, again at the Technical University of Vienna, Austria, prior to the European Geosciences Union Scientific Assembly. The meeting was entirely devoted to finalizing the detailed program that was assembled and distributed to the SPC members prior to the meeting by the Chair of SPC based on extensive consultations and input from the Association Secretaries General and JPdL who had control over the room assignment coordination. Having a detailed program that met the requirements and expectations of the Associations prior to the meeting was critical for the its finalisation in an efficient and effective manner within the limited time of the SPC meeting (1-day meeting). Lecture rooms and time slot allocations for all symposia were checked and approved. Time and place of the business meetings were checked, finalised and approved. At this face-to-face meeting, C-IN was present with three expert representatives that facilitated the changes and the upload of the program in the database.

In addition to the three face-to-face meetings, the SPC held four teleconferences: December 6, 2018; January 17, 2019; February 12, 2019; and February 28, 2019. These teleconferences dealt primarily with important issues, such as abstract submission and assessment platform preparation and tuning. In addition, very active e-mail communication contributed significantly to the scientific program preparation.

Table 1. Important tentative deadlines set by the SPC

Date	Event / Subject
30 Oct. 2017	Deadline for submission of the Union symposia scope and lead (co-) conveners by Associations
15 Nov. 2017	Comments by the SPC members on the Union symposia
15 Dec. 2017	<ul style="list-style-type: none"> • <i>Website design (with LOC)</i> – Include essential information on Visa, travel, etc. • Final list of Union Symposia with the scope and names of Lead conveners and co-conveners • Submission of Joint Symposia titles, scope and description, lead and (co-)conveners of Associations
08 Apr. 2018	Symposia Conveners/co-conveners confirmed by Association SGs (EGU-2018; 2 nd face-to-face SPC meeting)
15 Aug. 2018	Symposia descriptions proposals finalized and posted – names of Union Symposia speakers announced
30 Sept. 2018	Symposia organization by conveners/co-conveners ready for posting
01 Oct. 2018	<ul style="list-style-type: none"> • Online registration and abstract submission opens • <i>Online accommodation reservations open (plan with LOC and PCO)</i> • Travel grant applications open
15 Nov. 2018	Updates and reminders (newsletter)
05 Jan. 2019	Reminder on abstract submission and early-bird registration deadline
30 Jan. 2019	Final reminder on deadlines
18 Feb. 2019	<ul style="list-style-type: none"> • <i>Closing of abstract submission</i> • <i>Closing of Grant application submission</i>
01 Mar. 2019	<i>Final closing of possible abstract submission extension</i>
30 Mar. 2019	Abstract Acceptance sent to participants
5 Apr. 2019	<i>Early-bird registration closes</i>

12 Apr. 2019	<ul style="list-style-type: none"> • Newsletter on field trips and <i>accommodation reservations (LOC/PCO)</i> • Final Adjustment of program (<i>tentative 3rd face-to-face SPC meeting – Montreal</i>)
31 May 2019	Complete scientific program and guidelines for presenters published

3. Defining the Symposia

At the first face-to-face meetings of the SPC, the general design of the scientific program was adopted, to include:

- Nine Union Lectures with plenary speakers proposed by the Associations (one speaker per Association) and one speaker by the Union; all speakers were invited by the IUGG President.
- Nine Union Symposia identified as being of wide interest to all. Oral presentations by invitation only; poster presentations allowed upon the decision of the conveners. The Union Symposia were sponsored by several Associations.
- 66 Inter-Association symposia co-sponsored by two or more Associations. Lead conveners and co-conveners were identified and confirmed. The Inter-Association symposia included solicited oral presentations. Poster presentations were also called for.
- 157 Association symposia and 22 workshops of more specialised interest to individual Associations.

It was agreed that:

- Symposia would comprise technical sessions (also called blocks) of 90 minutes each, usually separated by a coffee break, or a lunch break, or spread over more than one day depending on the length of the Symposium.
- A symposium should comprise a minimum of two oral technical sessions (blocks). Symposia with small number of accepted oral presentations should be either merged with similar symposia, or the presentations should be presented as posters.
- Contributed (inter-Association or Association) oral presentations should be 15 minutes in length (including Q&A).
- Solicited (inter-Association or Association) oral presentations could be either 15 or 30 minutes in length (Conveners' decision).
- Workshops would have a more informal structure, following the usual practices of the sponsoring Associations.
- Poster and oral presentations should be considered of equal significance.

The coding convention of the symposia following from previous IUGG General Assemblies, was adopted:

Table 2. Coding convention of Symposia

U	Union	IUGG
J	Joint inter-Association	2 or more Associations
C	Cryospheric	IACS
G	Geodesy	IAG
A	Aeronomy and Geomagnetism	IAGA
H	Hydrology	IAHS
M	Meteorology	IAMAS
P	Oceanography	IAPSO
S	Seismology	IASPEI
V	Volcanology	IAVCEI

An Association symposium was identified by the relevant letter to the Association, followed by a number. For instance, G03 meant IAG symposium #3. Joint Symposia were identified with the prefix “J” followed by the association code and the number; for example, JM01 - Joint symposium #1 led by IAMAS, whereas JHW05 signified Joint Workshop #5 led by IAHS.

Recognised scientists were invited by their Association to submit symposia proposals and serve as lead conveners. Discussions between the lead conveners, Secretaries General and other recognised scientists helped identify co-conveners and cross-Association linkages. A working version of the scientific program was initially posted in a secure drop-box coordinated by the Chair of the SPC, and/or communicated via e-mail to the Secretaries General to develop and/or refine the development of the symposia. A complete list of symposia including their description was posted on the General Assembly web page on October 22, 2018. Minor modifications to the description of the symposia/workshops, and any required corrections, amendments, and formatting were done periodically as requested.

4. Scientific Programme Structure

An outline of the program structure of the Scientific Program both by Assembly day and by Association days (Figs. 1 and 2), was established at the second face-to-face meeting of the SPC, and it was maintained throughout the planning process. It was agreed that the scientific program would run for nine days, from Tuesday, July 9, to Wednesday July 17, 2019. Two morning sessions, including Union lectures on July 11, 13 and 16 (Thursday, Saturday and Tuesday), were followed by an afternoon program, combining two oral sessions, separated by a 90-minute-long coffee break to allow delegates to attend the first poster session of the day. This first poster session was followed by a second two-hour session (18:00-20:00), with complimentary snacks, finger-food, alcoholic and non-alcoholic beverages served.

At the first face-to-face SPC meeting, it was agreed that the Union Secretary General would be in charge of the organization of the Union Lectures and Union Symposia (along with the Chair of the SPC) and that the Chair of the SPC, in close collaboration with the Association Secretaries General would coordinate the preparation of the inter-Association symposia. Likewise, the Secretaries General of the Associations would organize their Association scientific and business programs. This distribution of tasks and responsibilities worked well and enabled the individual Secretaries General of the Associations to have clear autonomy, while sufficient overview and coordination was kept by the Chair of the SPC.

Union and inter-Association symposia were held during the entire 9-day period of the General Assembly. This appeared to work optimally since the Associations were able to schedule their program with the maximum number of sessions available. The detailed scientific program was coordinated by the SPC Chair, who had been continuously updating the master table with new input, or changes as they were becoming available from the Secretaries General. At the same time, the SPC Chair, in close collaboration with the managers of JPdL and C-IN, would assign rooms for each session to keep control of the room inventory while securing accommodation for every scientific session. Updates of the master table were communicated to the Secretaries General and the Associate PCO (C-IN) every few days or even daily, depending on the number of changes made. This approach proved to be very useful and efficient since the nearly final version of the program (symposia, sessions, and rooms) was made available to the SPC a few days prior to the third face-to-face SPC meeting, where the final version of the program was successfully tuned affording only minor changes.

Notably, all scientific sessions requested by the Associations were accommodated. While the scientific program was composed, the Secretaries General were in close contact with the PCO manager (JPdL) to plan all business meetings and workshops. Again, both processes went very smoothly as the SPC Chair and the manager of JPdL were in constant communication to accommodate every scientific session and every business meeting in a timely and optimal fashion. The complete program with the technical sessions, oral and poster presentations was finally published on June 3, 2019, along with the possibility to create personal programme. Guidelines for presenters of oral and poster presentations were posted in the second half of June 2019. Presenting authors of each oral presentation were encouraged to upload their presentation(s) at least one day in advance, on-site (Speaker’s Ready Room).

XXVII General Assembly of the International Union of Geodesy and Geophysics
Report of the Chair of the Science Program Committee

Time	MONDAY 08/07/2019	TUESDAY 09/07/2019	WEDNESDAY 10/07/2019	THURSDAY 11/07/2019	FRIDAY 12/07/2019	SATURDAY 13/07/2019	SUNDAY 14/07/2019	MONDAY 15/07/2019	TUESDAY 16/07/2019	WEDNESDAY 17/07/2019	THURSDAY 18/07/2019	Time	
8:30-10:00	Business Meetings	U1	U4	U7		U7	U2	U5	U7	U3	Business Meetings	8:30-10:00	
AM1 Association and Joint Symposia													
Coffee													
10:30-12:00		U1	U4	UL	AM2	UL	U2	U5	UL	U3			10:30-12:00
AM2: Association & Joint Symposia													
Lunch													
13:30-15:00	U1	U4	U6	U9	U9	U2	U8				13:30-15:00		
PM1 Association and Joint Symposia													
15:00-16:30	Coffee and Poster Session (Authors in attendance)											15:00-16:30	
16:30-18:00	U1	Opening Ceremony (Starts 16:00)	U6	U9	U9	U2	U8			Closing and Farewell	16:30-18:00		
PM2 Association and Joint Symposia													
18:00-20:00	PM2	Refreshments, snacks, Poster Session (each day); Awards (13/07/2019)									18:00-20:00		

Figure 1. Scientific program outline by day and times

ASSOCIATION	TUESDAY 09/07/2019	WEDNESDAY 10/07/2019	THURSDAY 11/07/2019	FRIDAY 12/07/2019	SATURDAY 13/07/2019	SUNDAY 14/07/2019	MONDAY 15/07/2019	TUESDAY 16/07/2019	WEDNESDAY 17/07/2019
IACS									
IAG									
IAGA									
IAHS						Provisional			
IAMAS									
IAPSO									
IASPEI									
IAVCEI									

Figure 2. Scientific program outline by Association

5. Call for Abstracts, Registration and Abstract Fee

The abstract submission portal and scientific symposia descriptions opened on October 22, 2018, with a delay of about three weeks. The deadline for abstract submission was set to February 18, 2019 @ 12:00CET, but it was extended to March 1, 2019 @ 12 CET. In some few well justified special cases, submissions of abstracts were allowed beyond the deadline. These cases had to be requested through the symposia conveners and/or Secretaries General of the Associations and did not exceed 0.01% of total number of submissions. Submission of abstracts required payment of abstract administrative fee of 35 €per abstract.

Web registration opened on October 31, 2018 and was handled by JpDL separately from the submission of abstracts, which was handled by the A-PCO (C-IN). The system was slightly different from those we are used at other similar Assemblies or previous IUGG General Assemblies. However, it was rather intuitive and easy to be used.

6. Mailings and Information Published on the General Assembly Website

All the important information was communicated via the General assembly website, and many mass e-mailings (Newsletters):

7. The Final Programme Handbook

The final General Assembly handbook was printed as hardcopy and the Scientific Program was made available on the IUGG2019 website. Several views with simple search options were available. Mobile application with all the information related to the Assembly was available for Android, iOS and Windows mobile devices.

8. Role of the Lead Conveners and Co-Conveners

The conveners of the Association and inter-Association symposia were responsible for the overall design, management, and success of the symposia and the scientific sessions comprising them. The lead conveners assumed the responsibility of establishing timely communication with the co-conveners of their symposium and organised team meetings via teleconferencing as required.

The tasks and responsibilities of the conveners were as follows:

- a) The lead convener will chair the team of conveners by establishing general communication guidelines and distribution of tasks and responsibilities within the team.
- b) The lead convener should communicate with the SPC Chair, Secretaries General of the Union and Associations, lead conveners and co-conveners of other symposia as required for updates and guidance.
- c) The lead convener, with advice from the co-conveners is responsible for contacting, inviting and securing invited speakers. The invited speakers will submit their abstract(s) through the regular abstract submission process. This task should start as early as possible.
- d) Promote the symposia through contacts, publications, announcements etc.
- e) Review all submitted abstracts, accept, reject or suggest moving abstracts to more relevant symposia.
- f) Assign the final form of presentation – oral or poster.
- g) Schedule the oral presentations in each scientific session
- h) In case of withdrawn oral contributions, the conveners should contact the authors of poster presentation(s) and offer oral presentation(s).
- i) Contact participants to serve as session chairs. Co-conveners may also accept this task.
- j) Develop the draft detailed program of the symposium on time for the SPC's review and finalisation by the first week of April 2019.
- k) Conveners should be readily available until and during the GA to resolve unforeseen issues and complications.

Co-conveners assisted the lead conveners in all the tasks mentioned above. In many cases, co-conveners served as session chairs. In very few cases, co-conveners assumed the responsibilities of the lead convener. It was crucially important for the success of the program that reliable and effective communication was established between the Chair of the SPC, the Secretaries General of the Union and Associations, lead conveners and co-conveners. For each symposium, only the lead convener was considered as the person in charge and acting in the name of all the co-conveners of the respective symposium.

In a few cases, the lead conveners were not timely in finalising their tasks, such as submitting the symposium description, reviewing and accepting the abstracts and scheduling the sessions. This caused delays in developing the draft detailed programme. In such cases, one of the co-conveners was asked to intervene.

9. Role of the Conference Organising Companies JPdL and C-IN

To achieve continuity in the organization of future IUGG General Assemblies, the Executive Committee of IUGG decided to hire a Professional Conference Organiser (PCO) namely C-IN (Prague) to handle the scientific component of the General Assembly by working closely with the SPC, whereas the local PCO (JPdL, Montreal) would handle the local organization component in close collaboration

with the LOC. This organizational scheme was tried for the first time, and was “stiff” at the beginning, until all responsibilities of each PCO were clarified, links were established, and all initial glitches were straightened out with no significant impact on the final organization of the General Assembly. The experience gained from this organizational change will certainly help in the smooth and efficient organization of future General Assemblies, should this approach be continued.

10. Observations and Issues

The following are points worth capturing for future reference to avoid delays and/or misunderstandings:

- It is crucial early in the preparation to clarify the priorities of the scientific program, namely the clear definition of the inter-Association and Association symposia.
- Should the organization of future general Assemblies be split between two PCO, care must be exercised very early on to establish clear and definitive responsibilities of each PCO as well as their interconnection.
- The needs of IAHS to have pre-Assembly preprints of proceedings must be clarified from the outset as well as the impact these requirements for the publication of the abstracts in the proceedings might have on the way abstracts are to be submitted and the corresponding part of the program is to be finalised and published.
- Clear distribution of tasks and responsibilities between the SPC Chair, Union and Association SsG is of primary importance as well as good communication among them.
- Extensions of deadlines have flow-on effects to key dates. Therefore, it is highly advised to minimize the number of extensions and their duration. The deadlines, including anticipated extensions, should allow enough time for all the actions required (e.g., review and decision time for the conveners).
- The SPC should be firm in avoiding too small or overlapping symposia. In several cases, such symposia were merged or the submissions were assigned to poster presentation. The lead conveners must make hard decisions.
- In case of gaps in the program of oral presentations, which are known in advance, the conveners should be able to fill them by offering the time slots to poster presenters. If done in advance, the change can be reflected in the online program.
- It should be made clear that posters have the same significance as oral presentations. The time and space allocated to posters should not discourage the authors from presenting them.
- The poster area should be an integral part of the whole Assembly space, not separated from the main lecture rooms. The same applies to exhibition area.
- The detailed scientific programme timetable, consisting of oral sessions, breaks, two afternoon poster sessions (one combined with coffee break, the other one with complimentary beer), proved to work very well.
- It should be emphasised that timekeeping is a must and Chairs of sessions must adhere to.
- Scientific workshops held during the Assembly should be well designed and in good balance with the oral and poster sessions. Excessive number of, or lengthy workshops may have an adverse impact on the participation in the oral sessions. The workshops should be well incorporated into the program, otherwise they will experience low participation or the relevant oral or poster sessions may also see low participation.
- Due to the large number of concurrent sessions, the layout of the rooms may be challenging. The SPC Chair, in close collaboration with the LOC should consider an efficient guiding system with the help of volunteers to guide the participants efficiently. Information screens or posters in front of the lecture rooms can provide quickly and efficiently the necessary information on the running session.
- The updating and the clarity of the website is an important requirement for any Assembly.
- The option to receive the letter of invitation should be clearly visible on the website. A similar ability to generate a certificate of participation during the Assembly is also important.

- Spacy quiet area is very much appreciated by many participants.
- Despite intense promotion and advertisement, it seems that exhibitors did not consider the IUGG Assembly as being of high priority. The number of exhibitors was much lower than at the AGU or EGU, and somewhat lower than at other assemblies of similar size (e.g., AOGS).
- Flexible communication within the SPC and between the SPC members and the conference organising company is crucial for the success of the whole event. The same applies to prompt responses and actions to all requests and needs.

Statistics of the General Assembly

The Scientific Program of the XXVII General Assembly of IUGG (IUGG2019) included 209 symposia and 21 workshops, consisting of 552 oral and 195 poster sessions, resulting in more than 4500 presentations (2329 oral, 1815 poster and 438 invited). Nearly 4000 scientists from 103 countries attended the General Assembly. It was very encouraging to see a notable increase in the student contributions: Nearly 800 student contributions from 56 countries!

**LIST OF LECTURES AND SYMPOSIA HELD AT THE XXVII GENERAL ASSEMBLY
OF THE INTERNATIONAL UNION OF GEODESY AND GEOPHYSICS**

Union Lectures

- IUGG Earth Sciences as the Underlying Pillars to Meet Societal Challenges in the next Century
(David Grimes, Canada)
- IAHS Bridging the Science-Policy Gap to address India's Water Crisis: Insights from Cauvery Basin
research
(Veena Srinivasan, India)
- IAPSO The Ocean's Role in Atmospheric Carbon Dioxide Changes During Ice Age Cycles
(Karen Kohfeld, Canada)
- IACS Exploring and Understanding Earth from Space: The Power of Perspective
(Waleed Abdalati, USA)
- IAMAS Improving atmospheric reconstructions for historical extreme events by rescuing lost weather
observations
(Ed Hawkins, UK)
- IAGA Hunting the Magnetic Field
(Lisa Tauxe, USA)
- IAG Geodesy sharpens you up
(Kosuke Heki, Japan)
- IASPEI Singing seismograms: Harmonic tremor signals in seismological records
(Vera Schlindwein, Germany)
- IAVCEI Volcanic giants - what we know, what we think we know, what we can't know about
cataclysmic super-eruptions
(Paolo Papale, Italy)

Union Symposia

- U01 Achieving Sustainable Development: The Role for Earth Sciences
- U02 Georisk Reduction: Science, Resources, and Governmental Action
- U03 Mathematics of Planet Earth: The Science of Data
- U04 Data-Driven Science for Earth and Space Exploration
- U05 New Discoveries in Earth's Deep Interior
- U06 Recent Advances and Discoveries in Planetary Science and Comparative Planetology
- U07 Centennial of the International Cooperation in Earth and Space Sciences
- U08 Earth and Space Observations
- U09 Celebrating Early Career Scientists

Joint Inter-Association Symposia

- JA01 Geophysical Constraints on the Earth's Core and Its Relation to the Mantle (IAGA, IASPEI,
IAG)
- JA02 Geophysical Data Assimilation (IAGA, IACS, IAG, IAHS, IAMAS, IAPSO, IASPEI,
IAVCEI)
- JA03 Geophysical Records of Tectonic and Geodynamic Processes (IAGA, IASPEI, IAG, IAVCEI)

XXVII General Assembly of the International Union of Geodesy and Geophysics
List of Lectures and Symposia

- JA04 Global Electrodynamics and Energetics of Atmospheric Regions from Ground to Space (IAGA, IAMAS)
- JA05 Solar Influence on the Atmosphere (IAGA, IAMAS)
- JA06 Space Weather Throughout the Solar System: Bringing Data and Models Together (IAGA, IAMAS, IAG)
- JA07 Geoscience Data Licensing, Production, Publication, and Citation (IAGA, IACS, IAG, IAHS, IAMAS, IAPSO, IASPEI, IAVCEI)
- JA08 Probing the Earth's Lithosphere and Its Dynamics Using Geophysical Modeling (IAGA, IASPEI, IAVCEI, IAG)
- JA09 Joint Inversion of Different Geophysical Data Sets (IAGA, IASPEI)
- JA10 Electromagnetic Signals Generated by Volcanic Eruptions/ Activity, Fluid Pressure, Earthquakes and Aseismic Fault Slip (IAGA, IAVCEI, IASPEI)
- JA11 Cratonic Structure and Dynamics (IAGA, IASPEI)
- JA12/JG08 Innovation in Geoscience Education, Outreach and Citizen Science (IAGA, IAHS, IAPSO, IASPEI)/Earth Systems Literacy: Geophysics in K-16 Class Rooms, Outreach Projects, and Citizen Science Research Projects (IAG, IASPEI, IAVCEI)
- JC01 Projecting Sea Level in the 21st Century and Beyond (IACS, IAMAS, IAPSO)
- JC02 Atmosphere-Ocean-Sea Ice Interactions: Local Processes and Global Implications (IACS, IAMAS, IAPSO)
- JC03 Mountain Cryosphere Hazards (IACS, IAVCEI)
- JC04 Declining Glaciers and Snow Cover and Their Impacts on Downstream Hydrology (IACS , IAHS)
- JC05 Climate Change Impacts on Arctic Snow, Permafrost, Lake and River Ice (IACS, IAHS)
- JC06 Is the West Antarctic Ice Sheet Collapsing? - Atmosphere, Ice, and Ocean Interactions Leading to Accelerated Ice Loss (IACS, IAMAS)
- JC07 Gravity-Driven Flows in the Earth System (IACS, IAPSO, IAVCEI)
- JC08 Coupling Processes Between the Atmospheric Boundary-Layer and Snow - Ice Surfaces: Observations and Modelling (IACS, IAHS, IAMAS)
- JG01 Interactions of Solid Earth, Ice Sheets and Oceans (IAG, IACS, IASPEI)
- JG02 Theory and Methods of Potential Fields (IAG, IAGA)
- JG03 Near-Real Time Monitoring of Regional to Global Scale Water Mass Changes (IAG, IAHS)
- JG04 Geodesy for Atmospheric and Hydrospheric Climate Research (IAG, IAMAS, IACS, IAPSO)
- JG05 Remote Sensing and Modelling of the Atmosphere (IAG, IAGA, IAMAS, IAVCEI)
- JG06 Monitoring Sea Level Changes by Satellite and In-Situ Measurements (IAG, IAPSO)
- JG07 Monitoring, Imaging and Mapping of Volcanic Belts (IAG, IAVCEI, IAGA, IASPEI)
- JH01 Scientific Inputs to Water-Related SDGs of the Agenda 2030 (IAHS, IAMAS)
- JH02 Climate and Hydrological Services: Bridging from Science to Practice and Adaptation (IAHS, IAMAS, IAG)
- JH03 Geosciences in the Anthropocene: Observing and Modelling Human-Nature Interactions in a Changing World (IAHS, IAMAS)
- JH04/JH05 MOXXI: Innovation and Multidisciplinarity to Observe Earth Processes (IAHS, IAMAS) / Citizen Science and Crowdsourced Data in Hydrology for Water Risk Management, Communication and Awareness (IAHS)
- JM01/JM10 Adapting in the Anthropocene (IAMAS, IAHS, IACS) / Atmospheric Water Generation (IAMAS, IAHS)
- JM02 Anthropogenic Changes in Chemistry and Physics of the Atmosphere: Evidence and Attribution Studies (IAMAS, IACVEI, IAG)

XXVII General Assembly of the International Union of Geodesy and Geophysics
List of Lectures and Symposia

- JM03 Advances and Frontier Challenges in Global Monsoon Studies: Dynamics, Convection and Interactions with Hydrological and Land Surface Processes (IAMAS, IAHS)
- JM04 Hydrometeorologic and Coastal Extremes in Current and Future Climates (IAMAS, IAHS)
- JM05 Ocean-Atmosphere Mechanisms of Variability, Change and Predictability (IAMAS, IAPSO)
- JM06 Recent Advances in Regional Climate Modelling (IAMAS, IAHS, IACS)
- JM07 Artificial Intelligence and Big data in Weather and Climate Science (IAMAS, IAHS)
- JM08 Earth System Models: Assessing the Earth System's State and Fate from Regional to Planetary Scales (IAMAS, IAPSO, IACS, IAHS)
- JM09 Satellite Remote Sensing: Vital Information on the Health of our Planet (IAMAS, IACS, IAPSO, IAHS)
- JP01 Tides of the Oceans, Atmosphere, Solid Earth, Lakes and Planets (IAPSO, IAHS, IAMAS, IAG)
- JP02 The North Atlantic-Arctic System: State, Process, and Change (IAPSO, IAMAS)
- JP03 Long-Term Climate Targets: From Emissions to Impacts (IAPSO, IAMAS, IACS, IAHS)
- JP04 Past Changes, in the Atmosphere, Oceans and Cryosphere, and Their Relevance for Future Climate (IAPSO, IAMAS, IACS, IAGA)
- JP05 Tsunamis (IAPSO, IASPEI, IAVCEI)
- JS01 Cryoseismology (IASPEI, IACS, IAG)
- JS02 Early Warning Systems for Geohazards (IASPEI, IAG, IAGA)
- JS03 Subduction Zone Deformation and Structure: Tracking the Sea Floor in Motion (IASPEI, IAG, IACVEI)
- JS04 Seismo – Geodesy (IASPEI, IAG)
- JS05 Probabilistic & Statistical Approaches in Geosciences (IASPEI, IAG, IAVCEI)
- JS06 Old Data for New Knowledge: Preservation and Utilization of Historical Data in the Geosciences (IASPEI, IAG, IAHS, IAGA, IAMAS, IACS, IAPSO, IAVCEI)
- JS07 Integrated Geophysical Programs for Earth Systems Monitoring (IASPEI, IAG)
- JS09 Tectonophysics of the Continental Lithosphere: Integrating the Thermal Field with Thermo-Barometric, Seismological, Electromagnetic and Seismicity Data (IASPEI, IAVCEI, IAGA)
- JV01 Advances in Volcano Seismology and Acoustics in a Multi-Disciplinary Context (IAVCEI, IASPEI)
- JV02 Petrological Reactions Forced by Transport and Deformation (IAVCEI, IASPEI)
- JV04/JS08 Advances in Terrestrial Heat Flow Measurement and Interpretation (IAVCEI, IASPEI) / Climate Modeling, Climate Change and Subsurface Temperature Field (IASPEI, IAHS, IAMAS)

Association Symposia and Workshops

International Association of Cryospheric Sciences (IACS)

- C01 Glacier Monitoring from In-Situ and Remotely Sensed Observations, including Aspects of the History of Cryospheric Sciences
- C02 Remote Sensing of the Cryosphere - Into an Era of High-Repeat Rate Time Series
- C03 Advances in Glacier and Ice Cap Modelling
- C04 Progress in Quantifying Ice-Sheet Surface Mass Balance: Past, Present and Future
- C05 Fast Glacier Flow: Processes, Observations and Modelling of Ice Streams, Tidewater Glaciers and Surging Glaciers
- C06 New Frontiers in Paleoclimate Reconstructions and Proxy Interpretations from Ice Cores
- C07 The Hydrological Cycle at High Latitudes: Variability, Changes and Impacts on the Cryosphere

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- C08/C13 Tropical Glaciers: History, Mass Changes, Climate Forcing and Impacts
- C09 Debris Covered Glaciers
- C10 Challenges in Measuring and Modeling Snow Mechanics
- C11 Towards the Development of a World Snow Centre of Excellence?
- C12 Observations and Modeling of Impacts to Snow and Glaciers Due to Deposition of Light-Absorbing Particles
- C14 Cryospheric Processes and Related Socioeconomic Services

International Association of Geodesy (IAG)

- G01 Reference Systems and Frames
- G02 Static Gravity Field and Height Systems
- G03 Time-Variable Gravity Field
- G04 Earth Rotation and Geodynamics
- G05 Multi-Signal Positioning, Remote Sensing and Applications
- G06 Monitoring and Understanding the Dynamic Earth With Geodetic Observations

International Association of Geomagnetism and Aeronomy (IAGA)

- A01 Planetary Magnetic Fields and Secular Variations
- A02 The Role of Iron Containing Minerals in Earth and Extraterrestrial Environments
- A03 Coupling Processes in the Atmosphere-Ionosphere (DivII-C - ICMA - SCOSTEP - ICDC)
- A04 Advances in Mid, Low Latitude and Equatorial Aeronomy
- A05 Long-Term Trends and Changes in the Stratosphere-Mesosphere-Thermosphere-Ionosphere System
- A06 Energetic Particle Precipitation into the Atmosphere: Sources and Atmospheric Impacts
- A07 The Earth's Radiation Belts and Plasmasphere: Observations and Modelling of the Wave, Ring Current, Energetic Particle, and Cold Plasma Environments
- A08 ULF Waves in the Magnetosphere (DIV III)
- A09 Reporter Review for Division III
- A10 Magnetosphere-Ionosphere Interactions
- A11 Magnetic Flux Ropes from the Sun to Geospace
- A12/A13 Quiet Sun, Active Regions and Coronal Holes (DIV IV)/Multi-Spectral Studies of Solar Activity and Eruptions
- A14 Advances and Upcoming Developments in Solar and Heliospheric Physics
- A15 Waves and Turbulence in the Solar Corona and Wind
- A16 Geomagnetic Observations for Earth and Space Science and for Space Weather Applications
- A17 Geomagnetic Observatories: Current Developments and Integration into Multidisciplinary Earth Observation Networks
- A18 Dependable, Long-Term Geomagnetic Indices and Modern, Index-Based Services: 70th Anniversary Of the Kp Index
- A19 Space Weather & Ground Observations: Geomagnetic Induced Currents and Corresponding Regional Conductivity Models of the Earth's Lithosphere
- A20 Geophysical Survey Technology for Mining Exploration
- A21 Advances in EMI theory: Data Processing, Modelling and Inversions
- A22 Significant Achievements in Magnetic Field Studies Induced by IUGG over Its 100-Year History

International Association of Hydrological Sciences (IAHS)

- H02 Using Fingerprinting and Modelling Techniques to Explore Transfer and Connectivity in Catchment Sediment Systems
- H03 Land Degradation Due to Natural and Anthropogenic Drivers: Impacts on Runoff, Soil Erosion and Sediment Yield at Multiple Scales
- H04 Source, Transport and Fate of Cohesive Sediment in Aquatic Systems: Implications for Water Quality and Ecosystem Health
- H05 Tracers For Understanding the Sources, Pathways and Fate Of Pollutants in the Hydrological Cycle
- H06 Long-Term Spatiotemporal Evolution of Catchment Water Quality and Sedimentation
- H07 Human-Water Interactions in Water Quality Models
- H08 Hydrology and Water Quality Contributions to the Water-Energy-Food Nexus?
- H09 Water Quality in Operational Water Resource Management
- H10 Quantifying Vulnerability and Human Impact on Urban Water Resources
- H11 Recent Advances in Peatland (Eco)Hydrology and Biogeochemistry
- H12 Coastal Hydrology, Hydrogeology, and Hydraulics in an Era of Unprecedented Change
- H13 Advancements in Modeling and Characterization of Aquifer
- H14 Sub-Seasonal to Seasonal Predictions: Skill and Limits for Decision-Based Forecasting
- H15 Short-Range Hydrometeorological Forecasting
- H16 Floods: Processes, Forecasts, Probabilities, Impact Assessments and Management
- H17 Advances in Snow Hydrology
- H18 Advances in Remote Observation Of Seasonal Snow
- H19 Advances in Remote Sensing Hydrology
- H20 Predictions in Ungauged Basins: What's New?
- H21 Comparative Inventories Of Water Resources Systems and their Functioning - Methodology and Tools For their Assessment, Protection and Efficient Use
comparative Inventories of Water Resources Systems and Their Functioning - Methodology and Tools for Their Assessment, Protection and Efficient Use
- H22 Time Series of Remote Sensing Data in Water Management
- H24 Modeling Hydrological Processes and Changes Under a Changing Environment
- H25 Quantifying Uncertainty in Hydrological Systems: A Bayesian Point of View
- H26 Hydrologic Time Series with Contributions on Methodologies, Applications, Assessment and Alternatives for Nonstationarity, and Assessment of Uncertainty
- H27 Multivariate Statistics For Hydrological Application
- H28 Contributions on the Unsolved Problems in Statistical Hydrology
- H29 Water-Related Education, Training and Capacity Development: Revisiting the Scopes and Competencies

International Association of Meteorology and Atmospheric Sciences (IAMAS)

- M01/M24 Cloud-Precipitation-Aerosol / Clouds and Circulations in Planetary Atmospheres
- M02 First Results from the Year of Polar Prediction (YOPP)
- M04 Polar Atmospheric Instrumentation
- M05 Polar Modelling (Polar CORDEX)
- M06 Middle Atmosphere Science
- M07 Stratosphere Couplings to the Troposphere and Ocean
- M08 Air Quality in the Changing Anthropocene

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- M09 The Arctic in the 21st Century: A Hotbed of Global Change
- M10 Recent Progress in the Field of Atmospheric Electricity
- M11 Advances in Atmospheric Dynamics
- M12 High-Impact Weather and Climate Extremes
- M13 Tropical Circulation Systems
- M14 Dynamics of Mountain Weather and Climate: Observations, Modeling and Prediction At All Scales
- M15 Frontier Challenges in Data Assimilation and Ensemble Forecasting
- M16 Sub-Seasonal to Seasonal (S2S) Prediction
- M17/M03 Past and Future Changes in Polar Climate System and Their Global Linkages / Future Evolution of the Polar Atmospheres
- M18 Natural Climate Variability and Predictability an All Time Scales
- M19 Role of Ocean-Atmosphere Interactions in Constraining Regional Climate Change
- M20 El Niño - Southern Oscillation and Its Regional and Global Impacts
- M21 Celebrating the Montreal Protocol in Montreal: Assessing Ozone Layer Recovery in an Evolving Climate
- M22 Earth's Energy Budget
- M23 Current Progress in Atmospheric Radiation
- M25 Celebrating 100 Years of IAMAS 1919 - 2019 - Past, Present and Future

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

- P01 General Topics in Oceanography
- P02 Physics and Biogeochemistry of Semi-Enclosed, Shelf Seas, and Coastal Zones
- P03/JP06 Storm Surges, Waves, and Coastal Hazards/Risk and Maritime Extremes
- P04 Mixing Processes in the Ocean
- P05 The Meridional Overturning Circulation: Mean State and Variability
- P06 Oceanic Boundary Current Systems
- P07 The Southern Ocean: Where Ocean, Ice and Atmosphere Meet
- P08 Coastal Ocean Acidification
- P09 Marine Biogeochemistry Through Time: Nutrient, Trace Metal, Oxygen, and Carbon Cycling in the Past, Present and Future
- P10 Role of Ocean Processes in the Transport and Fate of Floating Plastic Litter in the Ocean and Shelf-Seas: Theory, Modelling and Observations
- P12 Technological Advances for Ocean Sciences

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

- S01 Observational Seismology - Open Symposium Seismology
- S02 Standardization and Automatic Procedures in Source Studies
- S03 Induced and Triggered (Anthropogenic) Seismicity: A Global Perspective
- S04 Seismic Scattering, Ambient Noise, and Monitoring Earth's Structure
- S05 Seismology in the Oceans
- S06 Advancements in Observation, Processing and Interpretation of Seismological Data
- S07 Challenges and Prospects in the Investigation of Palaeo- and Historical Earthquakes
- S08 National and Regional Earthquake Centers: Highlights and Challenges
- S09 Advances in Geophysics, Atmospheric Science, and Signal Analysis for Monitoring the CTBT/
Advances in Array Seismology: Design, Theory and Applications

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- S10 Advances in Array Seismology: Design, Theory and Applications
- S11 Advances in Seismic Hazard and Risk Assessment
- S12 Genesis of Devastating Continental Earthquakes
- S13 Open Symposium - Earthquake Generation Process: Physics, Modelling Including Laboratory Experiments and Monitoring For Forecast
- S14 Earthquake Forecasting Models: Formulation, Testing and Application
- S15 Interdisciplinary Observations of Pre-Earthquake Processes: A New Approach Towards Earthquake Prediction Studies
- S16 Structure and Dynamics of the Extended Transition Zone (400-1000 km) and Mid-Mantle
- S17 Large Low Shear Velocity Provinces and Lower Mantle Structure
- S18 Cratonic Evolution, Structure and Resource Potential
- S19 Planetary Seismology
- S20 Earthquake Source Mechanics
- S21 Uncapping Flood Basalt Covered Terrains
- S22 The Lithosphere-Asthenosphere System
- S23 Integrated Seismological Studies of the Continental Lithosphere – What We Can Learn From Seismology About the (Micro-)Plate Structure and Fabrics
- S24 Subduction Zones in South and Central America: Geometry, Geodynamics and Geohazards

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

- V01 Celebrating 100 Year of Volcanic Activity: 1919-2019
- V02/JV05 When Magma Meets Water: Understanding the Trigger, the Dynamics and the Deposits of Phreatomagmatic Eruptions to Better Quantify the Associated Hazard /
- V03 Phreatic and Hydrothermal Eruptions: What We Really Know About Triggers, Magnitude, Styles and Hazards
- V04/V05 Experimental and numerical modeling of volcanic processes and their impacts
- V06 Linking Volcano-Sedimentary Features with Eruptive Processes
- V08/V21 Multidisciplinary Studies on Volcanic and Igneous Plumbing Systems / Generation, Storage and Transport of Magma in Plutonic and Volcanic Environments
- V09 The Role of LIPs in Environmental Change and Biotic Extinctions on Earth over Geologic Time
- V11/V10 Intra- and Extra-Caldera Large Volume Ignimbrites / Present State of Calderas
- V12 Geochemistry and Geophysics of Active Crater Lakes
- V13 Monogenetic Volcanism: Diversity, Processes, Tectonic Contexts, Risk and Geoheritage
- V15 Volatile Constraints on Magma Plumbing Systems and Eruption Dynamics at Open-Conduit Volcanoes
- V16 From High to Low-Enthalpy: Geothermal Energy at Work
- V17 Living with Volcanoes: Challenges and Benefits for Building Resilient and Healthy Societies
- V18 Mapping Volcanoes. Methodology and Applications
- V19 Experimental Volcanology Approach to Investigate Magma Generation, Ascent and Eruption
- V20 Recent Advances in Volcanology

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Statistics

Symposia and Oral Sessions Breakdown

	No. of Symposia		No. of Oral Sessions	
Union	9	4,3%	26	4,7%
Joint	57	27,3%	137	24,8%
IACS	13	6,2%	23	4,2%
IAG	6	2,9%	47	8,5%
IAGA	21	10,0%	51	9,2%
IAHS	28	13,4%	56	10,1%
IAMAS	23	11,0%	99	17,9%
IAPSO	11	5,3%	40	7,2%
IASPEI	25	12,0%	46	8,3%
IAVCEI	16	7,7%	27	4,9%
Total	209		552	

**XXVII IUGG GENERAL ASSEMBLY OPENING CEREMONY
MONTRÉAL, CANADA, 10 JULY 2019**

The Opening Ceremony of the XXVII General Assembly of the International Union of Geodesy and Geophysics was held in the afternoon of Wednesday, 10 July 2019 at the Palais des Congrès, Montréal, starting at 16:00.

PROGRAMME

Address by Fiona Darbyshire, Chair of the Local Organizing Committee of the XXVII IUGG General Assembly

Address by Michael Sideris, President of IUGG

Address by Julie Payette, Governor General of Canada

Address by Daya Reddy, President, International Science Council

Address by Gordon McBean, Past President of the International Council for Science

Address by Remi Quirion, Chief Scientist of Québec

Address by Vijaya Raghavan, President of the Academy of Science, Royal Society of Canada

Address by Danika Goosney, Vice-President, Natural Sciences and Engineering Research Council of Canada

Address by Sarah Gallagher, Science Advisor to the President, Canadian Space Agency

Report by Alik Ismail-Zadeh, Secretary General of IUGG

Address by Spiros Pagiatakis, Chair of the Scientific Program Committee of the XXVII IUGG General Assembly

ADDRESS BY FIONA DARBYSHIRE
CHAIR OF THE LOCAL ORGANIZING COMMITTEE OF THE XXVII IUGG GENERAL
ASSEMBLY

Dear IUGG2019 Delegates, colleagues and guests,

On behalf of the IUGG2019 Local Organising Committee, I am happy to welcome you to the 27th General Assembly of the International Union of Geodesy and Geophysics, celebrating the Union's centennial.

De la part du comité organisateur, je vous souhaite la bienvenue à la 27^e Assemblée Générale de l'Union géodésique et géophysique Internationale, qui fête aussi le centenaire de l'Union.

Our conference theme, "*Beyond 100: The next century in Earth and Space Science*" / "*Sciences de la Terre et de l'espace : un siècle de progrès, un autre à bâtir*" pays tribute to this special anniversary, and looks forward to the next 100 years and beyond. The conference is co-hosted by two Canadian societies whose domains of interest overlap with those of IUGG: the Canadian Geophysical Union (CGU) represented here by their President, Rich Petrone, and the Canadian Meteorological and Oceanographic Society (CMOS) represented here by their President Paul Kushner. We welcome our delegates from around the world to participate in our wide range of scientific symposia, meetings, workshops and short courses.

We acknowledge that the land on which we gather is traditional and unceded Indigenous territory, a place which has long served as a site of diplomacy and exchange amongst nations, including the signing of the Great Peace Treaty. We thank the Kanien'keha:ka (also known as the Mohawk) Nation for hosting us today on this unceded territory.

I would like to thank all the members of the Local Organising Committee and the Scientific Program Committee for their hard work in preparing the IUGG2019 General Assembly, as well as our dedicated team of volunteers who will ensure that everything runs smoothly during the conference sessions. Thanks also to Alik Ismail-Zadeh, the IUGG Secretary-General, for his valuable input, and to Franz Kuglitsch, the IUGG Executive Secretary, for invaluable advice and information, as well as active participation in our promotional activities at the AOGS and AGU conferences last year.

This year, for the first time, the task of professional conference organisation was split between two companies. C-IN (based in the Czech Republic) handled abstract submission, travel-grant management and all aspects of the scientific program, and JPdL International (based here in Montréal) was responsible for registration and all logistical aspects of the conference. I would like to thank the two teams for their hard work and invaluable contributions.

Last but by no means least, thanks to Gordon Young, former executive director of CGU, and Marc-André Gemme, business manager at the Palais des Congrès, for their efforts in spearheading Montréal's successful 2015 bid to host the 2019 IUGG General Assembly.

Thank you to all delegates and guests for coming to Montréal. I hope that you enjoy the conference and your stay here. I encourage you to take advantage of our summer weather to explore all that Montréal has to offer in this season, from woodland walks and panoramic views on Mont-Royal to the numerous festivals currently taking place downtown, as well as the international fireworks competition that is currently underway, including a display at 10pm this evening, visible from the Old Port.

I wish you all an excellent conference / Bon congrès.

**ADDRESS BY MICHAEL SIDERIS
PRESIDENT OF IUGG**

Distinguished guests, dear colleagues, ladies and gentlemen:

I would like to take a few minutes of your time, maybe ten, to give you a short presentation on what has developed in the last four years, the last quadrennial in IUGG, and also highlight a few of the main events in this particular assembly. But before doing so, I would like to start by reading for you IUGG's mission. Because I think we should all be aware of this and see if we can really fulfill it or not. 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 knowledge to governments and policy makers for an environmentally sustainable Earth, resilient against natural disasters. As you can probably tell from the title of my talk, I am here to argue that since the inaugural IUGG year, 1919, we have been doing that, or at least mostly that, 'that' being advancing geosciences for the benefit of humanity.

Please allow me to open a parenthesis here. You may see on screen under the little arrow connecting 1919 to 2019, a particular year, 1987. I have it there because that was a very important year for me. That was my first IUGG General Assembly (GA) in Vancouver, Canada. I was at that time a doctoral student finishing my PhD, and I am bringing this up because this is the time that they 'hooked me in'; this was the time that the International Association of Geodesy (IAG) asked me to chair one of their special study groups, and since then I moved, if you like, through the system to become President of the IAG and then eventually, 32 years later, I am here finishing my term as President of the IUGG. So I would like to take this opportunity to make a pledge to the young scientists and graduate students in the audience. Please try to get involved with the Union and the individual Associations through the various structures that you know exist, and do not wait to be asked. If you are not asked to chair a group or become a group member, ask yourself. This is the way to get into the Union and Associations, and this fantastic international community of scientists that are promoting and advancing geosciences. Close parenthesis.

As you know, we have a centennial anniversary this year. You will hear a lot more about this in the presentation of our Secretary General but there is also a particular session devoted to this. Very briefly, I will show you where we are with some of these celebrations, some of the key highlights, not in too much detail. We have developed a particular website, 100.IUGG.org, where you can find almost all of the history of IUGG and its Associations, and information about some of the events that we prepared to celebrate our centenary. There is a very interesting special issue of the open-access journal *History of Geo- and Space Sciences*, where through the hard work of our current Secretary General, Alik Ismail-Zadeh, and past Secretary General JoAnn Joselyn, we have really documented and collected this history in one place. I will point out some of the major sections. The first chapter is "Beginning, Establishment and Early Development (21019-2039)", the next one is "IUGG evolves (1940 to 2000)", and the third one is "IUGG in the 21st century". After that, we have one chapter for each of the eight Associations, where you can really find condensed the history of the Associations themselves. We have also been organizing and participating in various events around the world that celebrated one hundred years of our Union. These are typically events that held at either national academies, or national agencies, or national scientific meetings. The countries where some of these have taken place are Argentina, Canada, the Caribbean, China, France, Japan, Jordan, Mexico, Turkey and USA, and we still have a few more to come this year. You are probably a bit more familiar with the events we have in this GA, such as the Union Symposium 07 on July 13 and 11, "Centennial of the International Cooperation in Earth and Space Sciences", where you will hear various talks on the history and accomplishments of the Union. I urge you strongly to attend if you can. We also have joint celebrations with the American Geophysical Union (AGU), because we have basically the same origin and therefore this is the year for the centennial celebration of both organizations. The first joint event took place already at the AGU Fall meeting in Washington DC last December. It was a one-day event concentrating on disaster sciences, risk reduction, resilience, response and recovery (AGU-IUGG Centennial Symposium on "Disaster Science:

Risk Reduction, Resilience, Response and Recovery”). We will have a similar joint event here; it is our Union Symposium U02, on Sunday July 14, on “Disaster Science: Risk Reduction, Resilience, Response and Recovery.” Finally, one of the other planned major events is a one-day high-level celebration at the UNESCO headquarters in Paris on the 29th of this month, titled “International Cooperation in Earth and Space Sciences – Celebrating the 100th anniversary of the IUGG.”

Let me take a few moments to point out some of the highlights and developments in the last quadrennial. We had several important changes approved by our Council in our statutes and bylaws, which really improved the operation of the Union itself in terms of efficiency. We have now a standing Council with a four-year term, where decisions can be made as we go along; we no longer need all decisions to be made physically every four years when the Council meets at the GA. All important decisions can be taken care of by electronic vote, and implemented right away. We also have improved the inclusiveness of the Union by accepting scientists from any member country, even any non-member country, to hold leadership positions within the various subsections of the Union, except for the Bureau, the Executive Committee, and the Finance Committee. But other than that, any country, any scientist, even from non-member countries is welcome and encouraged to take leadership positions within our Union. We have a few more important changes in terms of better governance and more efficient operations of the Union itself. We have replaced the Vice-President position with a President-Elect so that there is better continuity, but also not a very long-term commitment of these officers because, for example, one may go from a Vice-President to a President to a Past-President, which has been typically a twelve-year commitment. We have limited the number of terms that the Secretary General and the Treasurer can hold; this is now three terms maximum. We have given a vote in the Executive Committee to the Past-President of the Union. We have limited the office term of the Bureau’s members at large and the Finance Committee to a maximum of two terms. And we have also reduced a little bit the Financial Committee in terms of the number of members (3 instead of 4 members). We have a new 2016-2023 strategic plan, which was approved by the Council in 2016, and we have several implementation actions, such as: promotion of IUGG to its constituents, geoscientists, policy makers and society; closer cooperation between the IUGG groups, e.g., through joint Scientific Assemblies; effective engagement with sister and partner organizations; assisting under-represented geoscientists to participate in international science activities; strengthening the effectiveness of Council, Executive Committee and Bureau; strengthening National Committees; promoting fundamental research and education in geosciences; and encouraging more countries to join the IUGG. We finally have organized joint scientific assemblies of Associations, which to me is a very important development because we have at last started thinking in broader, interdisciplinary or transdisciplinary terms, instead of the very disciplinary-focused scientific assemblies of the past. We have tried to have much more effective engagement with all of our partner organizations, and there was a strong effort made in the last four years to be as inclusive, effective and agile as possible, so that we can respond to the challenges as they arise.

Emphasis was placed in the last four years on outreach, education, science and policy. Let me start by pointing out a few things with outreach. You may have already heard that we obtained last year observer status with the IPCC, the Intergovernmental Panel for Climate Change. We have co-sponsored many activities; one of the important global ones is the International Year of Global Understanding, and of course we have continued the long tradition of cooperation with various international organizations, including UNESCO, the International Science Council (ISC) - we have the ISC President and Past-President here with us - the World Meteorological Organization, and so on. This is going to continue. It is still one of the focus points and important actions for the Union. Let me also open another parenthesis here to congratulate our Secretary General, Alik Ismail-Zadeh, who was elected last year to the position of the Secretary of the newly established International Science Council - so congratulations, Alik. I think, Daya (Prof. Daya Reddy, the ISC President, who was present at the Opening of the GA), you will enjoy working with Alik as much as we have; and you will find him extremely valuable. Regarding educational activities, we have, as always, sponsored many training schools, workshops, and conferences around the world, either alone or with our international partners. We have provided several grants in the quadrennial, which are basically helping regional activities often led by one or more of the Associations, but also educational activities and international cooperation activities, and this time

specifically including some of these regional and national activities for celebrating the centennial that I mentioned before. Regrading science and policy, well, the first point is that we have always been working on these aspects, even though we do not always explicitly advertise it - you know how bad we scientists are at expressing and explaining what we are doing to the public. We have had many contributions, and we continue to have, to the sustainable development goals in the 2030 agenda of the UN, and this is going to continue in the future, either alone or in cooperation with various international bodies. Related to that, we had two books that were added to the IUGG series of Cambridge University Press. There was one in 2014 (in the previous quadrennial) on disaster risks from, and societal implications of, extreme natural hazards, and there were two other ones in 2016 and 2018, one dealing with climatic events and risks and hazards from them, and the second one highlighting the Union's contributions to Future Earth and global change.

Let me close then, by highlighting a few of the events here in this particular assembly. We have the Union Lectures on the 11th, 13th and 16th of July, which, as you know from past assemblies, are the focal Union sessions on this type of general assembly. Typically, we have invited lecturers in these sessions, and the first one invited by IUGG is David Grimes from Canada, who was the past President of the World Meteorological Organization; he actually just finished his term last month. Additionally, every Association has invited a very prominent scientist to give particular lectures related to the work of the Association itself (Waleed Abdalati, USA, IACS; Ed Hawkins, UK, IAMAS; Kosuke Heki, Japan, IAG; Karen Kohfeld, Canada, IAPSO; Paolo Papale, Italy, IAVCEI; Vera Schindwein, Germany, IASPEI; Veena Srinivasan, India, IAHS; and Lisa Tauxe, USA, IAGA). We have an award ceremony on the 13th of July, where we give first of all our Gold Medal to Professor Richard Pelletier of the University of Toronto. His lecture will be in the Union Symposium 03, "Mathematics of Planet Earth and The Science of Data" on July 17th, and I again strongly encourage you to attend. We have seven new Union fellows or honorary members; we will hold the awards ceremony on July 13th. Finally, we have ten Early Career Scientist awards and a symposium dedicated to the Early Career Scientists, which is on July 12 and 13. In the last GA in Prague, I had the pleasure of organizing this. To me it was one of the highlights of the meeting – very active and young researchers and very enthusiastic about their work and I am sure this time will be the same, as well. The Union Symposium U09: Celebrating Early Career Scientists has been organized by our current Vice-President, and I, again, strongly urge you to attend. Let me list all Union Symposia in your program: U01 - Achieving Sustainable Development: The Role for Earth Sciences; U02 - *Georisk Reduction: Science, Resources, and Governmental Action*; U03 - Mathematics of Planet Earth: The Science of Data; U04 - Data-Driven Science for Earth and Space Exploration; U05 - New Discoveries in Earth's Deep Interior; U06 - Recent Advances and Discoveries in Planetary Science and Comparative Planetology; U07 - *Centennial of the International Cooperation in Earth and Space Sciences*; U08 - Earth and Space Observations; and U09 - Celebrating Early Career Scientists. As you can see, they cover a wide range of activities and subjects. I have highlighted in italics the two that are related to our centennial anniversary. The first one, U02, is the joint one with the AGU, and the other one, U07, is where a lot of the history, and historical and current scientific contributions will be presented. The Early Career Scientists one is U09.

As this marks the end of my term as President, I would like to end by thanking several colleagues. First of all, the members of the IUGG Bureau, Executive Committee, and Secretariat. In particular: Alik Ismail-Zadeh, the IUGG Secretary General. As you may or may not know, he is finishing his third term, so twelve years with us, and he is moving on to the ISC as its first Secretary. The Executive Secretary, Franz Kuglitsch, and also GFZ Potsdam for hosting our Secretariat for several years and for providing financial support, as well. The Treasurer, Aksel Hansen, who is completing twenty years of service to IUGG; congratulations Aksel. And, last but not least, we had a visioning committee and a "Task Force 100", that were tasked with setting up all the celebratory events, but also with the creation of our strategic plan and implementation actions. Bureau member Chris Rizos chaired these two committees and they did an outstanding job. I would also like to thank Fiona Darbyshire, chair of the Local Organizing Committee. I am sure Fiona had many sleepless nights but I hope she is feeling better today because it seems we are commencing a very well organized GA. Spiros Pagiatakis, worked as the Chair of the Scientific Program Committee together with the Secretaries General of the Associations and of the Union, and are thanked for preparing such an exciting program of scientific presentations and

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discussions. I would also like to thank the Presidents of the Canadian Geophysical Union (CGU) and the Canadian Meteorological and Oceanographic Society (CMOS) - thanks Rich Petrone and Paul Kushner - because as you may not know, they have their annual meetings every year and this time they decided to roll them into IUGG so that all the geoscientists from Canada could attend our General Assembly. So thanks again for that. And, finally, I would like to express our sincere thanks to the professional organizer, JPdL International, for their expert organization of this GA.

I would like to thank you all for your attendance and participation, and I now declare the 27th IUGG General Assembly open. Thank you very much.

**ADDRESS BY JULIE PAYETTE
GOVERNOR GENERAL OF CANADA**

Hello everyone. Bonjour.

It is my pleasure to welcome you to the General Assembly of the International Union of Geodesy and Geophysics, which celebrates this year an important milestone anniversary: one hundred years of existence.

Bienvenue à tous les délégués.

My name is Julie Payette and I am the Governor General of Canada. Prior to being sworn in to this position, I served for two decades as an astronaut and flew two missions in space.

So, I am a spacecraft operator by trade, an engineer by background, but I am also an avid science communicator and I spend quite a lot of time speaking to audiences – especially young ones – about the power of science and technology.

As you can imagine, I make shameless use of my spaceflight experience to illustrate scientific points, like rocket propulsion, or why when in space, astronauts float in weightlessness.

But basically, I just talk about how much fun it is to figure things out, to build something, to understand how the world works. How enormously useful science is in our everyday lives and how knowledge (and the never-ending quest to further it) is essential to our health, our prosperity, our future.

You are among the world's leading scientists – and future leaders – in the field of earth and space science and you have come together to compare notes and exchange ideas. Furthering knowledge is precisely why you are gathered at the Palais des Congrès in Montréal, my hometown.

Je dois dire que je suis particulièrement heureuse que ce soit Montréal, la ville où je suis née, qui vous accueille en cette année du centenaire de l'Union géodésique et géophysique internationale.

As experts in geodesy and geophysics, you have a unique perspective on this extraordinary planet we share. You understand and describe the Earth from its surface to the depth of its core, through its shape, its moods and the distribution of its gravity field. And this understanding is invaluable for us to understand other worlds, out there, worlds that we are bound to visit one day. An inescapable outcome of future space exploration. This is pretty cool!

Back here on Earth, in today's world, another inescapable truth is that international collaboration is critical to making advances in any scientific or technical fields. And meeting face-to-face, like you are for the 100th time, is even more valuable.

So do not hold back. Share your insights and expand your networks. And make the most of this opportunity.

I wish you a great conference. Bonne conférence.

**ADDRESS BY DAYA REDDY
PRESIDENT, INTERNATIONAL SCIENCE COUNCIL**

Global Scientific Cooperation and the International Scientific Council

It is a great pleasure and privilege for me to participate in this very happy event, to mark 100 years of existence of the International Union for Geodesy and Geophysics.

The title of my address, viz. global scientific cooperation, refers in the first instance to an observation that science has always been, in one way or another, international in its need for shared thought and joint action. Such cooperation is vital for the growth and health of scientific activities and for scientific advances. Science is affected by events outside the world of science, and the converse is, or should be, true: science has a unique role to play in addressing the range of problems that face communities, and which do not respect national boundaries.

The first attempt at a formal international science alliance lay in the formation of the International Association of Academies (IAA) in 1899, with 10 original member academies from Germany, France, the UK, USA, Italy and Austro-Hungarian Empire. Its purpose was to “initiate and ... promote scientific undertakings and to facilitate scientific intercourse between different countries”.

The outbreak of the first world war in 1914 effectively put an end to activity by the IAA. Progress came in the form of the establishment of the International Research Council (Conseil International des Recherches) in Brussels in July 1919, whose membership included 16 national academies from Europe, the USA and South Africa. Importantly, six international unions (IAU, IUGG, IUPAC, IUPAP, URSI, IUBS) came into being and five of these were inaugural members of the IRC. One may imagine the challenges of the immediate post-war period in promoting any international cooperation, but let us also remember the astonishing advances in physics and chemistry that were taking place during this time.

The transition from the IRC, in which Unions had a status equal to that of national members, to its successor the International Council of Scientific Unions (ICSU) in 1931, was a profound one. IRC began as a body of national members, with some unions associated with it, albeit with limited powers. ICSU began as a body with both national elements and unions as full members. So union subservience changed to equality. Here was an organization that could draw both on national and disciplinary strengths, and which grew from its original 40 national and 8 unions to respectively 122 and 30 in 2017.

There were corresponding developments in international cooperation in the social sciences, through the establishment of international unions in disciplines such as sociology, psychology, and anthropology, and the establishment in 1952 of the International Social Science Council (ISSC), which by 2017 had grown to a membership of 50 academies, unions, and science councils, and with a mission to advance the social sciences in all parts of the world.

So, though there existed two bodies whose scope covered the natural and social sciences, and though ICSU (later renamed the International Council for Science) and the ISSC had a record of excellent cooperation, the international setting within which science is done and the demands for it to contribute more directly to human wellbeing have changed in ways that need greater integration of understanding from the different domains of science, and particularly between the natural and social sciences. A more thoroughly embedded multidisciplinaryity was required to address such challenges effectively: to overcome institutional silos through regular opportunities for dialogue to understand fundamental differences between the natural and social sciences, and to build trust and confidence in each other through collaboration. And so we saw the merger of ICSU and the ISSC, to form the International Science Council (ISC), in July 2018.

The vision of the ISC is of science as a global public good. Through its national and regional members from 140 countries, 40 disciplinary scientific unions and associations, a range of affiliated organizations and partnerships, the ISC seeks to address strategic objectives that include

- mobilizing science for policy and public action on issues of global public concern;
- shaping policies and practices that enable scientific rigour, creativity and relevance in all parts of the world;
- promoting science as an open, collaborative and inclusive enterprise; and
- safeguarding the free and responsible practice of science.

The last of these is enshrined in an ISC Statute that states: “The free and responsible practice of science is fundamental to scientific advancement ... and requires freedom of movement, association, expression and communication for scientists, as well as equitable access to data, information, and other resources for research.”

Through its members and associates, its partnerships with other international scientific organizations, UN agencies and inter-governmental bodies, and its wider networks of expertise, the Council is unique in its capacity to bring together scientific excellence and science policy expertise from all fields of science and all regions of the world.

Much of the work of the ISC in the medium term is set out in its recently adopted Science Action Plan. It forms a practical framework for the ISC’s work, in all of its key functions, until the end of 2021. It therefore gives effect to the Council’s vision and mission, and serves as a basis for active engagement with ISC members, and as a point of departure for dialogue and cooperation with partners and funders who share the Council’s objectives.

The structure of the Plan comprises four major domains of impact – the 2030 Agenda for Sustainable Development; the Digital Revolution; Science in Policy and Public Discourse, and The Evolution of Science and Science Systems – within which are embedded a series of programmes and projects. Many encompass and build on ongoing ISC activities, including the Council’s portfolio of international research programmes, scientific committees, networks, data bodies and observing systems. It nevertheless allows the ISC the flexibility to respond to new and emerging opportunities, and to adapt to ongoing strategic reflection and development.

The ISC looks forward very much to the cooperation of its members, IUGG included, in working towards realizing the significant objectives of the Action Plan, and in this way giving substance to the vision of the Council.

I conclude by reiterating my congratulations to the International Union of Geodesy and Geophysics on the occasion of its centenary. May the IUGG continue to flourish!

ADDRESS BY GORDON McBEAN
PAST PRESIDENT OF THE INTERNATIONAL COUNCIL FOR SCIENCE

Distinguished Guests, Dear Colleagues, Ladies and Gentlemen,

It is my great pleasure to speak at the Opening Ceremony of the IUGG General Assembly here in Montreal. I look back on my days as a graduate student at McGill University, in Montreal, studying atmospheric science and learning about Canada's role in international science. Later, I had the honour of being the Chair of the Canadian National Committee for the IUGG when we hosted the General Assembly in Vancouver in 1987 and I have participated in most of the IUGG Assemblies since then. Through IUGG and Canadian and other connections, I have been very active in international science and was nominated by IUGG for the position of President of the International Council for Science – and won the election.

Now it is the IUGG's 100th Anniversary and having it here in Montreal and co-hosted by the CMOS and CGU make it even more special. The Conference theme of "*Beyond 100: The next century in Earth and Space Science*" really brings that important focus on the integrated science needed to address the Global Agenda 2030: the Paris Agreement on Climate Change; the Sustainable Development Agenda; and the Sendai Framework for Action on Disaster Risk Reduction. The excellent science being presented at this Assembly will address many of the Agenda's critical issues, emphasizing its importance at this 100th Anniversary Assembly. It is so important that the high level of scientific excellence be maintained and, where possible, enhanced for the benefits of future generations and all societies. As an international scientific union, IUGG has had a major role in stimulating and enhancing important global science. Canadian science has been very important in its contributions to both this Global Agenda and to the IUGG scope of science.

This year, as I look across the scientific program, I continue to be impressed with the quality and relevance of the science, from Canadian and the global community of scientists. This is the first time that the Canadian Meteorological and Oceanographic Society has joined its annual congress with an international, in this case IUGG, general assembly and I am sure that there will be great benefits for all. Next year, the CMOS Congress will be in Ottawa with the theme: "*Building Societal Resilience to Changing Weather, Climate, Oceans and Environment*" and, as the Co-Chair of the Scientific Program Committee, I am encouraging the scientists presenting outstanding science here to present their new results next year. Together, we are making a difference for all and, as we look ahead to the next century, it is so important that science is the basis for seeing the future and influencing the societies to make the "right" choices.

I thank the IUGG and the Assembly's Local Organizing and Scientific Program Committees for their contributions to this important international and Canadian event. I look forward to seeing you all during the Assembly, and hopefully next year in Ottawa, and thank you very much for inviting me to speak.

**ADDRESS BY REMI QUIRION
CHIEF SCIENTIST OF QUÉBEC**

Mesdames et messieurs, les dignitaires, membres du comité organisateur local, au nom du Gouvernement du Québec, et en mon nom personnel, c'est un plaisir de vous accueillir à Montréal. Pour cette très importante réunion, célébrant le centenaire de votre organisation. Très heureux que vous ayez choisi Montréal pour cette célébration.

So, very happy to welcome you to Montreal, in this very unique occasion, big celebration and hopefully you will have great science over the next few days but as well the opportunity to enjoy Montreal. So after a few speeches, I will say... what can I talk to them about that may be a little bit different. Well, after I have questioned chief scientists, "what do you do? How do you become a chief scientist?" So I may have a story there. How do you become a chief scientist for the young ones in the room, I have absolutely no idea. What do I do? Maybe focus on two things; one is giving advice, and it's advice, not decisions, not recommendations, to the Government of Quebec on all aspects of research and innovation. So that sounds fun, yes? When you start, by training, I am a neuroscientist... on dementia and mental health. So when you get a question from the Minister of Health, on public health, not too bad. The, when the Minister of the municipality calls you about flooding, it starts to be a little bit more difficult, and then you get a call about pit bulls. What do you think about pit bulls? Should we have a rule in Quebec about these types of dogs? So, usually they tell you don't really have time to write a PhD. thesis. Can I have the answer by tomorrow morning? So that is usually the part of the job that is kind of challenging but at the same time very fun, a lot of fun, and basically related a little bit to you because you have to get out of your zone of comfort, of your expertise, of your narrow expertise and talk to other colleagues that have other types of expertise and then try to summarize that, to make sense of that, to elected officials and policy makers.

On that note, I am also very much involved as a founding member, on the International Network for Science Advice, INSA. I am now the vice-chair of that structure, and the next international meeting of INSA will be here in this very same room on September 2020. What is INSA? Well basically, it's the little baby of the International Science Council. We need to find a little space on your business slide, to add the logo of INSA, and what are we trying to do? It is to build capacity. Scientists trying to provide advice to policy makers and governments, as were mentioned before, the other way around. And that is very important all over the world. Like here in Quebec, we are lacking expertise in that sense but also globally. So we not call it more and more science diplomacy, to try to make the world a bit closer in terms of big challenges in society. That is what we are trying to do with INSA, organizing many schools in Africa, especially for us here in Quebec. I shall have the opportunity to be the CEO of the three major funding research organizations in Quebec. One in health, one in nature and technology, one in science and engineering, and one in social sciences and humanities. 80% of our funding goes to the best proposal that we get. Like you in the room, you write a proposal on a topic and you get funded, depending of course on the recommendation of a peer review panel. But the other 20% probably is a bit closer to what we will be discussing here this week. There are some major challenges of our society; one of them in Quebec, in Canada, is demographics of an aging society. Canada is a rapidly aging society, Quebec even more so. So, in Quebec, we are the second after Japan, in terms of average age of our society. So there is a challenge there. The other big one, very close to you, sustainable development and climate change. There, we really think, as was mentioned before, that you need to make sure that your team of scientists are very interdisciplinary and it was great to see the creation of ISC, where you bring on board social science and humanities. My own bias is, if we want to be successful with the sustainable development goal, we need to bring on board the social sciences and humanities. Otherwise, we will fail. We also need to go closer to our citizens. Yes, you could have federal, you could have global, you could have regional types of strategy but you need to involve the citizens on the ground. They need to think, "Oh yes, climate change has an impact on me, I need to be involved". Otherwise, I'm afraid, that most of these strategies will fail. So, that is why we have started to develop programs where at first, it is about learning the language of the others, and here in Montreal, it is not French and English, it is English and let's say Chinese. Because at first, when you sit with them...you have an

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engineer or climatologist expert, with a social scientist, a different language. You have to learn the language of the other. Then you say “Ah! That is what I could do with that person”. That is one step. The other one I mentioned is to bring to Montreal organizations like Future Earth. Of course the head office is here, but the global network, very important to have this type of activity. We have also recently developed a network related to flooding and the impact of climate change on our citizens and our society. So, over the next few days, when you exchange with your colleagues from all over the world, you will have the opportunity to link a bit more with Canadian scientists of all shapes and forms and that maybe, in future meetings, there will be more and more, let’s say, “contamination” of the group here, with social scientists and experts in the humanities. Merci beaucoup et bon congres.

**ADDRESS BY VIJAYA RAGHAVAN
PRESIDENT OF THE ACADEMY OF SCIENCE, ROYAL SOCIETY OF CANADA**

Salutations à tous! Greetings to everyone!

As President of the Academy of Science of the Royal Society of Canada, I have the happy task of extending “un grand bravo à l’UGGI!” from the Royal Society. Congratulations to the IUGG for 100 years of accomplishments and service to science, engineering, and society. 100 years is a huge milestone and it is a good time to appreciate the hard lessons learned, the challenges that have been faced, and the progress that has been made. The work that has been done in many fields represented by the IUGG has been carried out by countless students, scientists, engineers, technicians, and staff working in the field and in labs, people who have each contributed in their own way to collectively pushing the envelop of knowledge and technical development just a little bit further. We take this moment to salute them all.

This centenary is also a good time to take a deep breath before venturing onto the road ahead.

We are reminded that we are powerless in the face of volcanoes, earthquakes, tsunamis, tornados, and solar flares. Our best approach is to muster as much of our knowledge and technology to predict, to prepare for, and to mitigate as much as possible the impact of such events.

But currently, foremost in the minds of many are rapid climatic changes that are challenging humans and the environment on many fronts. The picture being presented to us on a regular basis is not a happy one, but we ignore it at our peril. This situation seems to be of our making since the start of the Industrial Revolution. Our impact on this planet has grown in leaps and bounds.

We have made and continue to make many demands of our earth. Modern society was built in large part on the burning of wood, coal, and petroleum, and we are continuing to use fossil fuels that are rapidly being depleted in the face of growing demands. The combustion of these fuels has contributed to a steady increase in the levels of greenhouse gases and pollutants in the atmosphere. This has led to increasing global temperatures and climate changes that are having important effects on global ecosystems and habitats, and on the livelihoods and lives of billions who depend on agriculture and reliable predictable seasonal climatic events to sustain food production. Marine ecosystems are being greatly affected by pollution, increasing temperatures, and depletion of fish stock. The global population is currently about 7.4 billion and we will reach 9 billion by 2040. How are we going to provide food and fuel in a sustainable way? How do we do this without further destruction of biodiversity? How do we foster and conserve habitats to ensure their survival? I come from a background in mechanical and agricultural engineering and I am professor in the Department of Bioresource Engineering at McGill. I have a good appreciation of the capacity of different soils, and of their interactions with water and plants since I have worked on the mechanical properties of soils and the effect of soil compaction by heavy machinery on the productivity of soils in farms and orchards. The main thrust of my current work is on food security and safety, specifically in the field of post-harvest technologies for conserving harvested foods and the nutritional content of these food. So, the issues that I have just mentioned are near and dear to my heart.)

Clearly, we must work together in a multi-prong approach. There are efforts to coordinate global activities and goals under the auspices of the United Nations such as with the IPCC (Intergovernmental Panel on Climate Change) and various protocols such as the Kyoto Protocol. The Science20 or S20 Conferences are meetings of national academies of the members of the G20. These meetings are held in advance of G20 summits to provide science-based recommendations for the G20 summits. The last two conferences have been on soil (“Food and Nutrition Security: Improving Soils and Increasing Productivity”) and the marine environment (“Threats to Marine Ecosystems and Conservation of the Marine Environment – with Special Attention to Climate Change and Marine Plastic Waste”).

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Grass root movements are taking place. The push to recycle, reduce and reuse is in effect. We are saying goodbye to the incandescent light bulb and turning towards LEDs. We have awakened to the dark side of plastics and especially one-use plastics. We are turning more towards the use of solar, wind, and geothermal power as alternatives to fossil fuels. We are exploring other alternative and sustainable sources of fuels. Lifestyle and community changes are needed mainly in how we design our cities (urban agriculture, living closer to work) and our buildings (green buildings), handle our wastes (composting), and relate to our environment. Western society is also becoming more conscious of the importance of consuming less meat from both a health and an environmental point of view. Ironically, the demand for meat is growing in places where meat consumption used to be low. So, we have started, but we have far to go.

We look forward with optimism to the next 100 years and beyond.

ADDRESS BY DANIKA GOOSNEY
VICE-PRESIDENT, NATURAL SCIENCES AND ENGINEERING RESEARCH
COUNCIL OF CANADA

Je suis ravie de partager le micro avec tant de panélistes et de leaders de grande renommée du milieu de la géophysique.

Thank you for the opportunity to speak at your opening ceremonies. And congratulations on your 100th anniversary! Let me start by sharing a few comments on NSERC, the Natural Sciences and Engineering Research Council of Canada. At NSERC, our vision is to make Canada a country of discoverers and innovators. We support almost 12,000 independent researchers and over 34,000 students and postdocs annually at universities and other post-secondary educational institutions across Canada. Our budget for research this year – all of it in the natural sciences and engineering – is more than 1.2 billion dollars Canadian. We are very proud of our funding approach. We fund programs of research, not just projects. This means our scientists and engineers have the time and flexibility to explore the most promising avenues of research as they come up. Many of you here today are familiar with NSERC. In fact, many of you have helped us out, by contributing your time and expertise as peer reviewers. We would not be able to operate our programs without your dedicated efforts. So, thank you. Your expertise and insightful comments as reviewers play a central role in ensuring the high quality of research across Canada. I also wanted to highlight the work NSERC, along with our colleagues at the Canadian Institutes of Health Research and the Social Sciences and Humanities Research Council, have been doing to improve equity, diversity and inclusion – EDI for short – in Canadian research culture. Recently, after extensive consultation with universities and other stakeholders, we unveiled a Charter – a statement of principles for EDI. It's called Dimensions: Equity, Diversity, and Inclusion Canada. Over 70 institutions have signed on to the Charter. We are committed to working with these institutions to remove barriers and foster a more EDI-positive research environment. As well, we are reviewing our own policies and practices to identify and remove barriers. I urge you all – as individuals, and through the IUGG and associations – to consider how you can help foster EDI in your research groups, in your research designs, your collaborations, and in your institutions. Finally, I want to encourage and applaud you for the critical scientific knowledge that you discover and publish. Strong research evidence is crucial for decision-making by citizens in our democracies, and at all levels of government. Je vous souhaite de bons échanges au cours des prochains jours dans le cadre de l'assemblée générale. J'espère que vous aurez l'occasion de faire du réseautage et de communiquer des idées qui feront avancer la recherche en géophysique. Je vous souhaite également beaucoup de succès dans vos projets de recherche. Bravo et merci.

**ADDRESS BY SARAH GALLAGHER
SCIENCE ADVISOR TO THE PRESIDENT, CANADIAN SPACE AGENCY**

Bonjour tout le monde! C'est un plaisir d'être ici aujourd'hui pour vous parler.

The fact that I am here presenting the [Canadian Space Agency](#) speaks of the importance of science activities such as those being presented at IUGG to the Agency and in the broader Canadian government. Evidence-based decision-making based on science is a priority for Canada.

Yesterday, I was speaking to an early modern historian of science who shared two interesting facts with me when I mentioned that I was attending this conference. The first is the proper pronunciation of "geodesy". The second is that early modern measurements of the shape of the Earth used measurements of the acceleration of gravity from pendulums at different locations around the world.

We've certainly come a long way! How appropriate that I am here to speak to you just one month after the launch of the [RADARSAT Constellation Mission](#) (RCM). This constellation of three satellites will orbit Earth and make exquisite measurements of the shape of the Canadian landscape every four hours.

RCM is one component of our [national Space Strategy](#) released in March of this year by the Honourable Navdeep Bains, our Minister of Innovation, Science and Economic Development. Many science communities who are present at this event would find themselves reflected in the priorities outlined in that document. For example, atmospheric science plays a key role in increasing our knowledge of climate change. Many communities would also appreciate the focus on open science and open data, as I saw directly in the Data Symposium that I participated in today. Additional areas of space science, including solar-terrestrial interactions, the Solar System, and beyond are also embedded in the Strategy.

The composition of this conference reflects the international community that is engaged in science, represented by IUGG. Canada also participates in thriving international partnerships. Two examples of new projects that we are pursuing are the space weather [SMILE mission](#), with Europe and China, and the [NASA-led Lunar Gateway](#), an exciting new platform for science on and around the Moon. Such partnerships enable more and better science return on our efforts.

Merci pour votre attention. Je vous souhaite une belle conférence!

**REPORT BY ALIK ISMAIL-ZADEH
SECRETARY GENERAL OF IUGG**

Distinguished Guests, Dear Colleagues,
Ladies and Gentlemen,

It is my great pleasure to report to the 27th IUGG General Assembly certain aspects of the administration of the Union.

IUGG was founded in 1919 with 6 sections; the seventh was added in 1922 and the last association was formed in 2007. Today IUGG is comprised of eight semi-autonomous international associations, each responsible for a specific range of topics or themes within the overall scope of Union activities. IUGG is the roof of the geophysical colonnade that is supported by the eight pillars that are Union Associations. IUGG and its Associations operate through more than 100 scientific divisions, commissions, committees, working groups, and services. IUGG plays a special role in bringing state-of-the-art science to the developing countries of the world. This is done primarily through workshops, summer schools, symposia and scientific assemblies. Congratulations to all you for the Centennial Anniversary of our Union!

I summarize briefly the achievements of the Union since 2008 when IUGG started to reshape its structure and activities to meet scientific and organizational needs. Three Union Commissions on Data and Information (in 2008), on Climatic and Environmental Change (in 2012), and on Planetary Sciences (2015) as well as the Union Working Group on History (2012) have been established to coordinate activities across Union Associations and other international organizations on relevant scientific topics. Five Standing Union Committees on the Membership Issues, Outreach, Capacity Building and Education, Honor and Recognition, and Visioning have been formed to help the Union to reshape the membership and science education programs, to establish Union awards and medals, and to develop an IUGG strategic plan for the nearest future.

IUGG established a new Grants Program to support projects of importance to the international geophysical and geodetic community, which will explore new scientific ideas and develop future international initiatives. Since 2008 IUGG awarded 28 grants to support interdisciplinary projects of importance to the international geophysical and geodetic community. IUGG established a new Science Education Program to enhance geophysical and geodetic science education. Since 2012 IUGG awarded 48 advanced schools and workshops organized at the Abdus Salam International Centre for Theoretical Physics or in the less-affluent countries.

A new category of Union Membership have been established: Affiliate Membership to strengthen cooperation with geoscientific organizations worldwide. Since 2012, six scientific organizations became IUGG Affiliate Members, namely, the Commission for the Geological Map of the World, the Young Earth Scientists Network, the American Geosciences Institute, the International Association for Mathematical Geosciences, the International Landslides Consortium, and the International Association for Geoethics.

Three categories of Union awards were established in 2014: (i) Early Career Scientist Award, (ii) Union Fellow award, and (iii) the Gold Medal to award Earth and space scientists for outstanding contributions to geodesy and geophysics and for unselfish international cooperation in research. The second edition of the Union awards will be presented to recipients on 13 July 2019 at the Awards Ceremony.

In addition to Associations outstanding publication programs, IUGG renewed its publication policy, and signed a Memorandum of Agreement with the Cambridge University Press to publish a series of works entitled “Special Publications of the IUGG”. Three volumes of the series were published since 2014, and the fourth volume is ready for publication.

Let me now present some specific activities of the Union for the last quadrennium.

Since 2016 IUGG Council became Standing body. The first action of the Council was to approve the Union's Strategic Plan for 2016-2023. In 2018, the Council discussed the changes to Statutes and By-Laws proposed by the Bureau and voted for approval of the revised documents. IUGG Executive Committee and Bureau met at UNESCO Headquarters in Paris, France, in 2016 and in Montreal, Canada, in 2017. Bureau met in the Mexico City, Mexico in 2018.

As of 1 January 2019, IUGG has 72 Member Countries. Note that in 2007 IUGG had 66 members. So, we are slowly increasing despite financial and political difficulties in many countries. Algeria became a Regular Member, Serbia and Uruguay Associate Members of the Union. IUGG established new Union Commission on Planetary Sciences to promote and coordinate scientific (physical, chemical, and mathematical) studies of planets in the solar system and around other stars.

Scientific Assemblies of IUGG Associations have been organized in 2017: by IACS in New Zealand, by IAG and IASPEI in Japan, by IAGA, IAMAS, and IAPSO in South Africa, by IAVCEI in the USA, and by IAHS in South Africa. More than 4,000 scientists participated in the assemblies from more than 100 countries. IUGG Union Commissions held their scientific conferences/symposia: CMG conferences on mathematical geophysics in Paris, France (2016), and in Nizhny Novgorod, Russia (2018); SEDI symposia in Nantes, France (2016) and in Edmonton, Alberta, Canada (2018); CCEC workshop in Belval, Luxembourg (2016); GRC symposia in Washington, D.C., USA (2018); UCPS workshop in Berlin, Germany (2017), and in Wuhan, China (2018).

To celebrate the Centennial of the Union, IUGG established a Task Force 100 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 website (<http://100.iugg.org>) dedicated to the IUGG Centennial was launched.

The Second Volume of the Special Publication of the IUGG “*Dynamics and Predictability of Global and Regional High-impact Weather and Climate Events*” was published in 2016, and the Third Volume “*Global Change and Future Earth*” in 2018. A special volume on “The International Union of Geodesy and Geophysics: From Different Spheres to a Common Globe” will be published in 2019 as a part of the peer-reviewed journal *History of Geo- and Space Sciences*. Since 2000 IUGG publishes monthly *Electronic Journal*, as well as annual *Yearbooks and Reports*.

IUGG awarded 12 grants to support scientific and outreach projects of importance to the international geophysical and geodetic community, which will explore new scientific ideas and develop future international initiatives. IUGG co-sponsored 47 scientific meetings (workshops, symposia, conferences) worldwide in 2015-2018. IUGG and the Abdus Salam International Centre for Theoretical Physics (ICTP) in Trieste, Italy, continued a fruitful cooperation in geophysical and geodetic science education. IUGG co-sponsored 24 science education events (schools and workshops) in 2015-2018.

IUGG participated actively in dissemination of scientific knowledge among the countries and the public to promote resilience, sustainability, and peace. These activities include the dissemination of knowledge to UN agencies, G7 Science Ministers etc. Recent examples of science policy and diplomacy work include synthesis reports on disaster risk reduction (2015) and on future of the ocean (2017), and publications on global change and future Earth (2018), and disaster-related science diplomacy (2018). IUGG signed the Sendai Partnerships 2015-2025 declaration, issued *Anti-Harassment Guidelines*, and the statement “*The Earth's climate and responsibilities of scientists and their governments to promote sustainable development*”.

IUGG continued to strengthen cooperation with many International Scientific Unions including those related to Earth and space sciences (GeoUnions) and ISC interdisciplinary bodies as well as with other international and intergovernmental organizations, such as the United Nations Education, Science and Culture Organization (UNESCO) via the International Hydrological Program (IHP), the

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Intergovernmental Oceanographic Commission (IOC), and international Geoscience Program (IGCP), the World Meteorological Organization (WMO), the Global Framework for Climate Services (GFCS), the Comprehensive Nuclear-Test-Ban Treaty Organization (CTBTO), the Group on Earth Observations (GEO), the International Telecommunication Union (ITU), the Intergovernmental Panel on Climate Change (IPCC), International Civil Aviation Organization (ICAO), and with national and regional professional societies such as AGU, AOGS, EGU, and some other international and intergovernmental organizations.

An important part of my duties as Secretary General since 2007 has been service to the International Council for Science (ICSU) until 2018, which merged then with the International Social Science Council, here represented by Professor Daya Reddy, President of the International Science Council, and Professor Gordon McBean, IUGG Fellow and past President of ICSU. IUGG was successful in winning several competitive ICSU grants to promote interdisciplinary scientific cooperation. IUGG nominated persons for numerous ICSU panels and scientific committees, and endorsed many initiatives of the Council. IUGG officers and representatives attended ICSU meetings including Union Meetings and General Assemblies for the last quadrennium. As well as IUGG participated in the inaugural General Assembly of ISC last year held in Paris, France, where your obedient servant was elected Secretary of Council.

IUGG strengthened its relationship with GeoUnions Consortium (nine International Scientific Unions adhering ISC) and many ISC interdisciplinary bodies and programs via cooperation in programs related to disaster risks, data & information, climatic and environmental changes, and health & well-being. IUGG and the International Union of Geological Sciences (IUGS) are responsible for the International Lithospheric Programme (ILP). We look forward to continuing fruitful collaborations with ISC Members including social science unions and associations as well as to continuing a support of international scientific programs.

The 27th General Assembly the Union is held in the wonderful city of Montreal. On behalf of IUGG, I express a gratitude the government of Canada and especially to the former Prime Minister Rt. Hon. Stephen Harper, P.C. M.P. who wrote in his letter of support for hosting the General Assembly in Canada: "I am certain every effort will be made to ensure that the delegates have an extremely successful and enjoyable congress here..." However, despite this great enthusiasm of the government, several dozen scientists, especially from China, Iran, Russia, and some African countries could not get a Canadian visa to attend the general assembly. We are very sorry for that.

I thank the Local Organizing Committee and the Scientific Programme Committee of the Assembly for the excellent work done. Of particular importance, the Local Organizing Committee raised about funds to support scientists who could not otherwise afford to travel to Canada. We understand the challenges of hosting a General Assembly, and we are grateful for their hard work.

I thank Karlsruhe Institute of Technology for providing the excellent environment for the IUGG Secretariat for 2007-2011. Since 2012 the office of the IUGG Secretariat has been hosted by the German Research Center for Geosciences (GFZ) in Potsdam and was financially supported by GFZ and the German Science Foundation (DFG). I am very grateful to the IUGG sponsors for the generous support.

Finally, I thank the Members of the IUGG Executive and Finance Committees, Association Secretaries General, Union Committees and Commissions officers and all IUGG Members and Council Delegates for their dedication and voluntary participation in the IUGG activities for the last four years. I thank all you in this room and those IUGG scientists, who are not with us today, for your great voluntary work for the Union and Associations. Without support and engagement of yours and those who worked for IUGG before it, we could not create such a strong international Earth and space science community and could not be proud for the exciting history of the Union since 1919. Best wishes for a successful General Assembly! Thank you.

ADDRESS BY SPIROS PAGIATAKIS
CHAIR OF THE SCIENTIFIC PROGRAM COMMITTEE OF THE XXVII IUGG
GENERAL ASSEMBLY

Am I really, truly, the last speaker today? Alik, I have the last word. The bad news is that I am standing between you and the reception... the party upstairs. So, I will be brief. I will give you an overview of the program and I would like to share some thoughts about how we worked and what our thoughts were when preparing the program. So, over the last several days, I have been thinking personally: "What is it that will make this union stronger in the future? How is IUGG going to go forward in the next hundred years?" I thought that I would present, simple numbers. And here is the first one. We have eight hundred contributions from students from fifty-six countries. This is the future of IUGG! Now, how many of you are here? Now, over the years, we have developed our science... most of the time we used to work in our labs, isolated in our endeavours. We've learned quite a bit, but I thought that it is now the time to start working together... merge our sciences. This is a requirement for interdisciplinary research. Rather, I should say, transdisciplinary research. We have to be in the shoes of the other scientists in other disciplines. This is what we call empathy in everyday life. It is empathy in science. So, this year, one quarter of our symposia are joint symposia, each supported by at least two associations of IUGG. And, to put it into perspective, the number of joint symposia this year is 2.5 times larger than it was in the previous IUGG General Assembly. So, this is a significant move towards working together, towards doing research together. I thought that there are some problems with participation. Alik actually put it very clearly here. How many countries can contribute, how many colleagues can come to general assemblies? So, what this map shows here with the green areas are the countries that submitted abstracts to this symposium... 103 countries altogether. We can do more! We should try to paint those grey areas on the map green and dark green. This pie chart shows the distribution of abstracts per region. In this general assembly, the pie chart is not distributed equitably. We need to do more. We need to increase the contribution from other regions and countries in the world. Let's see what this pie chart is going to look like, at the next General Assembly. The task of the planning and creating the program for the General Assembly is a complex one. I don't think that I did very much. I simply served as the Chair of the Committee, and tried to coordinate the efforts of my colleagues, to create that fabulous program. First, I would like to acknowledge Alik, the Secretary General of IUGG, who has all this fantastic corporate memory and good advice to give us all the time... and he was my mentor. My colleagues, the Secretaries General of all the Associations contributed the most in this process by providing proposals, advertising the symposia and bringing you to this General Assembly. However, this could not be materialised without the significant help of three other entities whom I'd really like to thank wholeheartedly. It is JPdL, the local organising company, then C-IN... all showed immense professionalism and helped in dealing with all the challenges in creating the entire program and organising all the details of the venue. The Local Organising Committee, our colleagues in Canada, orchestrated all components of the GA. Thank you very much all, for this tremendous effort and make this GA a very successful one. Overall, we have more than one thousand colleagues serving as conveners... who evaluated abstracts and composed the program. And in round numbers, nearly five thousand abstracts were submitted... twenty-four hundred oral presentations, nearly two thousand posters, and over 400 invited talks. Thank you very much for coming and contributing to this general assembly. Go out, listen to the presentations, think, ask questions, debate, and also collaborate. This is the goal of this General Assembly. Thank you very much.

MINUTES OF THE COUNCIL MEETINGS
27TH GENERAL ASSEMBLY, MONTREAL, CANADA, 8-18 JULY 2019

MINUTES OF THE FIRST SESSION

TUESDAY, 9 JULY, 2019 (14:00 – 18:00), ROOM 524AB, MONTREAL CONVENTION CENTRE

PARTICIPANTS

NATIONAL DELEGATES

Australia	Matt King
Austria	Johannes Böhm
Belgium	Philippe Huybrechts (alternate)
Canada	Gordon Young
Chile	Eduard Cayul Aristondo
China	Jianping Li
China-Taipei	Bor-Shouh Huang
Costa Rica	Marino Protti Quesada
Czech Republic	Eduard Petrovsky
Denmark	Søren Gregersen
Egypt	Nasser M. Abou Ashour
Finland	Jyri Näränen
France	Claude Boucher
Germany	Jürgen Müller
Hungary	Laszlo Bozo (alternate)
India	Harsh Gupta
Israel	Colin Price
Italy	Fausto Guzzetti
Japan	Setsuya Nakada
Mexico	Miguel Angel Santoya
New Zealand	David Rhoades
Poland	Jan Krynski
Romania	Constantin Sava
Russia	Anatoly Soloviev
Slovakia	Peter Vajda
Spain	Marcelino Valdez Perez de Vargas
Sweden	Per Holmlund
Switzerland	Elmar Brockmann
United Kingdom	Jackie Kendrick (alternate)
United States of America	Steven McNutt Efi Foufoula-Georgiou (alternate)

LISTENERS

Argentina	Corina Risso
Brazil	Roberto Teixeira Luz

MEMBERS OF THE EXECUTIVE COMMITTEE

President	Michael Sideris
Vice-President	Kathy Whaler
Secretary General	Alik Ismail-Zadeh
Treasurer	Aksel Hansen
Bureau Member	Pierre Hubert
Bureau Member	Chris Rizos
President IASPEI	Thorne Lay

**GUESTS OF THE PRESIDENT ATTENDING THE
FIRST SESSION OF THE COUNCIL**

IACS Secretary General	Andrew Mackintosh
Chair of Statutes and By-Laws Committee	Charles Fierz
Chair of Nominating Committee	Tom Beer
IUGG Executive Secretary (Minute Taker)	Franz Kuglitsch
IUGG Secretariat	Katrin Gundrum
Ass. Director of BISO, U.S. Nat. Acad. of Sciences	Ester Szein
Executive Secretary, SCL/ILP	Alexander Rudloff
University of Nebraska	Priscilla Grew
DTU Space, Denmark	Niels Andersen
Secretary, National Committee, Russia	Roman Krasnoperov

1. Greetings; Presentation of the credentials; election of tellers

The First Session of the Council Meeting was called to order at 14:00 and began with a roll call of delegates. Delegates from 32 member countries were present at the opening. Delegates from 30 member countries were eligible to vote. The total number of countries eligible to vote was 48 (72 minus 10 in observer status minus 14 in associate status). The quorum (16) was reached.

Michael Sideris welcomed all participants to the Council Meeting.

Alik Ismail-Zadeh noted that the Bureau proposed to appoint Katrin Gundrum, Harsh Gupta, and Ester Szein as the three tellers for voting matters. Gordon Young, Council Delegate of Canada, proposed, seconded by Marino Protti, Council Delegate of Costa Rica, to accept the three tellers. A vote by hand was conducted. The Council Members accepted the proposal with one abstention.

2. Approval of the Agenda

The Agenda was approved unanimously.

3. Approval of the Minutes of the Council Meeting in Prague (2015)

The Minutes of the 2015 Council Meeting were distributed to the participants of the 2019 General Assembly (IUGG2019) for their comments,

published in the Comptes Rendus of the 26th General Assembly, and also posted on the IUGG [website](#). Constantin Sava, Council Delegate of Romania, proposed, seconded by Søren Gregersen, Council Delegate of Denmark, to approve the minutes of the 2015 Council Meeting. A vote by hand was conducted. The Minutes were approved unanimously.

4. Reports of the IUGG Officers

President Michael Sideris

Michael Sideris summarized the major Union activities since 2015 as detailed in his report in the [Council Meeting Agenda Book](#) (pages 30-36). Note: the quadrennial report of the President is also published in the Comptes Rendus of IUGG2019. The presentation he gave can be downloaded [here](#).

He especially highlighted (i) the changes made to the IUGG Statutes and By-Laws, (ii) the approval and implementation of the IUGG Strategic Plan (2016-2023), (iii) major activities in outreach, education, science and policy, (iv) IUGG's involvement in the International Science Council (ISC) and its GeoUnions, (v) celebrations related to the Centennial Anniversary of IUGG., and (vi) the preparations and highlights of IUGG2019.

Matt King, Council Delegate of Australia, asked how the progress against the Strategic Plan is tracked. Michael Sideris clarified that, based on the recommendations given in Strategic Plan, action items (e.g., how to attract new member countries) have been identified and addressed.

Harsh Gupta, Council Delegate of India, complimented Michael Sideris on his report on focusing on fundamental research.

Secretary General Alik Ismail-Zadeh

Alik Ismail-Zadeh summarized the Union activities since 2015 as detailed in his report in the [Council Meeting Agenda Book](#) (pages 37-47). Note: the quadrennial report of the Secretary General is also published in the Comptes Rendus of IUGG2019. The presentation he gave can be downloaded [here](#).

He especially highlighted (i) developments in the structure and membership of IUGG, (ii) the Scientific Assemblies organized by the Associations in 2017, (iii) IUGG conferences and symposia, (iv) IUGG Business Meetings, (v) the IUGG Science Education and Grants Program, (vi) Publications of IUGG and the Associations, (vii) the IUGG Honor and Recognition Program, (viii) International Cooperation with ISC, its GeoUnions and Partner Organizations, and (ix) Science Policy and Diplomacy.

Treasurer Aksel Hansen

Aksel Hansen summarized his report on the financial status of the Union as detailed in the [Council Meeting Agenda Book](#) (pages 48-56). Note: the quadrennial report of the Treasurer is also published in the Comptes Rendus of IUGG2019. The presentation he gave can be downloaded [here](#).

He especially highlighted (i) the final financial overview for 2012-2015, (ii) the preliminary financial overview for 2016-2019, (iii) and current membership issues.

He noted that around 75% of the total budget is reserved for scientific activities. 50% is distributed among the Associations, 25% is spent by IUGG on Symposia Support, the Grants Program, Publications etc. Around 25% of the total budget is reserved for administration.

IUGG currently has 72 members, i.e., 58 Regular Members (10 of them in observer status) and 14 Associate Members accounting for a total number 276 units. He noted that over the last two decades the number of paid units has decreased from almost 300 to around 260.

The economic situation of IUGG is sound and the net balance allows IUGG some flexibility. The new budget for 2020-2023 will allow for increased expenditures of the Union on scientific programs and grants.

Still, it is very important that IUGG will be able to keep its present members in the Union and at the same time attract new members.

Vice-President Kathryn Whaler

Kathryn Whaler summarized the major activities of the six Union Commissions and the Union Working Group on History (WGH) as detailed in her report in the [Council Meeting Agenda Book](#) (pages 57-95). Note: the quadrennial reports of the Vice-President and Union Commissions are also published in the Comptes Rendus of IUGG2019. The presentation she gave can be downloaded [here](#).

The six Union Commissions and the Union Working Group are:

- Commission on Climatic and Environmental Change (CCEC),
- Commission on Mathematical Geophysics (CMG),
- Commission on Geophysical Risk and Sustainability (GRC),
- Committee on the Study of the Earth's Deep Interior (SEDI),
- Commission on Data and Information (UCDI),
- Commission on Planetary Sciences (UCPS), and
- Working Group on History (WGH).

All Union Commissions and the Working Group on History have been very active for the reporting period. WGH was dedicated to the preparations related to 100th anniversary celebrations of IUGG and ceased its activities in 2019.

Ratification of major decisions by the Bureau and Executive Committee

Alik Ismail-Zadeh summarized the major decisions of the Bureau and Executive Committee as detailed in his report in the [Council Meeting Agenda Book](#) (pages 40-42), which were taken after the last Council Meeting during the 26th IUGG General Assembly in 2015. Note: the major decisions are part of the quadrennial report of the Secretary General which is also published in the Comptes Rendus of IUGG2019. The presentation he gave can be downloaded [here](#).

The Bureau met five times during the term (2015-2019): in Prague, Czech Republic (June 2015) in Paris, France (June 2016), in Montreal, Canada (September 2017), in Mexico City, Mexico (October 2018), and in Montreal, Canada (July 2019). The Executive Committee met four times during the term (2015-2019): in Prague, Czech Republic, (June 2015), in Paris, France (June 2016), and in Montreal, Canada (September 2017 and July 2019).

Michael Sideris noted that the decision on lowering the price of one unit for least developed countries to USD 500 should be made later under agenda item 5. All other major decisions by the Bureau and Executive Committee were ratified unanimously in one vote by hand.

5. Matters of Membership

Alik Ismail-Zadeh noted that admissions of new members to IUGG and transfers to other membership categories require a two-thirds absolute majority vote of the Council for final approval (IUGG Statute 18).

The matters requiring votes were presented in detail in the [Council Meeting Agenda Book](#) (page 96). The presentation he gave can be downloaded [here](#).

Admission of the following members was ratified:

- Algeria as Regular Member (Cat. 1)
- Serbia as Associate Member
- Uruguay as Associate Member

Transfer of Membership of the following members was ratified:

- North Macedonia from Regular Member (Cat. 1) to Associate

There was one vote for all matters of membership. A vote by ballot was conducted. Of the 30 valid votes, there were 29 consents and one abstention

In addition, the Council was asked to approve a proposal (developed by the Finance Committee, supported by the Bureau, and endorsed by the Executive Committee of IUGG) of IUGG Membership for Least Developed Countries which says “*Least Developed Countries (as defined by the United Nations) can become IUGG Regular Members in Category 1 paying annual contributions at the level of 25% of the Category 1 membership dues.*”

Eduard Petrovsky, Council Delegate of the Czech Republic asked how this new membership category will be communicated to the Least Developed Countries. Alik Ismail-Zadeh noted that relevant people in Least Developed Countries should be approached through the Associations.

Marino Protti, Council Delegate of Costa Rica mentioned exploring the idea of developing a donations program where developed countries can pay the membership dues for developing countries. Alik Ismail-Zadeh noted that the Royal Society (RS) provided funding for IUGG membership to some African countries. Unfortunately, the experiment was not sustainable, and the participating countries did not pay their dues after the RS funding period was over. Alik Ismail-Zadeh noted that he would prefer having a bottom-up approach, where the interest for an IUGG membership comes from the science community of the country.

Kathryn Whaler noted that Ethiopia would be one of the first countries to be approached knowing that there is interest for an IUGG membership.

Colin Price, Council Delegate of Israel, proposed, seconded by Marino Protti, Council Delegate of Costa Rica, to approve the proposal for four years (with a possibility for extension of this experiment for further four years) without changes of the current IUGG Statutes and By-Laws. A vote by hand was conducted. The proposal for membership of Least Developed Countries was approved with two abstentions.

6. Report of the Nominating Committee

Tom Beer, Chair of the Nominating Committee, gave the report of the Nominating Committee as detailed in his report in the [Council Meeting Agenda Book](#) (page 97). The presentation he gave can be downloaded [here](#).

As required by IUGG By-Laws 10b and 10c, one or two candidates have been nominated for each position. The positions and the nominated candidates were:

IUGG Bureau

President: Kathryn Whaler (UK)
President-Elect: Chris Rizos (Australia)

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Secretary General: Aksel Hansen (Denmark)
Alexander Rudloff (Germany)
Treasurer: Niels Andersen (Denmark)
Bureau Members (Position #1, Europe):
Eduard Petrovsky (Czech Republic)
Harald Schuh (Germany)
Bureau Members (Position #2, Asia):
Virendra Tiwari (India)
Jun Xia (China)
Bureau Members (Positions #3, America):
Gordon Young (Canada)
Stephen McNutt (USA)

IUGG Finance Committee

Position #1: Corina Risso (Argentina)
Position #2: Jozsef Adam (Hungary)
Position #3: Priscilla Grew (USA)

Matt King, Council Delegate of Australia, noted that possibilities to increase the number of female candidates should be explored in future.

Michael Sideris invited the Council Delegates to nominate more candidates for the IUGG Bureau and Finance Committee in the next 48 hours.

Votes on the nominated candidates will be taken in the third session of the Council Meeting.

7. Report on the proposals to host the XXVIII General Assembly in 2023

Eduard Petrovsky, Chair of the Site Comparison Committee, gave the report of the Site Comparison Committee as detailed in his report in the [Council Meeting Agenda Book](#) (pages 98-106). The presentation he gave can be downloaded [here](#).

IUGG received five bids to host the XXVIII General Assembly in 2023 to be decided on:

- Athens, Greece
- Berlin, Germany
- Geneva, Switzerland
- Guadalajara, Mexico
- Izmir, Turkey (withdrawn on 28 May 2019)

In his report, the proposals were shortly introduced and compared against the criteria published in the Guidelines for IUGG General Assemblies (<http://www.iugg.org/assemblies/>). There was no need for personal site visits.

Eduard Petrovsky noted that all bids fulfil the criteria. He does not know the reasons why Turkey withdrew its bid.

Eduard Petrovsky explained that the remaining four bids will be presented on 12 July, at 3 PM. All Council Delegates are kindly invited to attend and to ask questions. The Site Comparison Committee will then shortlist two bids. Votes on the two shortlisted

bids will be taken after the final presentations in the third session of the Council Meeting.

Constantin Sava, Council Delegate of Romania, proposed to shortlist all four bids instead since they all fulfil the criteria.

Harsh Gupta, Council Delegate of India, supported the proposal coming from Romania.

Jürgen Müller, Council Delegate of Germany, criticized that the rules and procedures were well known to the bidders and should not be changed last minute.

Alik Ismail-Zadeh confirmed that the rules and procedures (made by the Bureau) were well known to the bidders and Council Delegates for a long time. No complaints were received.

Harsh Gupta, Council Delegate of India, proposed, seconded by Constantin Sava, Council Delegate of Romania, that in view of four very good bids the Council listens to all four and chooses one. A vote by hand was conducted. The proposal was rejected with 8 in favor, 14 against, and 8 abstentions.

Therefore, the procedure of selection will be as planned and described by Eduard Petrovsky.

8. Report of the Statutes and By-Laws (SBL) Committee on reformatting the IUGG SBL

Charles Fierz, Chair of the SBL Committee, gave the report of the SBL Committee on reformatting the IUGG SBL as detailed in his report in the [Council Meeting Agenda Book](#) (page 107). The presentation he gave can be downloaded [here](#).

He summarized that in 2017, the Bureau decided to reformat the IUGG SBL to make reading and understanding of the basic documents easier. The SBL Committee has not yet finished its work and therefore the reformatted version was not presented to the Council Delegates for their consideration. New developments will be reported to the Council later.

9. Report on scientific and educational programs

International Lithosphere Program (ILP)

Alexander Rudloff, Executive Secretary of ILP, summarized the report on the activities of ILP as detailed in his report in the [Council Meeting Agenda Book](#) (pages 108-120). Note: the quadrennial report of ILP is also published in the Comptes Rendus of IUGG2019. The presentation he gave can be downloaded [here](#).

ILP is a joint body of IUGG and the International Union of Geological Sciences (IUGS).

IUGG had appointed Harsh Gupta (India) as its representative to ILP Bureau for the term 2015-

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2019. Alan Green (Switzerland) was appointed as joint IUGS/IUGG representative.

ILP holds annual meetings, either during the EGU General Assembly in Vienna, Austria, or the AGU Fall Meeting in San Francisco, USA, where the results and further tasks of its Task Forces and Regional Coordinating Committees are discussed. Furthermore, ILP awards are given to excellent early- and mid-career scientists being active within the ILP Task Forces.

Cooperation with the Abdus Salam International Centre for Theoretical Physics (ICTP)

Alik Ismail-Zadeh summarized the report on the activities of the cooperation with the Abdus Salam International Centre for Theoretical Physics (ICTP) as detailed in his report in the [Council Meeting Agenda Book](#) (pages 121-123). The presentation he gave can be downloaded [here](#).

In 2011, ICTP and IUGG signed a memorandum of understanding (MoU) to promote educational programs related to geodesy and geophysics in the period 2012-2015. In 2015 the new MoU was signed for the period of 2016-2019. In the 2016-2019 period, IUGG co-sponsored 24 educational events organized by ICTP with a total of USD 60,000.

Council approved unanimously the extension of the Science Education Program in cooperation with ICTP for 2020-2023. A new memorandum of understanding should be signed in September 2019.

The First Session of the Council Meeting closed at 18:00.

MINUTES OF THE SECOND SESSION

FRIDAY, 12 JULY 2019 (09:00 – 13:00), ROOM 524AB, MONTREAL CONVENTION CENTRE

PARTICIPANTS

NATIONAL DELEGATES

Austria	Johannes Böhm
Belgium	Philippe Huybrechts (alternate)
Canada	Gordon Young
Chile	Eduard Cayul Aristondo
China	Jianping Li
China-Taipei	Bor-Shouh Huang
Costa Rica	Marino Protti Quesada
Croatia	Mirko Orlic
Czech Republic	Eduard Petrovsky
Denmark	Søren Gregersen
Egypt	Nasser M. Abou Ashour
Finland	Jyri Näränen
France	Claude Boucher
Germany	Jürgen Müller
Greece	Ioannis Daglis (alternate)
Hungary	Jozsef Adam
Iceland	Kristin Vogfjörd
India	Harsh Gupta
Ireland	Sergei Lebedev
Israel	Colin Price
Italy	Fausto Guzzetti
Japan	Setsuya Nakada
Mexico	Miguel Angel Santoya
New Zealand	David Rhoades
Norway	Liss Andreassen
Poland	Jan Krynski
Romania	Constantin Sava
Russia	Anatoly Soloviev
Slovakia	Peter Vajda
Slovenia	Polona Vreca
Spain	Marcelino Valdez Perez de Vargas
Sweden	Per Holmlund
Switzerland	Elmar Brockmann
Turkey	Murat Dagdeviren (alternate)
United Kingdom	Joanna Haigh
United States of America	Steven McNutt

LISTENERS

Argentina	Corina Risso
Brazil	Roberto Teixeira Luz
Iran	Mohammed Kazem Hafizi
Nigeria	Shakirudeen Odunuga

MEMBERS OF THE EXECUTIVE COMMITTEE

President	Michael Sideris
Vice-President	Kathy Whaler
Secretary General	Alik Ismail-Zadeh
Treasurer	Aksel Hansen
Bureau Member	Pierre Hubert
Bureau Member	Chris Rizos

President IACS	Regine Hock
President IAG	Harald Schuh
President IAMAS	John Turner
President IAPSO	Denise Smythe-Wright
President IASPEI	Thorne Lay
President IAVCEI	Donald Dingwell

GUESTS OF THE PRESIDENT ATTENDING THE FIRST SESSION OF THE COUNCIL

IAHS Secretary General	Christophe Cudennec
Chair of Nominating Committee	Tom Beer
IUGG Executive Secretary (Minute Taker)	Franz Kuglitsch
IUGG Secretariat	Katrin Gundrum
Ass. Director of BISO, U.S. Nat. Acad. of Sciences	Ester Sztejn
ICTP	Abdelkrim Aoudia
Executive Secretary, SCL/ILP	Alexander Rudloff
University of Nebraska DTU Space, Denmark	Priscilla Grew Niels Andersen
Secretary, National Committee, Russia	Roman Krasnoperov
GeoEcoMar, Romania	Anghel Sorin

10. Greetings; Presentation of the credentials

The Second Session of the Council Meeting was called to order at 09:00 with a roll call of delegates.

Delegates from 40 member countries were present, 36 eligible to vote. The total number of countries eligible to vote was 48 (72 minus 10 in observer status minus 14 in associate status). The quorum (16) was reached.

Alik Ismail-Zadeh announced that a group photo will be taken at 10:45.

Harsh Gupta, Council Delegate of India, announced that the IAGA-IASPEI Joint Assembly 2021 will be organized in Hyderabad, India. Information material is available for all Council Delegates at the entrance of the room 524AB.

11. Reports by Association Presidents

Council Delegates were asked to note the reports of the Associations available in the [Council Meeting Agenda Book](#) (pages 124-168). Note: the quadrennial reports of the IUGG Associations are also published in the Comptes Rendus of IUGG2019.

The IUGG Associations Presidents and the IAHS Secretary General reported on the activities of the Associations from 2015-2019.

IACS

Regine Hock gave a presentation on the activities of IACS, which can be downloaded [here](#). She highlighted (i) the revisions made to the IACS Statutes and By-Laws, (ii) the new IACS website, (iii) the IACS individual membership program, (iv) sponsored events, (v) IACS awardees, (vi) the IACS administration and structure, (vii) the involvement of IACS Bureau Members in IPCC activities, and (viii) planned activities for 2019-2023. She suggested reducing the length of IUGG General Assemblies to 5 days.

IAG

Harald Schuh gave a presentation on the activities of IAG, which can be downloaded [here](#). He highlighted (i) the IAG administration and structure, (ii) the IAG Strategic Plan and its implementation, (iii) new Inter-Association Activities, (iv) new Inter-Commission Committees, (v) new IAG projects, products and services, (vi) the new structure of the Global Geodetic Observing System (GGOS), (vii) the launch of the Gravity Recovery and Climate Experiment Follow-On (GRACE-FO) satellite mission, (viii) the adoption of the United Nations (UN) resolution on Global Geodetic Reference Frame (GGRF), (ix) the newly established UN-GGIM Subcommittee on Geodesy, (x) the planned development of a Global Geodetic Center of Excellence under the umbrella of the UN, and (xi) IAG publications.

IAGA

Eduard Petrovsky gave a presentation on the activities of IAGA, which can be downloaded [here](#). He highlighted (i) the IAGA administration and structure, (ii) the IAGA-IAMAS-IAPSO Joint Assembly held in Cape Town, South Africa, in 2017, (iii) IAGA awardees, (iv) IAGA schools and sponsored meetings, and (v) IAGA publications.

IAHS

Christophe Cudennec gave a presentation on the activities of IAHS, which can be downloaded [here](#). He highlighted (i) the IAHS Community, (ii) IAHS supported events between 2015 and 2019 incl. the IAHS Scientific Assembly 2017, which was organized in Port Elizabeth, South Africa, (iii) IAHS Publications, (iv) the IAHS Office, (v) the involvement of Early-Career Scientists in IAHS activities, (vi) the IAHS scientific decade Panta Rhei, (vii) the 23 unsolved problems in hydrology, and (viii) ongoing preparations for the IAHS Scientific Assembly 2021 to be organized in Montpellier, France.

IAMAS

John Turner gave a presentation on the activities of IAMAS, which can be downloaded [here](#). He

highlighted (i) the IAMAS administration and structure, (ii) past and future IAMAS events incl. the IAGA-IAMAS-IAPSO Joint Assembly held in Cape Town, South Africa, in 2017, and the IACS-IAMAS-IAPSO Joint Assembly to be held in Busan, Republic of Korea, in 2021, (iii) the IAMAS Strategic Plan (2019-2027), (iv) IAMAS on social media, (v) IAMAS awardees, (vi) the involvement of early-career scientists in IAMAS, and (vii) IAMAS publications.

IAPSO

Denise Smythe-Wright gave a presentation on the activities of IAPSO, which can be downloaded [here](#). She highlighted (i) the IAPSO administration and structure, (ii) the IAGA-IAMAS-IAPSO Joint Assembly held in Cape Town, South Africa, in 2017, (iii) the IACS-IAMAS-IAPSO Joint Assembly to be held in Busan, Republic of Korea, in 2021, (iv) IAPSO awardees, (v) the involvement of Early Career Scientists in IAPSO, and (vi) IAPSO publications incl. the G7 report “Future of Oceans and its Seas”.

IASPEI

Thorne Lay gave a presentation on the activities of IASPEI, which can be downloaded [here](#). He highlighted (i) the IASPEI Regional Assemblies held in 2016 and 2018, (ii) the IAG-IASPEI Joint Assembly held in Kobe, Japan, in 2017, (iv) the IASPEI administration, budget, and structure, (v) IASPEI awardees, (vi) IASPEI publications, and (viii) planned activities for 2019-2023 incl. the IAGA-IASPEI Joint Assembly to be held in Hyderabad, India, in 2021.

IAVCEI

Donald Dingwell gave a presentation on the activities of IAVCEI, which can be downloaded [here](#). He highlighted (i) the IAVCEI administration, budget, and structure, (ii) IAVCEI publications, (iii) Inter-Association activities, (iv) the Cities on Volcanoes Meetings held in Puerto Varas, Chile (2016) and Naples, Italy (2018), (v) the IAVCEI Assembly held in Portland OR, USA, in 2017, and (vi) planned activities for 2019-2023 incl. the IAVCEI Assembly to be held in Rotorua, New Zealand, in 2021.

12. Relations with ISC

Alik Ismail-Zadeh summarized the IUGG relations with the International Science Council (ISC) as detailed in his report in the [Council Meeting Agenda Book](#) (pages 169-182). The presentation he gave can be downloaded [here](#).

Alik Ismail-Zadeh highlighted (i) the history of international research collaboration, (ii) the recent merger of the International Council for Science (ICSU) with the International Social Science

Council (ISSC), (iii) the founding Assembly of the ISC in 2018, (iv) the goals and structure of ISC, and (v) IUGG's cooperation with ISC GeoUnions and ILP.

Johanna Haigh, Council Delegates of the UK, asked to make all the presentations of the Council Meeting available to the Delegates. Michael Sideris and Alik Ismail-Zadeh agreed after having received the permission of all presenters. Alik Ismail-Zadeh further noted that important numbers and statistics on the assembly will be published in the Comptes Rendus of IUGG2019 by the end of 2019.

13. Reports from liaisons to ISC Committees

Alik Ismail-Zadeh introduced the Partner Organizations of IUGG and summarized the responsibilities of IUGG Liaison Officers.

In order to save time, Alik Ismail-Zadeh referred the Council Delegates to the reports received from the IUGG Liaison Officers to ISC Committees as detailed in the [Council Meeting Agenda Book](#) (pages 183-196). The presentation he gave can be downloaded [here](#).

He briefly reviewed each of the organizations incl.

- Committee on Data for Science and Technology (CODATA),
- Committee on Space Research (COSPAR),
- Scientific Committee on Antarctic Research (SCAR),
- Scientific Committee on Oceanic Research (SCOR),
- Scientific Committee on Solar-Terrestrial Physics (SCOSTEP),
- World Data System (WDS),
- Regional Office for Africa (ROA),
- Regional Office for Asia and the Pacific (ROAP), and
- Regional Office for Latin American and the Caribbean (ROLAC).

Alik Ismail-Zadeh noted that no report was received from WDS, ROA, ROAP, and ROLAC. As the regional strategy of ISC is yet to be developed, he recommended to not appoint Liaison Officers to ROA, ROAP and ROLAC for 2019-2023 at this stage, but perhaps in the future.

14. Reports from liaisons to intergovernmental and other organizations

Alik Ismail-Zadeh continued to briefly review the reports received from the IUGG Liaison Officers to intergovernmental and other organizations as detailed in the [Council Meeting Agenda Book](#) (pages 197-224). The presentation he gave can be downloaded [here](#).

The following organizations were reviewed:

- Consultative Committee for Time and Frequency (CCTF),
- Group on Earth Observations (GEO),
- UNESCO International Hydrological Programme (IHP),
- UNESCO Intergovernmental Oceanographic Commission (IOC),
- Pan-American Institute of Geography and History (PAIGH),
- The United Nations Geospatial Information Section (UN-GIS),
- International Civil Aviation Organization (ICAO),
- World Climate Research Programme (WCRP),
- World Meteorological Organization (WMO),
- International Civil Aviation Organization (ICAO), and
- ISC-UNDRR Scientific Committee on Integrated Research on Disaster Risk (IRDR).

Alik Ismail-Zadeh mentioned that Hermann Drewes, IUGG Liaison Officer to UN-GIS, suggested in his report to discontinue the IUGG Liaison to UN-GGIS, and instead develop an IUGG Liaison to the United Nations Committee of Experts on Global Geospatial Information Management (UN-GGIM).

Alik Ismail-Zadeh noted that no report was received from ICAO and IRDR as the Liaison Officers to these bodies have never been contacted. He mentioned that he will meet high-level representatives of ICAO to discuss the future Liaison to IUGG. IRDR is in a restructuring process. Therefore, no any Liaison Officer should be appointed IRDR for 2019-2023 at this stage.

Anatoly Soloviev, Council Delegate of Russia, suggested establishing an IUGG Liaison to the International Arctic Science Committee (IASC). Alik Ismail-Zadeh noted that IACS signed a Memorandum of Understanding with IASC to collaborate. Michael Sideris asked to clarify the issue with IACS and with IASC if they accept Liaison Officers at all.

Tom Beer, IUGG President (2007-2011), noted that the establishment of an IUGG Liaison to Future Earth could be explored. Alik Ismail-Zadeh noted that Future Earth is quite detached from the ISC membership and clarified that they do not accept any Liaison Officers.

Claude Boucher, Council Delegate of France, noted that the establishment of an IUGG Liaison to the International Hydrographic Organization (IHO) could be explored. Christophe Cudennec noted that there is no link between IAHS and IHO which is an international governmental organization.

Marino Protti, Council Delegate of Costa Rica, noted that the establishment of an IUGG Liaison to the International Network for Government Science Advice (INGSA) could be explored. Alik Ismail-Zadeh noted that INGSA is part of ISC and does not accept Liaison Officers at this stage.

Alik Ismail-Zadeh noted that in the past IUGG had a good liaison to the International Telecommunication Union (ITU) which suddenly stopped. Reestablishing a link to ITU could be considered in future.

The reports of the IUGG Liaison Officers to ISC Committees, intergovernmental and other organizations were adopted unanimously.

15. Report of the IUGG Finance Committee

Jan Krynski summarized the major activities of Finance Committee as detailed in his report in the [Council Meeting Agenda Book](#) (pages 225-227). Note: the quadrennial report of the Chair of the Finance Committee is also published in the Comptes Rendus of IUGG2019. The presentation he gave can be downloaded [here](#).

He highlighted (i) administration and structure of the Finance Committee, (ii) the role of the Finance Committee, (iii) membership issues, (iv) other issues incl. financial reporting of the Associations, the IUGG Grant Program, the accounting process, and IUGGs allocations to its Commissions, (v) the IUGG Budget 2020-2023, and (vi) the cooperation with the Treasurer.

Gordon Young, IUGG Council Delegate of Canada, suggested exploring a more aggressive marketing to approach the countries and possibly to engage a company to do so.

Jan Krynski mentioned that there should be a list of good arguments and benefits to become an IUGG member country.

Michael Sideris noted that leaflets and brochures will not be enough to get more member countries. Instead, IUGG can only raise its profile by being present in the media which would cost too much money and efforts considering our small budget.

Harsh Gupta, IUGG Council Delegate of India, asked to whom we would market ourselves since most affluent countries are already member of IUGG. Instead, our current member countries should be approached and informed about new developments, to keep them members in future. He noted that commercial marketing is probably not in the interest of IUGG.

Michael Sideris asked the Council Delegates to promote IUGG in their member countries.

Shakirudeen Odunuga, Council Delegates of Nigeria, suggested inviting more government representatives, who are usually not familiar with IUGG, to attend General Assemblies to provide more information about how IUGG works and to organize some special event (e.g. session, panel discussion etc.) for them. Michael Sideris noted that IUGG is a non-governmental organization but it might be worth trying in future.

Alik Ismail-Zadeh explained that there are two reasons why member countries are in observer status, (i) financial reasons, and (ii) political reason. The latter is the case for Iran which is willing but not able to pay IUGG membership dues due to international sanctions. Therefore, IUGG would like to keep Iran as a regular member country in observer status and not transfer it to Associate status.

16. Presentation of the 2020-2023 Budget

Aksel Hansen discussed the draft IUGG Budget 2020-2023 as detailed in the [Council Meeting Agenda Book](#) (page 228). The presentation he gave can be downloaded [here](#). As recommended by the Finance Committee, the balance of the IUGG Budget was set to approximately one year's turnover.

He went through the budget line by line and highlighted the significant changes. He noted that the interest IUGG has received is close to zero and that there are no plan to make any kind of capital investments in future.

Alik Ismail-Zadeh noted that the last version of the IUGG Budget 2020-2023 will be circulated by Franz Kuglitsch on 13 July 2019.

A final vote to adopt the 2020-2023 Budget takes place in the Third Session of the Council Meeting.

The Second Session of the Council Meeting closed at 13:00.

MINUTES OF THE THIRD SESSION

TUESDAY, 16 JULY 2019 (14:00 – 18:00), ROOM 524AB, MONTREAL CONVENTION CENTRE

PARTICIPANTS

NATIONAL DELEGATES

Australia	Matt King
Austria	Johannes Böhm
Belgium	Karen Fontyn (alternate)
Canada	Gordon Young
China	Dunxian She (alternate)
	Jun Xia (alternate)
China-Taipei	Bor-Shouh Huang
Costa Rica	Marino Protti Quesada
Croatia	Mirko Orlic
Czech Republic	Eduard Petrovsky
Denmark	Søren Gregersen
Egypt	Nasser M. Abou Ashour
Finland	Jyri Näränen
France	Claude Boucher
Germany	Jürgen Müller
Greece	Ioannis Daglis (alternate)
Hungary	Jozsef Adam
Iceland	Kristin Vogtjörd
India	Harsh Gupta
Ireland	Sergei Lebedev
Israel	Colin Price
Italy	Fausto Guzzetti
Japan	Setsuya Nakada
Korea, Rep.	Sang-Mook Lee
Mexico	Miguel Angel Santoya
New Zealand	David Rhoades
Poland	Jan Krynski
Romania	Constantin Sava
Russia	Anatoly Soloviev
Slovakia	Peter Vajda
Slovenia	Polona Vreca
Sweden	Jonas Agren
Switzerland	Elmar Brockmann
Turkey	Murat Dagdeviren (alternate)
United Kingdom	Joanna Haigh
United States of America	Steven McNutt

LISTENERS

Argentina	Corina Risso
Brazil	Roberto Teixeira Luz
Nigeria	Shakirudeen Odunuga

MEMBERS OF THE EXECUTIVE COMMITTEE

President	Michael Sideris
Vice-President	Kathy Whaler
Secretary General	Alik Ismail-Zadeh
Treasurer	Aksel Hansen
Bureau Member	Pierre Hubert
Bureau Member	Chris Rizos
President IACS	Regine Hock
President IAG	Harald Schuh

GUESTS OF THE PRESIDENT ATTENDING THE FIRST SESSION OF THE COUNCIL

IAG Secretary General	Hermann Drewes
IAHS Secretary General	Christophe Cudennec
IAPSO Secretary General	Stefania Sparnocchia
IASPEI Secretary General	Johannes Schweitzer
Chair of Statutes and By-Laws Committee	Charles Fierz
Chair of Nominating Committee	Tom Beer
IUGG Executive Secretary (Minute Taker)	Franz Kuglitsch
IUGG Secretariat	Katrin Gundrum
Ass. Director of BISO, U.S. Nat. Acad. of Sciences	Ester Szein
Executive Secretary, SCL/ILP	Alexander Rudloff
University of Nebraska DTU Space, Denmark	Priscilla Grew
Secretary, National Committee, Russia	Niels Andersen
GeoEcoMar, Romania	Roman Krasnoperov
IAMAS National Correspondent, Germany	Anghel Sorin
GFZ, Germany	Hans Volkert
GFZ, Germany	Ludwig Stroink
GFZ, Germany	Christine Bismuth

17. Greetings; Presentation of the credentials

The Third Session of the Council Meeting was called to order at 14:00 with a roll call of delegates. Delegates from 38 member countries were present, 35 eligible to vote. The quorum (16) was reached. Delegates from Chile, Colombia, and Norway had deposited their votes with the IUGG President for matters to be taken up at the Third Session. Altogether, 38 votes were cast.

18. Adoption of the 2020-2023 Budget

The Council was asked to vote on the 2020-2023 Budget as distributed by Franz Kuglitsch on 13 July 2019. Aksel Hansen summarized the major numbers. The presentation he gave can be downloaded [here](#).

Jyri Näränen, Council Delegate of Finland, seconded by Gordon Young, Council Delegate of Canada, to approve the proposed 2020-2023 Budget.

The ballots to vote on the 2020-2023 Budget were distributed among the Council Delegates. The votes on financial matters were weighted by the countries categories of membership. 38 votes representing 142 units were received. The results are given below.

In favor: 142 Against: 0 Abstain: 0

The 2020-2023 Budget was adopted unanimously.

19. Election of IUGG Officers

Alik Ismail-Zadeh explained the procedures for the election of the members of the IUGG Bureau and Finance Committee for the term 2020-2023. The ballots to vote were distributed among the Council Delegates. This vote requires a simple majority of all ballots cast.

The candidates for President, President-Elect, Secretary General, and Treasurer presented their position statements. No further comments or questions were asked by the Council. The Council Delegates were asked to vote.

The candidates for Bureau Members presented their position statements. No further comments or questions were asked by the Council.

The results of the votes for President, President-Elect, Secretary General, and Treasurer were presented. For the position of President, Kathryn Whaler was elected. For the position of President-Elect, Chris Rizos was elected. For the position of Secretary General, Alexander Rudloff was elected. For the position of Treasurer, Niels Andersen was elected.

Then, the Council Delegates were asked to vote on the Bureau Members.

The candidates for Finance Committee Members presented their position statements. No further comments or questions were asked by the Council. The Council Delegates were asked to vote.

The results of the votes for the three Bureau and the three Finance Committee Members were presented. The Bureau Members elected were Stephen McNutt, Eduard Petrovsky, and Jun Xia. The Finance Committee Members elected were Jozsef Adam, Priscilla Grew, and Corina Risso. The actual vote tallies are given in the following:

Candidate	For	Against	Abstain
Kathryn Whaler for President	35	0	3
Chris Rizos for President-Elect	37	0	1
Alexander Rudloff for Secretary General	23		
Aksel Hansen for Secretary General	15		
Niels Andersen for Treasurer	37	0	1
Eduard Petrovsky for Bureau Member	22		
Harald Schuh for Bureau Member	15		
Virendra Tiwari for Bureau Member	14		
Jun Xia for Bureau Member	24		

Stephen McNutt for Bureau Member	27		
Gordon Young for Bureau Member	11		
Jozsef Adam for Finance Committee Member	33	0	4
Priscilla Grew for Finance Committee Member	35	0	2
Corina Risso for Finance Committee Member	32	1	4

20. Presentations of the proposals to host the XXVIII General Assembly. Selection of the venue of the XXVIII General Assembly (2023)

The Bureau received four bids to host the XXVIII IUGG General Assembly incl. Athens (Greece), Berlin (Germany), Geneva (Switzerland), and Guadalajara (Mexico).

After the hearing on 12 July 2019, Athens (Greece) and Berlin (Germany) were shortlisted by the Site Comparison Committee. Michael Sideris invited the presenters of both bids to give a presentation of not more than 20 minutes to the Council Delegates.

Following this, the Council was asked to vote on these two venues. The results were as follows:

2023 GA venue	Votes
Athens, Greece	15
Berlin, Germany	23

The XXVIII IUGG General Assembly will take place in Berlin, Germany.

21. Renewal of the IUGG liaison officers for 2019-2023

Alik Ismail-Zadeh presented the following table of proposed IUGG Liaison Officers to the Council Delegates. Principal Liaisons are marked in **bold**. The presentation he gave can be downloaded [here](#).

Organization	Liaisons 2019-2023
ISC Committee on Data for Science and Technology (CODATA)	Alena Rybkina (RUSSIA)
ISC Committee on Space Research (COSPAR)	Andrew W. Yau (CANADA) Christopher Kotsakis (GREECE)
ISC Scientific Committee on Antarctic Research (SCAR)	Ian Allison (AUSTRALIA) John Turner (UK)
ISC Scientific Committee on	Trevor McDougall (AUSTRALIA) Joyce Penner (USA)

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Oceanic Research (SCOR)	
ISC Scientific Committee on Solar-Terrestrial Physics (SCOSTEP)	Renata Lukianova (RUSSIA) Peter Pilewskie (USA)
ISC World Data System (WDS)	Toshihiko Iyemori (JAPAN) Aude Chambodut (FRANCE) Carey Noll (USA)
UNESCO Section on Earth Sciences and Geo-Hazards Risk Reduction	Alik Ismail-Zadeh (GERMANY/RUSSIA) Harsh Gupta (INDIA)
UNESCO International Hydrological Program (UNESCO-IHP)	Christophe Cudennec (FRANCE) Charles Fierz (SWITZERLAND)
UNESCO Intergovernmental Oceanographic Commission (UNESCO-IOC)	Denise Smythe-Wright (UK) Satheesh Sheno (INDIA)
World Meteorological Organization (WMO)	Roger Pulwarty (USA) Christophe Cudennec (FRANCE) Charles Fierz (SWITZERLAND) Arnau Folch (SPAIN) Jens Wickert (GERMANY) Hua Zhang (CHINA)
United Nations Committee of Experts on Global Geospatial Information Management (UN-GGIM)	Harald Schuh (GERMANY)
International Civil Aviation Organization (ICAO)	David Schneider (USA) Larry Mastin (USA)
Intergovernmental Panel on Climate Change (IPCC)	Franz Kuglitsch (GERMANY/AUSTRIA)
World Climate Research Programme (WCRP)	Lisa Alexander (AUSTRALIA)
Consultative Committee for Time and Frequency (CCTF)	Claude Boucher (FRANCE) Gerard Petit (FRANCE)
Pan American Institute of Geography and History (PAIGH)	Laura Sanchez (GERMANY/COLOMBIA)

Group on Earth Observations (GEO)	Michael Sideris (CANADA) Chris Rizos (AUSTRALIA) Kathryn Whaler (UK)
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Michael Sideris then asked the Council Delegates to approve the appointments.

Jyri Näränen, Council Delegate of Finland, proposed, seconded by Eduard Petrovsky, Council Delegate of the Czech Republic, to accept the proposed IUGG Liaison Officers for 2019-2023.

Alik Ismail-Zadeh clarified the differences between CODATA and WDS and mentioned that these two bodies may wish to merge in the future.

A vote by hand was conducted. The proposal was accepted unanimously.

22. Presentation and adoption of the Resolutions

Harsh Gupta, Chair of the Resolutions Committee, reported that the Associations had been asked to submit their resolutions to the Resolutions Committee. Each resolution was then examined by the Resolutions Committee and carefully considered by the Executive Committee before being brought to the Council. Two resolutions plus one traditional resolution of thanks of IUGG to the organizers of IUGG2019 were put on screen, read and commented by Harsh Gupta. He welcomed questions and comments by the Council. [The final versions of the resolutions which were adopted can be downloaded [here](#). They are also published in the Comptes Rendus of IUGG2019.]

Resolution 1: Reducing the Carbon Foot Print by the Research Community.

Resolution 2: The International Terrestrial Reference Frame (ITRF).

Resolution 3: Thanks.

Michael Sideris then asked the Council Delegates to adopt the resolutions.

Jürgen Müller, Council Delegate of Germany, proposed, seconded by Jyri Näränen, Council Delegate of Finland, to accept the proposed resolutions.

Polona Vreca, Council Delegate of Slovenia, referring to Resolution 1, noted that she and many colleagues are suffering from the low temperatures in the convention center. Increasing the temperature by a few degrees would help reduce the carbon footprint.

Peter Vajda, Council Delegate of Slovakia, referring to Resolution 3, noted that it should be noted carefully why certain people did not receive a visa on time.

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Jürgen Müller, Council Delegate of Germany, referring to Resolution 3, noted that the visa issue should not be part of this resolution, and made a motion to remove it. Stephen McNutt, Council Delegate of the USA, seconded. A vote by hand was conducted. The modified resolution was accepted with 25 votes in favor, 4 votes against, and 3 abstentions.

Alik Ismail-Zadeh noted that it is a major concern of ISC that many scientists are not able to attend international meetings. He mentioned that only few weeks ago, ISC established a new Committee on Freedom and Responsibility in Science to consider such issues.

A vote by hand on all three resolutions was conducted. The resolutions (incl. the modified Resolution 3) were accepted unanimously.

Michael Sideris noted that after getting the final numbers on people who did not receive a visa on time, a fourth resolution can be prepared by the Executive Committee and adopted by the Standing Council.

Closing remarks

Michael Sideris thanked all Council Delegates, Committees and organizers of the General Assembly for their help and assistance to make the assembly such a success. He invited all participants to make their comments for the improvement of future General Assemblies known to IUGG.

Michael Sideris declared that the Council of Delegates to the XXVII General Assembly was adjourned at 18:00.

Respectfully submitted by Franz Kuglitsch

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IUGG Budget 2019-2023, approved 16 July 2019, Montreal

Based on discussions at Bureau Meetings in Mexico City, 2018, and in Montreal, 2019

Approved by the Finance Committee and Executive Committee in Montreal, 2019

All figures, except the value and number of units, are in thousands of US dollars

Year	2019	2020	2021	2022	2023	2020-2023	2016 - 2019
Estimated unit value	\$2.020	\$2.060	\$2.100	\$2.140	\$2.180	\$2.060-\$2.180	\$1.940-\$2.050
Estimated number of units	260	260	260	260	260	1040	1080
INCOME						Budget	Budget
		2020	2021	2022	2023	2020-2023	2016-2019
1. MEMBERSHIP DUES	525,2	535,6	546,0	556,4	566,8	2204,8	2157
2. ASSEMBLY SURCHARGE					20,0	20,0	20
3. ROYALTIES		0,2	0,2	0,2	0,2	0,8	1
4. MISCELLANEOUS (interest)		0,1	0,1	0,1	0,1	0,4	0
5. TOTAL INCOME		535,9	546,3	556,7	587,1	2226,0	2178
6. INCOMING BALANCE 2020		662,0	659,8	642,8	651,0	662,0	
EXPENDITURES						Budget	Budget
		2020	2021	2022	2023	2020-2023	2016-2019
11. ADMINISTRATION		99,0	119,0	99,0	125,0	442,0	440
11.1 Personnel		15,0	15,0	15,0	15,0	60,0	60
11.2 Equipment		1,0	1,0	1,0	1,0	4,0	4
11.3 Supplies		4,0	4,0	4,0	4,0	16,0	16
11.4 Communication		4,0	4,0	4,0	5,0	17,0	17
11.5 Travel		70,0	90,0	70,0	90,0	320,0	335
11.6 Miscellaneous		5,0	5,0	5,0	10,0	25,0	8
12. SCIENCE AND EDUCATION INITIATIVES		70,0	70,0	70,0	70,0	280,0	160
12.1 Education and outreach		30,0	30,0	30,0	30,0	120,0	80
12.2 Science		40,0	40,0	40,0	40,0	160,0	80
13. ASSEMBLIES		0,0	0,0	0,0	110,0	110,0	70
13.1 Organizational expenses		0,0	0,0	0,0	10,0	10,0	10
13.2 Travel Grants		0,0	0,0	0,0	100,0	100,0	60
14. SYMPOSIA		25,0	25,0	25,0	0,0	75,0	60
14.1 Symposia		25,0	25,0	25,0	0,0	75,0	60
15. ASSOCIATIONS		262,6	267,8	273,0	278,2	1081,6	1059
15.1 Allocations		262,6	267,8	273,0	278,2	1081,6	1059
16. DUES		32,0	32,0	32,0	32,0	128,0	120
16.1 ISC		32,0	32,0	32,0	32,0	128,0	120
17. UNION ACTIVITIES		39,0	39,0	39,0	39,0	156,0	164
17.1 Union commissions		24,0	24,0	24,0	24,0	96,0	104
17.2 Inter-Union Science		15,0	15,0	15,0	15,0	60,0	60
18. FEES		8,0	8,0	8,0	8,0	32,0	32
18.1 Professional Services		5,0	5,0	5,0	5,0	20,0	20
18.2 Bank Fees		3,0	3,0	3,0	3,0	12,0	12
19. CONTINGENCIES		2,5	2,5	2,5	2,5	10,0	10
20. TOTAL EXPENDITURES		538,1	563,3	548,5	664,7	2314,6	2201
21. OUTGOING BALANCE 2023		659,8	642,8	651,0	573,4	573,4	

NOTE 17.1 Union commissions CMG, SEDI, CCEC, UCPS, GRC, UCDI
17.2 Inter-Union Science ILP

OFFICERS OF IUGG AND THE UNION ASSOCIATIONS FOR 2019-2023

BUREAU OF THE UNION

<i>President:</i>	Kathryn Whaler	UNITED KINGDOM
<i>President-Elect:</i>	Chris Rizos	AUSTRALIA
<i>Secretary General:</i>	Alexander Rudloff	GERMANY
<i>Treasurer:</i>	Niels Andersen	DENMARK
<i>Members:</i>	Stephen McNutt	USA
	Eduard Petrovsky	CZECH REPUBLIC
	Jun Xia	CHINA

EXECUTIVE COMMITTEE OF THE UNION

According to Article 10 of the Statutes of IUGG the Executive Committee consists of:

- the Bureau (see above),
- the Retiring President of the Union, Michael G. Sideris (CANADA)
- the Presidents of the International Associations:

<i>IACS:</i>	Regine Hock (2019-2021)	USA
	Liss M. Andreassen (2021-2023)	NORWAY
<i>IAG:</i>	Zuheir Altamimi	FRANCE
<i>IAGA:</i>	Mioara Manda	FRANCE
<i>IAHS:</i>	Günter Blöschl (2019-2021)	AUSTRIA
	Berit Arheimer (2021-2023)	SWEDEN
<i>IAMAS:</i>	Joyce Penner	USA
<i>IAPSO:</i>	Trevor McDougall	AUSTRALIA
<i>IASPEI:</i>	Kenji Satake	JAPAN
<i>IAVCEI:</i>	Patrick Allard	FRANCE

FINANCE COMMITTEE OF THE UNION

<i>Chair:</i>	Corina Risso	ARGENTINA
<i>Members:</i>	Jozsef Adam	HUNGARY
	Priscilla Grew	USA

SECRETARIES GENERAL OF THE INTERNATIONAL ASSOCIATIONS

<i>IACS:</i>	Richard Essery	UNITED KINGDOM
<i>IAG:</i>	Markku Poutanen	FINLAND
<i>IAGA:</i>	Monika Korte	GERMANY
<i>IAHS:</i>	Christophe Cudennec	FRANCE
<i>IAMAS:</i>	Steven Ackerman	USA
<i>IAPSO:</i>	Stefania Sparnocchia	ITALY
<i>IASPEI:</i>	Johannes Schweitzer	NORWAY
<i>IAVCEI:</i>	Roberto Sulpizio	ITALY

**RESOLUTIONS ADOPTED AT THE XXVII GENERAL ASSEMBLY
BY THE UNION - 16 JULY 2019
XXVII GENERAL ASSEMBLY, MONTRÉAL, CANADA, 8 - 18 JULY 2019**

IUGG Resolution 1: Reducing the Carbon Foot Print by the Research Community

The International Union of Geodesy and Geophysics

Considering

The clearly established impact of human activity on climate change and biosphere degradation,

Acknowledging

The irreversible consequences of continuing the current trajectory of greenhouse gas emission for the ecosystems of the planet and human societies,

Noting

That the Intergovernmental Panel on Climate Change (IPCC), in its recent special report on the impact of global warming of 1.5°C (IPCC, 2018; <https://www.ipcc.ch/sr15/>),

- Demonstrated the dramatic differences between the consequences of warming of 1.5°C and 2.0°C above pre-industrial levels, and
- Showed that limiting the warming to 1.5°C could be obtained only by strongly reducing carbon dioxide emissions before 2030,

Urges

- IUGG and affiliated Scientific Associations to take carbon foot print criteria into account when choosing the venue of future meetings, and
- The participants of the 27th IUGG General Assembly, research institutions and individual researchers to contribute to an unprecedented effort to evaluate and reduce greenhouse gas emission impact on the environment.

Resolves

The research community, which is well aware of the origins and impact of climate change, should exhibit an exemplary attitude by modifying its professional practices in order to rapidly reduce its carbon footprint.

IUGG Resolution 2: The International Terrestrial Reference Frame (ITRF)

The International Union of Geodesy and Geophysics

Considering

- The significant efforts of the International Association of Geodesy (IAG) in developing and maintaining fundamental geodetic products, in particular the International Terrestrial Reference Frame (ITRF), for scientific and societal benefits, and
- The importance of inter-operability of various geospatial data-sets and geo-referencing applications,

Acknowledging

The adoption by the IUGG of Resolution 2 in Perugia 2007 of the International Terrestrial Reference System (ITRS) as the preferred Geocentric Terrestrial Reference System (GTRS) for scientific and technical applications,

Noting

- That the ITRF is the numerical realization of the ITRS, developed, maintained and made available to users by the International Earth Rotation and Reference Systems Service (IERS), an IAG service, and
- That the ITRF is widely used as the standard in various geo-referencing applications,

Resolves

To recommend to the user community that the ITRF be the standard terrestrial reference frame for positioning, satellite navigation and Earth Science applications, as well as for the definition and alignment of national and regional reference frames.

IUGG Resolution 3: Thanks

The International Union of Geodesy and Geophysics

Resolves

To record gratefully its appreciation for the organization, arrangements, and hospitality at its 27th General Assembly.

On behalf of all participants the Council expresses its warm thanks to the Local Organizing Committee, the Scientific Program Committee, the Canadian Geophysical Union (CGU), the Canadian Meteorological and Oceanographic Society (CMOS) and all others for making the 27th General Assembly a success in the beautiful city of Montreal.

**RESOLUTIONS ADOPTED AT THE XXVII GENERAL ASSEMBLY
BY THE IUGG ASSOCIATIONS
XXVII GENERAL ASSEMBLY, MONTRÉAL, CANADA, 8 - 18 JULY 2019**

IAG Resolution 1: The International Terrestrial Reference Frame (ITRF)

The International Association of Geodesy,

Considering,

- The significant efforts of the International Association of Geodesy (IAG) in developing and maintaining fundamental geodetic products for scientific and societal benefits, in particular the International Terrestrial Reference Frame (ITRF);
- The importance of interoperability of various geospatial data-sets and geo-referencing applications;

Acknowledging,

The adoption by the IUGG Resolution 2 in Perugia 2007 of the International Terrestrial Reference System (ITRS), as the preferred Geocentric Terrestrial Reference System (GTRS) for scientific and technical applications;

Noting,

- That the ITRF is the numerical realization of the ITRS, developed, maintained and made available to the users by the International Earth Rotation and Reference Systems Service (IERS), an IAG service;
- That the ITRF is widely used as the standard in various geo-referencing applications;

Resolves,

To recommend to the user community that the ITRF be the standard terrestrial reference frame for positioning, satellite navigation and Earth science applications, as well as for the definition and alignment of national and regional reference frames.

IAG Resolution 2: Third Realization of the International Celestial Reference Frame

The International Association of Geodesy,

Considering,

- That the International Union of Geodesy and Geophysics adopted at the 25th General Assembly in Melbourne 2011 Resolution 2 on the second realization of the International Celestial Reference Frame;
- That the International Astronomical Union (IAU) adopted Resolution B2 at its XXXth General Assembly (2018) (https://www.iau.org/static/resolutions/IAU2018_ResolB2_English.pdf) that resolves to consider the “Third Realization of the International Celestial Reference Frame (ICRF3)” as the fundamental realization of the International Celestial Reference System (ICRS) (see note 1);

Note 1: The Third Realization of the International Celestial Reference Frame by Very Long Baseline Interferometry, Presented on behalf of the IAU Working Group, Patrick Charlot, Chris Jacobs, David Gordon et al. Astronomy & Astrophysics (in preparation).

- That the celestial reference system and the nutation-precession model have a large influence on geodetic and geodynamic observations, analyses and interpretations;
- That the ICRF3 was constructed by the International Astronomical Union (IAU) involving working group members of the International Earth Rotation and Reference Systems Service (IERS) and the International VLBI Service for Geodesy and Astrometry (IVS) communities;

Recommends,

- That the ICRF3 should be used as a standard for all future applications in geodesy and astrometry;
- That the organizations responsible for geodetic VLBI observing programs take appropriate measures to continue existing and develop improved VLBI observing and analysis programs to both maintain and improve ICRF3;
- That highest consistency between the ICRF, the International Terrestrial Reference Frame (ITRF), and the Earth Orientation Parameters (EOP) should be a primary goal in all future realizations.

IAG Resolution 3: Establishment of the International Height Reference Frame (IHRF)

The International Association of Geodesy,

Considering,

The IAG Resolution for the Definition and Realization of an International Height Reference System (IHRS) released at the 26th IUGG General Assembly in July 2015;

Acknowledging,

- The achievements of
 - GGOS Focus Area “Unified Height System” and its JWG 0.1.2 “Strategy for the Realization of the International Height Reference System (IHRS)”;
 - IAG JWG 2.2.2 “The 1 cm geoid experiment”;
 - IAG SC 2.2 “Methodology for geoid and physical height systems”;
 - ICCT JSG 0.15 “Regional geoid/quasi-geoid modelling - Theoretical framework for the sub-centimetre accuracy”;
- in realizing this resolution;

Noting,

The need of an operational infrastructure to ensure the determination, maintenance and availability of an International Height Reference Frame (IHRF) in the long-term basis;

Urges,

- All countries to engage with the IAG and concerned components, in particular the International Gravity Field Service (IGFS), in order to promote and support the implementation of the IHRF by
 - Installing IHRF reference stations at national level,
 - Conducting the necessary gravimetric surveys to guarantee the precise determination of potential values,
 - Making data available open access,
 - Contributing to the development of analysis strategies to improve the estimation of reference coordinates and modelling of the Earth’s gravity field,

- Describing, archiving and providing geodetic products associated to the IHRF.

IAG Resolution 4: Establishment of the Infrastructure for the International Gravity Reference Frame

The International Association of Geodesy,

Considering,

The IAG Resolution No. 2 for the establishment of a global absolute gravity reference system released at the 26th IUGG General Assembly in July 2015;

Acknowledging,

- The achievements of
 - JWG 2.1.1 “Establishment of a global absolute gravity reference system“,
 - Sub-Commission 2.1 “Gravimetry and Gravity Networks“,
 - International Gravity Field Service (IGFS)
- in realizing this resolution;

Noting,

That the realization of the International Gravity Reference System (IGRS), the International Gravity Reference Frame (IGRF), is based on measurements with absolute gravimeters (AG) monitored at reference stations and during international comparisons, which needs the support of national and international institutions;

Urges,

International and national institutions, agencies and governmental bodies in charge of geodetic infrastructure to

- Establish a set of absolute gravity reference stations on the national level,
- Perform regular absolute gravity observations at these stations,
- Participate in comparisons of absolute gravimeters to ensure their compatibility,
- Make the results available open access.

IAG Resolution 5: Improvement of the Earth’s Rotation Theories and Models

The International Association of Geodesy,

Recognizing,

- That the continuous improvement of the terrestrial and celestial reference systems and frames pursuing the accuracy and stability goals set by GGOS is necessary for determining and investigating the global change of the Earth;
- That the consistent definition and determination of the rotation between the two reference frames is tightly linked to geodynamics and necessary for the accurate realization of terrestrial frames and the determination of global geodetic variables;
- That the current Earth rotation theories are unable to model and predict the Earth orientation parameters (EOP) with an accuracy close to the GGOS requirements, in spite of the improved

accuracy and precision of the individual and combined solutions derived from single or multiple techniques;

- That the precession nutation theories IAU2000 and IAU2006 suffer from internal inconsistencies and systematics whose correction is available, but also from inconsistencies due to incorporating outdated models instead of the state-of-art models used in EOP determination;
- That the theoretical models of the different EOPs and their observations are not always referred to the current IAG standards, in particular regarding terrestrial reference frames;

noting,

- The results of the IAG Commission 3 Joint Working Group on Theory of Earth and validation, joint with the International Astronomical Union (IAU) Commission A2, summarized in its 2015-2019 report (see note 1);
- The need of taking advantage of the advances accomplished or yet in progress on different aspects of the theoretical and empirical modelling and prediction of the Earth's rotation to get closer to the GGOS goals;

resolves,

- To encourage a prompt improvement of the Earth rotation theory regarding its accuracy, consistency, and ability to model and predict the essential EOP,
- That the definition of all the EOP, and related theories, equations, and ancillary models governing their time evolution, must be consistent with the reference frames and the resolutions, conventional models, products, and standards adopted by the IAG and its components,
- That the new models should be closer to the dynamically time-varying, actual Earth, and adaptable as much as possible to future updating of the reference frames and standards.

Note 1: Report of Commission 3 Joint Working Group 3.1 Theory of Earth rotation and validation (Joint with the IAU). In: IAG Reports Vol. 41 (Travaux de l'AIG 2015-2019, <https://iag.dgfi.tum.de/en/iag-publications-position-papers/iag-reports-2019-online/>)

IAGA Resolution 1: World Data Center SILSO and the international sunspot number

IAGA,

Recognising

The importance of the long-running international sunspot number in an increasing number of studies into Solar Activity and related studies into Space Weather, Space Climate and Global Change in the Earth environment,

Noting

The leadership role of the World Data Center SILSO (Sunspot Index and Long-term Solar Observations) in the production, collection, preservation and dissemination of the international sunspot number over several decades,

Urges

Funding agencies to make every possible effort to continue the operation of the WDC-SILSO and the production of the International Sunspot Number in a long-term sustainable manner.”

IAGA Resolution 2: Space Weather and the ESA Lagrange Mission

IAGA,

Recognising

- Recent international efforts by COSPAR and other organisations and researchers to determine the potentially severe societal and economic impact of space weather
- The expressed need of organisations and agencies, including the UN Committee on the Peaceful Uses of Outer Space (COPUOUS), for improved space weather forecasting, mitigation and preparedness across a wide range of environments, which include near-Earth space, the ionosphere, the upper atmosphere and on the ground,

Noting

The activities of agencies and individuals over recent years to define and develop space weather monitoring platforms off the Sun-Earth line, to provide significant improvement in our knowledge of the evolution of conditions at the Sun and in the corona, and the *in situ* properties of the solar wind and interplanetary magnetic field,

Expresses

Deep appreciation of the work of the European Space Agency (ESA) in developing the Lagrange project to monitor the terrestrial environment from the L5 Lagrange point, and

Urges

ESA, together with collaborating institutes and agencies, to make every effort to support the implementation of the Lagrange project at the earliest opportunity.”

IAGA Resolution 3: Magnetotelluric survey data

IAGA,

Considering

- The importance of geoelectric field monitoring and forecasting for mitigation of geomagnetic hazards to ground-based technological conductors such as electrical power transmission networks
- The potential societal impact of severe geoelectric fields on ground-based infrastructure
- The challenges of long-term wide-spread direct monitoring of geoelectric fields

Noting

The critical importance of magnetotelluric data in indirect estimation of geoelectric fields from well-established geomagnetic field measurements including from geomagnetic observatories and variometer networks, and the added value of magnetotelluric data in imaging and understanding geophysical imprints,

Endorses

National magnetotelluric survey initiatives, and

Urges

Funding agencies to support continued acquisition of magnetotelluric survey data and efforts in historical magnetotelluric data recovery, and

Encourages

Governments and the international magnetotelluric community to endorse open data sharing practices for magnetotelluric time series and data products, particularly magnetotelluric impedances and related transfer functions.”

IAGA Resolution 4: Importance of the Rapid Magnetic Variation Service and the lists of Sudden Commencements (SC) and Solar Flare Effects (SFE)

IAGA,

Recognizing

The outstanding importance of the SC (sudden commencement) and SFE (solar flare effect) data in geomagnetic, ionospheric, space weather, and space climate research,

Noting

That in accordance with IAGA Resolution no 6 at the XVI IUGG General Assembly (1975), and Resolution no 8 at the 8th IAGA Scientific Assembly (1997), the institute of "Ebro Observatory" is responsible for the collection and preparation of the SC and SFE lists as part of its Rapid Magnetic Variation Service,

Expresses

Deep appreciation for the work performed to date by Ebro Observatory, and

Urges

Funding agencies to make every possible effort to continue the long-term production of SC and SFE lists for the Rapid Magnetic Variation Service by Ebro Observatory.”

IAMAS Resolution: Role of Ozone and Ozone Depleting Substances for the Environment

IAMAS,

Noting

The critical role of atmospheric ozone in the Earth's climate and for screening dangerous solar ultraviolet radiation

Recalling that The Vienna Convention for the Protection of the Ozone Layer,

- obligates its Parties to take appropriate measures to protect human health and the environment against adverse effects resulting or likely to result from human activities which modify or are likely to modify the ozone layer,
- requires its Parties in accordance with the means at their disposal and their capabilities to cooperate by means of systematic observations, research and information exchange in order to better understand and assess the effects of human activities on the ozone layer and the effects on human health and the environment from modification of the ozone layer

Recalling that The Montreal Protocol on Substances that Deplete the Ozone Layer,

- under its Article 2a fully controls the production and consumption of trichlorofluoromethane (or chlorofluorocarbon-11, CFC-11, CFCl_3)

Noting the recent WMO/UNEP "Scientific Assessment of Atmospheric Ozone: 2018" shows evidence of,

- a reduction of ozone depletion as levels of ozone depleting substances (ODSs) such as CFC-11 decline in our atmosphere,
- a slowing of the decline rate of atmospheric CFC-11 concentrations,
- an unexpected global increase of CFC-11 emissions

Urges,

- All countries to contribute through international cooperation and coordination to establish adequate and sustainable observing systems, ensuring high quality observations of ozone and ODSs on long time scales,
- Relevant international organizations such as the World Meteorological Organization's Global Atmospheric Watch (WMO/GAW), the World Climate Research Program (WCRP), United Nations Environment, and international observation networks to work together to contribute to the previous objective,
- All countries to enhance their observations to better quantify regional emissions of ODSs through targeted field missions and long-term measurements,

Resolves

- To continue and promote national and international research efforts to insure an adequate observation system on ozone and ODSs to insure the protection of our environment from the dangerous effects of ultraviolet radiation.
- To take a scientific leadership role on developing and enhancing an adequate observing system for ODSs, ozone, and related substances.

IASPEI Resolution:

Recognising

the enormous effort required to organise the IUGG General Assembly, IASPEI

Thanks and Congratulates

the IUGG Local Organizing Committee and its Chair, Fiona Darbyshire, as well as the Scientific Programme Committee and its Chair, Spiros Pagiatakis, for a memorable meeting at an excellent venue in Montreal.

XXVII IUGG GENERAL ASSEMBLY CLOSING CEREMONY

The Closing Ceremony of the XXVII General Assembly of the International Union of Geodesy and Geophysics was held in the afternoon of Wednesday, 17 July 2019 at the Palais des Congrès de Montréal, starting at 16:30.

PROGRAMME

Remembrance of Colleagues deceased since the 2015 General Assembly

Report of the IUGG Secretary General Alik Ismail-Zadeh

Report of the IUGG Treasurer Aksel W. Hansen

Reading of the Resolutions of the Union adopted at the XXVII General Assembly

Final Remarks by Michael G. Sideris, Outgoing IUGG President

Closing Remarks by Kathryn Whaler, Incoming IUGG President

REMEMBRANCE OF COLLEAGUES DECEASED SINCE THE XXVI IUGG GENERAL ASSEMBLY

IUGG

Attia Abdel-Salam ASHOUR (Egypt)
David COLLINS (UK)
Eigil FRIIS-CHRISTENSEN (Denmark)
Claude FROIDEVAUX (France)
Roland LIST (Canada)
James J. O'BRIEN (USA)
Stanley RUTTENBERG (USA)
A. Fred SPILHAUS, Jr. (USA)

IACS

Graham COGLEY (Canada)

IAG

Olumuyiwa ADEBEKUN (Nigeria)
Marcin BARLIK (Poland)
Jean DICKEY (USA)
Graciela FONT (Argentina)
Camil GEMAEL (Brazil)
Bernard GUINOT (France)
Heinz HENNEBERG (Venezuela)
Barbara KOLACZEK (Poland)
Alexander KOPAEV (Russia)
Jean KOVALEVSKY (France)
Yoshihide KOZAI (Japan)
Dieter LELGEMANN (Germany)
Klaus LINKWITZ (Germany)
Michel LOUIS (France)
Hermann MÄLZER (Germany)
Mikhail PRILEPIN (Russia)
Hermann SEEGER (Germany)
Suriya TATEVIAN (Russia)
John WAHR (USA)
József ZÁVOTI (Hungary)

IAGA

Fr. Luis Felipe ALBERCA SILVA
Arthur C. AIKIN
Attia Abdel-Salam ASHOUR
Eigil FRIIS-CHRISTENSEN
Don FARLEY
John W. FREEMAN, Jr.
Paul GEORGESCU
John T. «Jack» GOSLING
Ahmed HADY
Bengt HULTQVIST

Michael Charles KELLEY
Predhiman Krishan KAW
Olof Walter LENNARTSSON
Peter MILLIGAN
Walter Heinrich MUNK
Neil D. OPDYKE
Ram Gopal RASTOGI
Karl RAWER
Peter ROBINSON
Wallace SMITH BROECKER
Andrei Alexandru SOARE
Shi Tsan WU

IAMAS

Roland LIST (Canada)

IAPSO

John BULLISTER (USA)
David CARTWRIGHT (UK)
Christopher DUNCOMBE RAE (South Africa)
John HARVEY (UK)
Angus McEWAN (Australia)
Walter MUNK (USA)
Alberto TOMASIN (Italy)
George VERONIS (USA)
Jef ZIMMERMAN (Netherlands)

IASPEI

Enzo BOSCHI (Italy)
Jean-Claude DE BREMAECKER (USA)
Adam M. DZIEWOŃSKI (USA)
Claude FROIDEVAUX (France)
Paolo GASPARINI (Italy)
Jocelyn GUILBERT (France)
Alexander A. GUSEV (Russia)
Hosseyh HAMZEHLO (Iran)
Victor KUKSENKO (Russia)
Cinna LOMNITZ (Mexico)
Alberto Giesecke MATTO (Peru)
Brian J. MITCHELL (USA)
Marco MUCCIARELLI (Italy)
Miles OSMASTON (UK)
George PURCARU (Romania)
Ragnar SIGBJÖRNSSON (Iceland)
Valentin I. ULOMOV (Russia)
Jiří VANĚK (Czech Republic)

**REPORT OF THE IUGG SECRETARY GENERAL
ALIK ISMAIL-ZADEH**

XXVII GENERAL ASSEMBLY, MONTRÉAL, CANADA, 17 JULY 2019

Dear Colleagues, Ladies and Gentlemen,

The General Assembly of the International Union of Geodesy and Geophysics (IUGG) bringing together Earth and space scientists from many places of the world comes to closure. The assembly consisted of three important parts: an open Scientific Assembly where all scientists participated, a meeting of the duly accredited Delegates of the IUGG Member Countries and guests invited in accordance with the IUGG By-Laws, and many business meetings of the Union, its Associations, and scientific groups.

Any country in which “independent activity in geodesy and geophysics has been developed” is eligible for IUGG membership. We believe that IUGG membership contributes to the scientific well-being of our member countries, and may lead to economic benefits through enhanced exchange of scientific and technical expertise. The Secretary General is always interesting in talking to people about National or Affiliate membership and possibilities to join the Union. Today, IUGG has 72 Member countries, and more countries are encouraged to join.

At the Council meeting, delegates from 40 Adhering Bodies attended one or more sessions of the Council Meeting. The IUGG Council considered and approved a number of initiatives and activities. Namely,

- The Council ratified the admission of Algeria as a Regular National Member; Serbia and Uruguay as Associate Members; transfer of North Macedonia to Associate membership.
- The Council approved the proposal of the Executive Committee that least developed countries (as defined by the United Nations) can become IUGG Regular Members in Category 1 paying annual contributions at the level of 25% of the Category 1 membership dues.
- Official IUGG Liaisons to various intergovernmental and international scientific bodies have been appointed. You may see their names on the screen.

- The budget for 2020-2023 has been approved. You will hear the presentation by IUGG Treasurer after my report.
- Berlin, Germany has been selected as the venue for the 28th General Assembly of the Union in 2023.
- New IUGG and Association Officers have been elected

Namely, the Council elected the IUGG Bureau members: President Kathy Whaler (UK), President-Elect Chris Rizos (Australia), Secretary General Alexander Rudloff (Germany), Treasurer Nils Andersen (Denmark), and three members at large: Stephen McNutt (USA), Eduard Petrovsky (Czech Republic), and Jun Xia (China). Also the IUGG Council elected Josef Adam (Hungary), Priscilla Grew (USA), and Corinna RISSO (Argentina) to the IUGG Finance Committee.

- Three resolutions have been passed.

They are (1) Reducing the Carbon Foot Print by the Research Community; (2) The International Terrestrial Reference Frame (ITRF); and (3) the resolution of Thanks.

The General Assembly held in the beautiful city of Montreal has been a scientific success! The Scientific Program Committee, chaired by Spiros Pagiatakis, prepared an exciting program. On behalf of the IUGG, I thank the Local Organizing Committee, the Scientific Program Committee, and the professional conference organizers, the JPdL company and C-IN company (which managed the scientific program), for making the 27th General Assembly a big success.

Finally, as I am retiring from the position of the IUGG Secretary General after 12 years of my service to the Union, I thank all Members of the IUGG Executive and Finance Committees, Association Secretaries General, Union Committees and Commissions officers, IUGG National Committee Members and Council Delegates for their dedication and voluntary participation in the IUGG activities for the last twelve years. In particular, it was delightful to work with Presidents Tom Beer, Harsh Gupta, and

Michael Sideris, Vice President Kathy Whaler, Treasurer Aksel Hansen, and my Assistant, IUGG Executive Secretary Franz Kuglitsch, who served the Union with passion and dedication.

Thank you all for your contribution to the success of the 27th IUGG General Assembly!

REPORT OF THE IUGG TREASURER AKSEL W. HANSEN

XXVII GENERAL ASSEMBLY, MONTRÉAL, CANADA, 17 JULY 2019

My job today is to give a brief overview of IUGG's financial status just before we are closing the XXVII General Assembly. I could give you many numbers, but time does not allow this, and I guess you would not want to see them. Therefore, I'll keep it simple.

IUGG is a union with 8 associations each of them having their own economy. Here I'll give a brief report of the union only.

The Union's economy is based on dues paid by the members. 58 members in different categories pay dues of approximately USD 500,000. pr year.

The money goes to Associations and commissions, meetings, grants, administration and membership dues of other organizations.

IUGG has now reserves close to one year income.

On July 16, 2019, the Council approved the budget for 2020 – 2023.

Expected balance (1 January 2020)	USD 662K
Income in 2020-2023	USD 2,178K
At our disposal	USD 2,678K
Expenditures in 2020-2023	USD 2,201K
- Associations	USD 1,059K
- IUGG Grants Programme, Meetings	USD 140K
- Travel Grants, Montreal	USD 100K
- Outreach, Education	USD 80K
- Union Commissions	USD 186K
- International Relations	USD 184K
- Administration (Traveling)	USD 452K
Balance (31 December 2019)	USD 477K

Conclusion

The economy of IUGG is good. The budget for the coming period is nearly balanced, i.e. a little higher expenditure than the expected income.


Compared to the previous period there is an increased allocation to new initiatives for 2020-2023.

**READING OF THE RESOLUTIONS OF THE UNION
ADOPTED AT THE XXVII GENERAL ASSEMBLY
XXVII GENERAL ASSEMBLY, MONTRÉAL, CANADA, 17 JULY 2019**

The Resolutions adopted by the IUGG Council constitute the most serious and enduring business of the General Assembly. These Resolutions present the findings of the Union to our Adhering Bodies and to the scientific community as a whole, and recommend actions. The Resolutions of the

Union and also of the Associations that adopted resolutions are printed in these *Comptes Rendus*. At the Closing Ceremony, each resolution was read in English by Harsh Gupta, and they were shown on overhead projection in English.

FINAL REMARKS BY MICHAL SIDERIS, OUTGOING IUGG PRESIDENT
XXVII GENERAL ASSEMBLY, MONTRÉAL, CANADA, 17 JULY 2019




Union Geodesique et Geophysique Internationale
International Union of Geodesy and Geophysics
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▪

CLOSING COMMENTS BY MICHAEL SIDERIS

IUGG President (2015-2019)

XXVII IUGG General Assembly, Montreal, Canada, July 8-18, 2019 0



Union Geodesique et Geophysique Internationale
International Union of Geodesy and Geophysics
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THANK YOU to

- ◆ Members and Chair of Science Program Cmte., Spiros Pagiatakis
- ◆ Members and Chair of the LOC, Fiona Darbyshire
- ◆ C-IN and jPdL International – Adriana Bonacci, Laure Durand
- ◆ Volunteers of the GA
- ◆ All Sponsors of the GA
- ◆ Financial support to IUGG of the Government of Canada through the Federal Department of Environment and Climate Change (ECCC)
- ◆ Canadian Geophysical Union (CGU)
- ◆ Canadian Meteorological and Oceanographic Society (CMOS)

XXVII IUGG General Assembly, Montreal, Canada, July 8-18, 2019 1



- ◆ All speakers, contributors and participants of the
- ◆ Members of IUGG's Bureau, EC, Secretariat, and in particular
 - ▶ Vice-President, Kathryn Whaler
 - ▶ IUGG Secretary General, Alik Ismail-Zadeh
 - ▶ Executive Secretary/Assistant SG, Franz Kuglitsch
 - ▶ Assistant to Executive Secretary, Katrin Gundrum
 - ▶ GFZ, DFG and KIT
 - ▶ Treasurer Aksel Hansen
- ◆ Past IUGG Presidents, Harsh Gupta, Tom Beer and Uri Shamir

CONGRATULATIONS AND BEST WISHES to

- ◆ All newly elected Officers of the Union and the Associations



The 27th IUGG General Assembly
is now Closed

Please join us in the 28th IUGG
General Assembly, Berlin, July 2023

CLOSING REMARKS BY KATHRYN WHALER, INCOMING IUGG PRESIDENT

XXVII GENERAL ASSEMBLY, MONTRÉAL, CANADA, 17 JULY 2019

IUGG into its second century

- Fundamental science will continue to underpin everything we do – we must ceaselessly make the case for this. Our Associations and Commissions are our bedrock, since they ensure the health of our disciplines, but under the IUGG ‘umbrella’ we can take advantage of the synergies between them. We should keep our structures and organization ‘nimble’ to be responsive to new opportunities and challenges
- However, the public is entitled to expect us to tackle societal problems. This requires new ways of collaborating – for example, integrated, multi-disciplinary, and trans-disciplinary science – and for us to be able to communicate with non-scientists and work with decision-makers. IUGG should continue to play a unique role through its ability to connect to governments, policy-makers, other international and global bodies.
- ‘Big data’, data standards and curation, and data-based services and products are going to be increasingly important in our technology-dependent society. We have a fundamental role in being the recognized body for defining, producing, validating and endorsing them. I applaud the dedication of many IUGG scientists who spend significant amounts of time to ensure the best possible outcomes in these endeavours.
- Inequity between the ‘global North’ and the ‘global South’ continues to be a challenge. Fewer and fewer lower income countries are IUGG members, and fewer scientists from them participate in our Assemblies and Commission conferences
- Visas – to attend meetings and for collaborative research visits – are becoming more expensive and seem to be refused more often. We must work with ISC to highlight and address this issue.
- We extend our reach to those less able to attend our Assemblies through Workshops and capacity-building activity. Also, many individual scientists within the IUGG community are involved in activities intended to improve the welfare and opportunities for those in the less economically developed nations, e.g. around the Sustainable Development Goals.
- Open data and publications and open source software can help, and IUGG can help promote them.
- Our underlying values should continue to be integrity, ethics, dignity and respect for others. We must all be responsible scientists. The older generation can help early career scientists advance and become the leaders of the future. I encourage early career scientists to consider how they can contribute to furthering all activities of the Union, its Associations and Commissions, not just the science they cover.

Duration of General Assemblies

- The duration of our General Assemblies continues to provoke much discussion, and there are many strongly held views. They have gradually been shortened over time, but it is prudent to ask whether we can go further, or organise them differently. For example, we could shorten them more by holding only Union and Joint Association Symposia and Lectures, with single Association events being limited to Scientific Assemblies.
- Advantages:
 - Takes full advantage of presence of all Associations;
 - Reduces cost;
 - Administratively simpler.

- Disadvantages:
 - Scientists are less likely to come to a meeting where they don't see their strong involvement, which often involves their core disciplinary science linked to a single Association;
 - Attendees may need to be presenting to get funding or permission to attend, which can only be accommodated over a shorter duration Assembly by having many posters and/or more parallel sessions, which is administratively more complex;
 - In any case, we wish to be as inclusive as possible, and must do all we can to encourage participation, especially by early career scientists and those from less economically well developed nations;
 - Besides the science presentations, our General Assemblies include a lot of business which would have to be packed into a shorter time, and we don't want to 'silo' it by scheduling it outside the time of the science program, thereby only involving a limited number of participants.
- The debate will continue!

Can we 'celebrate' more?

- Besides our Assemblies and other scientific meetings, the Union undertakes and supports an enormous amount of other activity to support our Mission, which distinguishes it from other Unions and Learned Societies. Yet very few people or organisations are aware of the totality of these endeavours, or appreciate the full extent of what we do to further our aims. Who knows (for example):
 - How many days our scientists have spent delivering Workshops, Summer Schools and other training events we run or sponsor, and the numbers of researchers benefiting from these activities?
 - Which policy-makers have been influenced by our publications and other activities?
 - The amount of additional support leveraged from funds provided to meetings, workshops and the like?
 - When our resolutions have made a difference?
- Much of this sort of information is contained in numerous reports, but could be collated and publicized. This could be helpful when we are asked by an adhering body why they are paying us large sums of money, and what the value of country membership is, for example. We have a useful document identifying the difference between IUGG and other Unions and Learned Societies that have individual membership, and summarizing the added value of an International Union. However, this could be enhanced by some contextualized information and examples. It might also encourage more individual scientists to get involved in Union activities.

Acknowledgements

- All members of IUGG Bureau, in particular
 - Michael Sideris, outgoing President
 - Alik Ismail-Zadeh, outgoing Secretary-General
- All members of IUGG Executive Committee
- The General Assembly LOC, in particular
 - Fiona Darbyshire, LOC Chair
 - Spiros Pagiatakis, Scientific Program Committee Chair
- IUGG Council and all National Delegates
- All participants in this highly successful General Assembly

ADMINISTRATIVE REPORTS
XXVII GENERAL ASSEMBLY, MONTRÉAL, CANADA, 8-18 JULY 2019

QUADRENNIAL REPORT OF THE PRESIDENT

As 2019 marks one hundred years since the IUGG was established in Brussels in July 1919, activities in the 2015-2019 period focussed on the organization of the Centennial 27th General Assembly (GA) to be held in Montreal in July 2019, as well as on celebrating and promoting this important anniversary. This quadrennial has also been a very productive period with respect to modernizing the governance and operations of the Union, and its relationships with other scientific organizations.

IUGG and its Associations

At the 26th GA in 2015 in Prague, the Council approved changes to the Statutes and Bylaws that have improved the efficiency and decision-making processes (e.g., the term of Council Delegates is the full four-year period between two consecutive GAs, which allows the standing Council to vote electronically at any time the need arises and not just during GAs), as well as the inclusiveness of the Union (e.g., individual scientists, even from non-member countries, can now hold most elected positions). Also, important resolutions were passed in support of new infrastructure and research in Earth observation, ranging from new satellite systems to global and regional environmental risk monitoring.

In 2016, the IUGG standing Council was officially established for the 2016-2019 period, with the task to consider, discuss and decide on major scientific proposals, initiatives, and urgent administrative issues of the Union. At the end of the same year, the Council approved unanimously the 2016-2023 Strategic Plan of the IUGG. In 2018, the Council approved unanimously the following significant changes to the Statutes and Bylaws: the Vice-President position was replaced by President-Elect, and duties of the President-Elect were defined; the number of members of the Finance Committee was reduced from 4 to 3; the IUGG Secretary General 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 (EC).

Important work on forming the Union's 2016-2023 Strategic and Implementation Plans continued, and the implementation of actions for the 2016-2023 IUGG Strategic Plan developed by the Visioning Committee commenced in 2018. These Actions are: promote the IUGG to its constituents, and to geoscientists, policy makers and to society in general; encourage closer cooperation between the IUGG groups; encourage more

effective engagement with sister organisations, and other partner agencies; assist under-represented geoscientists to more fully participate in international science activities; strengthen the effectiveness of Council, EC and Bureau; strengthen National Committees; promote fundamental research and education in the geosciences; and encourage countries to become a member of the IUGG.

The IUGG Bureau met three times and the EC met two times during the quadrennial. The first meeting of the Bureau and the EC took place in Paris in June 2016, with main agenda items the Strategic Plan and its implementation, the proposed College of Fellows, the possible establishment of a network of Early Career Scientists, and issues related to the 2019 IUGG GA in Montreal, Canada. We were hosted by Dr. Patrick McKeever, then UNESCO's Earth Sciences and Geo-Hazard Risk Reduction Section Head. Dr. Heide Hackmann, then ICSU's Executive Director and current CEO of the ISC, attended the meeting and briefed the EC about ICSU's activities and programs, and the proposed merger between ICSU and ISSC. The second Bureau and EC meetings took place at the Palais des Congrès in Montreal in September 2017, concurrently with the business meetings of the Finance Committee, the Scientific Program Committee for the 2019 IUGG GA, and the Task Force 100. The main agenda items were the organization and scientific program of the Centennial GA in 2019, and the Union's Strategic Plan and the actions for its implementation. The third IUGG Bureau meeting took place in October 2018 in Mexico City, hosted by El Colegio Nacional and Dr. Jaime Urrutia-Fucugauchi, and discussed the Union's business (e.g., membership issues, candidates for officer positions, Early Career Scientist Awards, etc.) and the status of the preparations for the 27th GA.

In 2017, the mid-year between IUGG GAs, all our Associations held very successful Scientific Assemblies (SAs), several of them jointly organized and addressing interdisciplinary scientific themes: the IACS SA in Wellington, New Zealand; the IAHS SA in Port Elizabeth, South Africa; the IASPEI-IAG joint SA in Kobe, Japan; the IAVCEI SA in Portland, Oregon, USA; and the IAGA-IAMAS-IAPSO joint SA in Cape Town, South Africa. Although I was able to personally attend only the SA in Kobe, I am indebted to the colleagues who represented me/IUGG at the other SAs, namely, Bureau members Chris Rizos and Pierre Hubert in Wellington and Port Elizabeth, respectively; IAVCEI Secretary General Roberto Sulpizio in Portland; and IUGG Vice President Kathy Whaler in Cape Town.

Union Commissions and Committees

In 2015, IUGG established a new Commission on Planetary Sciences, chaired by Prof. Shuanggen Jin (IAG, China), to promote and coordinate scientific studies of planets in our and in other solar systems. Three Union Committees were renewed in 2016 for the period 2016-2019 (Capacity Building and Education Committee, chaired by László Szarka; Honours and Recognition Committee, chaired by Athena Coustenis; Statutes and By-Laws Committee, chaired by Charles Fierz), and a new one, the Union Outreach Committee, was established, chaired by Kathy Whaler. The Union Commission on Data and Information (UCDI) was renewed for 2017-2019, chaired by Satheesh Shenoi, and John Labrecque was appointed Chair of the Commission on Geophysical Risk and Sustainability. The Commission on Mathematical Geophysics, chaired by Yehuda Ben Zion, continued its successful series of conferences (2016 in Paris, France, and 2018, in Nizhny Novgorod, Russia), and the Commission on Climatic and Environmental Change (CCEC), chaired by Past IUGG President Tom Beer, coordinated, among other things, the monograph “Global Change and Future Earth: The Geoscience Perspective” published in the IUGG series of Cambridge University Press.

The Visioning Committee, chaired by Chris Rizos, worked tirelessly during the quadrennial to finalize the 2016-2023 IUGG Strategic Plan and develop the Implementation Actions for it that were mentioned above; the complete documents for these are available on IUGG’s web site at http://www.iugg.org/special/IUGG_StrategicPlan_2016-2023.pdf and http://www.iugg.org/special/IUGG_ImplementationActions4SP.pdf, respectively. A Task Force (TF100), also chaired by Chris Rizos, was established to develop a program for the celebration of the Union’s Centennial Anniversary during the 2019 GA in Montreal, as well as other relevant activities. These include joint events/sessions with sister organizations (AGU, AOGS, EGU), national/regional celebrations organized by National Committees, the establishment of an Early Career Earth and Space Scientists Network, a set of articles on the History of the IUGG, and the IUGG Centenary Day event in July 2019 at the UNESCO Headquarters in Paris. Specifics on these events are given in the Centennial Anniversary Celebrations section below.

Our Statutes and By-Laws Committee worked very hard and submitted a set of proposed changes that will improve the operation and the governance of the Union, which have now been approved by the Council as already mentioned above. The Finance Committee was renewed in 2017 because of the unfortunate passing of its Chair, David Collins, and Jan Krynski stepped in as Chair of the Committee.

Education and Outreach

Throughout the quadrennial, IUGG continued its many international educational activities, was represented at many meetings, global forums and conferences (e.g., the Mathematical Geophysics conferences), and promoted the importance of science for decision making on issues such as climate change, risk reduction and resilience to disasters, and sustainable development. In June 2017, the IUGG Bureau issued a statement on “The Earth’s climate and responsibilities of scientists and their governments to promote sustainable development.” IUGG also continued to strengthen its cooperation with the scientific Unions and interdisciplinary bodies of the ISC such as the World Data System (WDS) Committee and CODATA, as well as with the World Meteorological Organization (WMO), UNESCO, the Comprehensive Nuclear-Test-Ban Treaty Organization (CTBTO), the Global Framework for Climate Services (GFCS), the Group on Earth Observations (GEO), and the World Climate Research Programme (WCRP). 2016 was the International Year for Global Understanding (IYGU), and it was co-sponsored by the IUGG. At the 47th Session of the International Panel on Climate Change (IPCC) held in Paris in March 2018, IUGG was accepted as an Observer Organization.

IUGG scientists and present and past officers contributed to Earth and space science education and to science policy issues related to disaster risk reduction and climate change. As an example, the Conference on Future Earth & Space Science and Education took place at the Abdus Salam International Centre for Theoretical Physics (ICTP) in Trieste, Italy, in November 2015. The conference was attended by participants from 29 countries, and Harsh Gupta, I, Kathy Whaler and Alik Ismail-Zadeh, who also co-organized the conference, gave invited lectures. The participants also issued a declaration on strengthening of basic scientific research and science education, especially in the developing world. During the same conference, IUGG and ICTP renewed officially their agreement for continuous collaboration.

IUGG awarded many grants to support workshops and training schools organized around the world by the ICTP every year. It also awarded grants to several regional research, development and educational projects supported by its Associations, such as:

Data intensive systems analysis for geohazard studies; Determination of the Earth’s mathematical surface in Africa towards the realization of the International Height Reference System; Marine magnetics in remote areas: filling gaps together in education, research and observations; Seismological contributions to earthquake risk reduction; Training school for students and early career atmospheric scientists from Asian monsoon countries; and Training school on stratosphere-troposphere interactions. The IUGG Bureau dedicated the 2018 call to the IUGG Centennial and international

cooperation in Earth and space sciences. The following initiatives/projects were funded: 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.

In 2016, the book *Dynamics and Predictability of Large-Scale, High-Impact Weather and Climate Events*, edited by Jianping Li, Richard Swinbank, Richard Grotjahn, and Hans Volkert, was published in the IUGG series of Cambridge University Press. In 2018, a new book, *Global Change and Future Earth: The Geoscience Perspective*, was published in the same Cambridge University Press series. Edited by Tom Beer, Jianping Li and Keith Alverson, the book demonstrates how geoscience research outputs can address the physical and societal impacts of climate change and contribute to the *Future Earth* programme co-sponsored by the ISC. I and Alberto Montanari, Vice President of the European Geosciences Union, contributed a chapter titled *Satellite Hydrology and Future Earth*. Many other geoscientists and current and past IUGG officers also contributed a diverse set of chapters to the 2016 and 2018 books.

On several occasions, I had the opportunity to personally promote IUGG's work to the international scientific community as well as to decision makers, highlighting in particular the importance of long-term Earth observations from space for climate change and hazards research. Some examples of these are invited/keynote addresses at the Side Event on Earth and Space Observations for Disaster Risk Assessment during the XIII GEO Plenary in St. Petersburg, Russia in November 2016 (talk title: 'Hazards/Risks Observations in the IUGG and the GEO Work Program: not fully linked'); at the Opening session of the European Space Agency's 4th Swarm Science Meeting and Geodetic Missions Workshop in Banff, Alberta, Canada in March 2017 (talk title: 'Satellite Earth Observation and Geosciences'); and at Session 7: The Role of Earth Observations in Supporting the Paris Climate Agreement of the GEO Symposium in June 2018 in Geneva (talk title: 'Earth Observation Applications and Challenges – The Geosciences/IUGG Perspective'), which comprised invited talks from officers of UNFCCC, IPCC, GCOS, WMO, CEOS, WCRP and IUGG.

International Science Council (ISC, formerly ICSU) and the GeoUnions

IUGG has a long history of collaboration with the International Council for Science, ICSU (now called International Science Council, ISC, as in 2018 ICSU merged with the International Social Sciences Council, ISSC, to form the ISC) and, during this quadrennial, it was actively involved in the programs of ICSU/ISC related to environment, disaster risks, scientific data, and health and well-being. In April 2016, the Scientific Unions of ICSU met in Paris, to debate a new strategic plan, changes to the election of ICSU's Executive Board, as well as the future of ICSU and its relationship with the ISSC. I and our Secretary General (SG), Dr. Alik Ismail-Zadeh, attended this, and the following, meetings on behalf of IUGG. In October 2016, an extraordinary ICSU General Assembly was held in Oslo, Norway, and approved in principle the merger between ICSU and ISSC. It was at the Joint Meeting of ICSU and ISSC, held in October 2017 in Taipei, that it was decided to merge ICSU and ISSC into the ISC, a new organization representing all of science. ISC's inaugural GA was held in July 2018 in Paris. A new Governing Board was elected, which, I am very pleased to report, includes Alik in the position of the first Secretary of the ISC. The new ISC President, Prof. Daya Reddy, and the ISC Chief Executive Officer, Dr. Heide Hackmann, have both accepted my invitations to attend our GA in Montreal and our centennial celebration at UNESCO in Paris, respectively.

IUGG is also a member of the cluster of nine GeoUnions of the ISC, which promote Earth and Space Sciences within the ISC, but also in the UN and other international bodies. In addition, the GeoUnions collaborate amongst themselves and with other scientific Unions on various projects funded by the ISC. The current GeoUnion members are: the International Astronomical Union (IAU), the International Cartographic Association (ICA), International Geographical Union (IGU), the International Union of 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 International Union of Radio Sciences (URSI). The Steering Committee of the GeoUnions meets typically the day before the General Assemblies and Scientific Unions Meetings of the SC, and it did so right before the meetings mentioned above. Additional meetings were held at the ICTP, Trieste, Italy, in November 2015, at GFZ in Potsdam, Germany, in September 2017, and in Istanbul, Turkey, in November 2018. IUGG was represented at these meetings by me and Alik, who was also the Chair of the GeoUnions Steering Committee until last year.

Group on Earth Observations (GEO)

GEO is a partnership of 105 Member Countries and 127 Participating Organizations (POs) promoting sustained Earth observations for informed decision making. In November 2015, the XII Plenary of GEO in Mexico City approved the establishment of the GEO Program Board (PB), and in 2016 I was elected a member of the newly established PB. My term actually ended at the end of 2017, but I was re-elected to the PB for another three-year period (2018-2020). It is also worth mentioning that the International Association of Geodesy (IAG), though its Global Geodetic Observing System (GGOS), is now also elected on the PB for the same period, and thus the voice of geosciences has been strengthened in GEO. Although IUGG, IAG and several IUGG-related entities are POs of GEO, having IUGG participate in the PB gave a much broader picture of the international GEO activities, and increased the prospects for collaboration and future IUGG involvement in many of them.

GEO is currently focussing its efforts on addressing the goals of three major international initiatives, namely the Paris Agreement, the Sendai framework and UN's Sustainable Development Goals (SDGs). I am contributing to the work of two PB Subgroups related to these focus areas, namely the Sendai Framework Subgroup and the Paris Agreement Subgroup. Clearly IUGG can play a much bigger role in, and become a key contributor to, these three focus areas, and therefore I would recommend that the future leadership of IUGG and its Associations and their Services explore options for a significantly higher involvement in GEO's current and future flagships, initiatives and community activities.

GEO holds three to four PB meetings, one Symposium and one Plenary/GEO Week per year, and since 2016 I attended almost all of them. I attended the XIII GEO Plenary in St. Petersburg, Russia, in November 2016 (representing ICSU) and the XV GEO Plenary and GEO Week in the fall of 2018 in Kyoto, Japan. During the XIII Plenary, our SG organized together with the Russian Agency on Hydro-Meteorology (RosHydroMet) a very well attended GEO Side Event on 'Earth and Space Observations for Disaster Risk Assessment.' As mentioned in the Education and Outreach section above, I gave a talk at this side event and participated in the panel discussions, and also gave another talk at the 2018 GEO Symposium in Geneva, Switzerland. Unfortunately, neither I nor our SG were able to attend the XIV GEO Plenary in Washington, DC, as it was held in October 2017 at the same time as the ICSU GA. The 2019 GEO Symposium will be held in Geneva, May 27-29, and the XVI GEO Week and Ministerial Summit will be held in Canberra, Australia, November 4-9, 2019.

2018 marked the end of the long and productive tenure of Dr. Barbara Ryan (USA) as the Director of the GEO Secretariat. The new Director is Prof. Gilberto Camara from Brazil. He has accepted my invitation to give a talk at the IUGG Centennial Celebration event at UNESCO in Paris in July 2019.

Preparations for the 27th GA in Montreal and selection of award winners

Preparations for our Centennial IUGG General Assembly (GA) *Beyond 100: The next Century in Earth and Space Science*, to be held in Montreal in July 2019, have been ongoing since 2017. For this purpose, I have appointed the members of the Nominating Committee (chair: Tom Beer), Resolutions Committee (Chair: Harsh Gupta), Site Comparison Committee (Chair: Eduard Petrowski), Fellow Selection Committee (Chair: Joyce E. Penner), Gold Medal Committee (Chair: Uri Shamir), and Early Career Scientist Awards Committee (Chair: Jenny Baeseman).

The work of the Local Organizing Committee (LOC), chaired by Fiona Darbyshire, and the Scientific Program Committee (SPC), chaired by Spiros Pagiatakis and aided by the SGs of the eight Associations and the Secretary General and Executive Secretary of the IUGG, has progressed very well, including the organization and scheduling of sessions and special events, invitations to dignitaries, and the selection of Union lecturers. More specifically, I have invited nine prominent scientists to deliver Union Lecturers, including Dr. David Grimes, President of the World Meteorological Organization. They are: Waleed Abdalati (USA, IACS), David Grimes (Canada, IUGG), Ed Hawkins (UK, IAMAS), Kosuke Heki (Japan, IAG), Karen Kohfeld (Canada, IAPSO), Paolo Papale (Italy, IAVCEI), Vera Schindwein (Germany, IASPEI), Veena Srinivasan (India, IAHS), and Lisa Tauxe (USA, IAGA).

The ten winners of the Early Career Scientist awards, selected by Early Career Scientist Awards Committee for their outstanding research in Earth and space sciences and for international research cooperation, are: 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), and Qiuzhen Yin (Belgium; climatology).

On the recommendation of the IUGG Fellows Selection Committee, the IUGG Bureau announced the seven Union Honoraries Members/Fellows elected for their exceptional contributions to international cooperation in geodesy or geophysics and their eminence in the field of Earth and space sciences. They are: Anny Cazenave (France), Sierd Cloetingh; Shuanggen Jin (China);

Barbara Romanowicz (France/USA); Soroosh Sorooshian (USA); Philip Woodworth (UK), and Jun Xia (China).

The Gold Medal Committee selected Prof. William Richard Peltier (University of Toronto, Canada) as the 2019 IUGG Gold Medal winner for his pioneering and profound scientific contributions in deep Earth physics and climate system processes, and for his unselfish contributions to international scientific collaboration. All winners will be officially acknowledged and recognized during the Awards Ceremony of the centennial GA in Montreal.

Centennial Anniversary Celebrations

Task Force 100 developed various activities for the celebration of the Union's Centennial Anniversary, 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 webpage of the IUGG Centennial (<http://100.iugg.org>), 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 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, namely 'IUGG: Beginning, Establishment and Early Development (1919-1939)', 'IUGG Evolves (1940-2000)', and 'IUGG in the 21st Century', which have undergone review and will be published in June 2019. The first two papers are co-authored by Jo Ann Joselyn (1999-2007 IUGG SG) and Alik Ismail-Zadeh, who jointly lead this whole effort, while the third paper is jointly authored by Jo Ann Joselyn, Alik Ismail-Zadeh, Tom Beer, Harsh Gupta, Masaru Kono, Uri Shamir, me and Kathryn Whaler.

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 3rd 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.

During the 27th GA in Montreal in July 2019, besides the IUGG-planned celebrations for the GA, AGU and IUGG agreed to organize another joint Symposium on 'Georisk Reduction: Science, Resources, and Governmental Action' on July 14. IUGG is also organizing a high-level event at on July 29 at the UNESCO Headquarters in Paris titled 'International Cooperation in Earth and Space Sciences: Celebrating 100th anniversary of the International Union of Geodesy and Geophysics', where dignitaries and Officers of UN and other international organizations have been invited as speakers or panel members; the tentative program is available at http://100.iugg.org/events/unesco_program_draft.pdf.

Acknowledgements and Thanks

I would like to thank all colleagues in the Bureau and Executive Committee of the IUGG for their support and collaboration in the period 2015-2019. Vice President Kathy Whaler has been a strong advocate for the Union and has regularly provided her support and advice to me, the Bureau and the EC. I am particularly grateful to the IUGG Secretary General, Alik Ismail-Zadeh, and the Executive Secretary / Assistant Secretary General, Franz Kuglitsch, for their unwavering commitment to the Union. Alik has served as IUGG SG for three terms (12 years) and I am sure past Presidents Harsh Gupta and Tom Beer would agree fully with me when I say that, without him it would be simply impossible for IUGG to function properly and the job of the President would have been significantly more difficult. Treasurer Aksel Hansen has served in this position since 1999 and has done an outstanding job in keeping the finances of the Union in perfect order. During my term as President, he was aided by the members of the Finance Committee, expertly chaired by the late David Collins and currently by Jan Krynski. Members of the Bureau Isabelle Ansonge, Pierre Hubert and Chris Rizos provided valuable advice during the EC and Bureau deliberations.

Success of the programs of the Associations and the Union would not have been possible without the tireless work of the Association Presidents and the Chairs of the Union Commissions and Committees. Their dedication to the Union is very much appreciated. I want to particularly acknowledge the work of Chris Rizos as

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Chair of the Visioning Committee and Task Force 100, who produced the 2016-2013 Strategic Plan and its Implementation Actions and coordinated and organized various events for the celebration of IUGG's centennial anniversary. I also express my appreciation to the Associations' Secretaries General and the Science Program and Local Organizing Committees, chaired by Spiros Pagiatakis and Fiona Darbyshire, respectively, for their work on the organization of the 27th GA in Montreal, which, by all accounts, will be one of the most successful GAs of the Union.

The GFZ German Research Centre for Geosciences in Potsdam has been hosting the IUGG Secretariat since

2013 and has been providing the positions of Franz Kuglitsch and his Assistant, Katrin Gundrum; this continuous support is gratefully acknowledged.

For me, at the end of the Montreal GA it will be 8 years of involvement with the Bureau and 12 years of involvement with the EC of the IUGG. This has been a very rewarding and at times challenging experience, which I have enjoyed very much. I will be looking forward to serving our Union as Past President, and I wish every success to IUGG and its new leadership.

Michael G. Sideris, IUGG President

QUADRENNIAL REPORT OF THE VICE-PRESIDENT

As a member of IUGG's Bureau and Executive Committee, I participated in all the Bureau and Executive Committee meetings, held in Prague, Czech Republic (2015), Paris, France (2016), Montreal, Canada (2017) and Mexico City, Mexico (2018).

Immediately after my appointment as Vice-President, I was able to attend the Climatic and Environmental Change Union Commission meeting held during the General Assembly in Prague (2015).

At the request of the President, I represented IUGG at the joint IAGA, IAMAS and IAPSO Scientific Assembly 'Good Hope for Earth Sciences' in Cape Town in August 2017, and delivered an address on behalf of the President at the Opening Ceremony. The event was held at Cape Town's International Conference Centre, and was the first time the three Associations had met together for a joint assembly, resulting in over 1000 registrations from 64 countries.

After the Bureau Meeting in Mexico City last year, at the invitation of the Mexico National Committee, I travelled to Puerto Vallarta for the annual meeting of the Mexican Geophysical Union. There I participated in a plenary panel discussion 'Forum on 100 years of Geophysics', with Alik Ismail-Zadeh (IUGG Secretary-General), Chris McEntee (Executive Director of the American Geophysical Union) and others, and gave a plenary lecture entitled 'Late stage continental rifting in Ethiopia – magnetotellurics in multi-disciplinary studies'.

I am organizing and will convene Union Symposium U09 at the General Assembly in Montreal later this year. This Symposium is by invitation only, designed to highlight the contributions of outstanding early career scientists within IUGG, and give them the opportunity to share experiences, successes, expectations, suggestions and/or concerns for the future of geosciences. All 10 recipients of IUGG's Early Career Scientists Awards have been invited, along with two other early career researchers recommended by Associations. The Symposium will be held over two half days on July 12th-13th.

I will represent the Union at a commemoration of Roland Eötvös, to be held in Budapest, Hungary on 8th April 2019, exactly one hundred years after his death. This is part of a memorial year '100th anniversary of Roland Eötvös (1848-1919), physicist, geophysicist, and innovator of higher education - Commemorated in association with UNESCO'. There is good synergy with the centenary of IUGG, since Eötvös had wide scientific interests in topics covered by the Union, and was very active in pre-IUGG international cooperation leading up to the formation of the Union.

As an *ex-officio* member of the Statutes and By-Laws Committee, I participated in discussions that led up to the changes in Statutes and By-Laws approved by Council in 2018. The Committee is now being asked to look at reformatting the Statutes and By-Laws to make the documents clearer and easier to understand. The aim is to undertake a root-and-branch review of the entirety of the documents, which have been revised and modified many times in a piecemeal fashion, leading to different interpretations and possible inconsistencies.

The Union Outreach Committee was formed at the last General Assembly, with the Vice President the *ex-officio* Chair. The Committee has a very broad remit, and it has been difficult to identify a distinctive presence separate from the actions of TF100, the task force that is planning the Union's centenary celebrations. Apart from the Chair, members are all early career scientists, some still on fixed-term contracts; although generally enthusiastic, they do not have much time to devote to the Committee, nor do they have between them the range of experience to undertake all of the terms of reference. Bureau discussed the Committee's terms of reference at its meeting last year, and suggested that its role might better be defined as generating ideas, and providing oversight, monitoring and assessment of activities within the Union, its Associations and Commissions around outreach. This could include evidence-gathering, ensuring there is no duplication in and coordinating activities, and increasing publicity. I communicated with some of the proposers of Inter-Association Symposium JA12 'Innovation in Geoscience education, outreach and citizen science' to be held in Montreal about their plans; some of the convenors are already involved in some exciting initiatives.

With other current and past members of the Bureau, I co-authored an article 'IUGG in the 21st Century', to appear in a Special Issue of *History of Geo- and Space Sciences*.

The Vice-President also oversees the Union Commissions and the Working Group on History, which report individually below, so these comments are brief. A highlight for me has been the publication of the Climatic and Environmental Change Commission's book 'Global Change and Future Earth: The Geosciences Perspective', part of the Cambridge University Press series of IUGG publications, though sadly the author of one chapter (and Commission member), Eigil Friis-Christensen, died as it went to press. The Chair of the Union Commission on Geophysical Risk and Sustainability changed during 2017, and the new Chair took an active role in the successful joint IUGG-AGU symposium on disaster science in association with the AGU Fall 2018 meeting; this is part of the joint IUGG-AGU activities to celebrate

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the centenaries of both organisations under a Memorandum of Understanding. The Data and Information Commission has recently been re-established, and has already begun new activities, e.g. participating in Workshops organized by the ISC's Committee on Data for Science and Technology (CODATA). The Committee on Mathematical Geophysics and the Study of the Earth's Deep Interior have continued their successful format of holding scientific meetings in the 'off' years, i.e. when no Scientific and General Assemblies take place. The Commission on Planetary Science was established at the General Assembly in Prague (2015). Its first main activity was a joint Symposium with the International Association of Planetary Sciences in Berlin, Germany entitled 'Interdisciplinary observation and understanding of the Solar System', with about 100 participants from 14 countries. Most of the Commissions are taking a lead in organizing Symposia at the 2019 General Assembly. At its meeting in 2018, the Bureau decided it was timely to review the Terms of Reference of the Commissions, and this will begin shortly, in close collaboration with each Commission.

As past-President of IAGA, I remain a member of its Executive Committee, thereby also contributing indirectly to IUGG.

Over my tenure as Vice President, I have also contributed to consultations and participated in sometimes intense discussions that have taken place – sometimes face-to-face, more often by e-mail – on various issues affecting the Union, its members, and the science we undertake and promote. One significant aspect has been the amalgamation of the International Council of Science (ICSU) with the International Social Science Council (ISSC) to form the International Science Council (ISC). The ISC is now established, including a Governing Board and Secretariat, and I commented on its document concerning its strategic challenges and how it intends to address them. As the ISC can be regarded as our (along with about 40 other international scientific Unions and Associations) 'parent body', I am very relieved that Alik Ismail-Zadeh has been elected its Secretary; if he brings a fraction of the energy and insight he has provided to the Union as its Secretary General over the last 12 years, it will be in safe hands. It has been my pleasure and privilege to work with him and the other Bureau and Executive Committee members to discharge my duties as Vice President.

Kathryn Whaler, IUGG Vice-President

QUADRENNIAL REPORT OF THE SECRETARY GENERAL

The report covers the period from 3 July 2015 to 1 March 2019 and intends to summarize the administration and major activities of the Union. Detailed reports of the Secretary General can be found in IUGG Annual Reports (http://www.iugg.org/publications/reports/annual_rep.php)

The International Union for Geodesy and Geophysics (IUGG) is one of the largest international geoscience unions, which celebrates its 100th anniversary in 2019. The Union membership is comprised of the National Adhering Bodies (National Members), which establish National Committees for Geodesy and Geophysics in their countries. The Union is financially supported by National Members that benefit from the knowledge, data, services, and scientific talent that are concentrated within IUGG. Although the Union is not an individual membership organization like professional societies of scientists (e.g., the American Geophysical Union (AGU), European Geosciences Union (EGU) or Asian Oceanic Geosciences Society (AOGS)), scientists from any country can take part in any activities of the Union and its Associations and are eligible to hold various positions within IUGG with the following exceptions: positions in the Bureau and the Finance Committee, and the positions of Presidents of the Associations can only be held by scientists from IUGG Member Countries. Actually IUGG is a home for all geoscientists worldwide, those who share the Union's mission in advancing, promoting, and communicating knowledge of the Earth and its environment. As a member of the International Science Council (ISC, former ICSU), 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 is a union of eight International Associations, each dedicated to a specific scientific discipline, but with overlapping interests and complementary strengths: they are the International Associations of Cryospheric Science (IACS), Geodesy (IAG), Geomagnetism and Aeronomy (IAGA), Hydrological Sciences (IAHS), Meteorology and Atmospheric Sciences (IAMAS), Physical Sciences of the Oceans (IAPSO), Seismology and Physics of the Earth Interior (IASPEI), and Volcanology and Chemistry of the Earth Interior (IAVCEI). At present, there are six Union Commissions and one Union Working Group that are dedicated to particular interdisciplinary topics: Commission on Climatic and Environmental Change (CCEC), Commission on Mathematical Geophysics (CMG), Commission on Geophysical Risk and Sustainability (GRC), Commission on Study of the Earth's Deep Interior (SEDI), Commission on Data and Information (UCDI), Committee on Planetary Sciences (UCPS), and Working Group on History (WGH).

UNION ACTIVITIES

Union activities during the past quadrennium are summarized below.

Administration

IUGG Council. In 2016, the Council reviewed a draft Strategic Plan for 2016-2023, accepted the final document, and voted for approval of the new Member of the IUGG Finance Committee. In 2018, the Council discussed the changes to Statutes and By-Laws proposed by the Bureau, and voted for approval of the revised documents.

IUGG Executive Committee and Bureau met at UNESCO Headquarters in Paris, France, in 2016 and in Montreal, Canada, in 2017. Bureau met in the Mexico City, Mexico in 2018.

- **MEMBERSHIP.** Algeria became a Regular Member, Serbia and Uruguay Associate Members of the Union. More: <http://iugg.org/members>.
- **STRATEGY.** The first IUGG Strategic Plan (http://iugg.org/special/IUGG_StrategicPlan_2016-2023.pdf) was adopted by the IUGG Council in 2016 with the Implementation Plan (2016-2023): http://iugg.org/special/IUGG_ImplementationActions4SP.pdf.
- **NEW COMMISSION.** IUGG established new Union Commission on Planetary Sciences to promote and coordinate scientific (physical, chemical, and mathematical) studies of planets in the solar system and around other stars. More: <http://iugg.org/about/commissions>.
- **NEW COMMITTEE.** IUGG established the Union Committee on Outreach to organize and manage IUGG's communication, promotion, public information and general outreach activities. More: http://iugg.org/administration/outreach_cmt.php
- **SCIENTIFIC ASSEMBLIES.** Scientific Assemblies of IUGG Associations have been organized in 2017: by IACS in New Zealand, by IAG and IASPEI in Japan, by IAGA, IAMAS, and IAPSO in South Africa, by IAVCEI in the USA, and by IAHS in South Africa. More than 4,000 scientists participated in the assemblies from more than 100 countries. More: <http://iugg.org/meetings/assemblies.php>
- **IUGG SCIENTIFIC MEETINGS.** IUGG Union Commissions held their scientific conferences/symposia: CMG conferences on

mathematical geophysics in Paris, France (2016), and in Nizhny Novgorod, Russia (2018); SEDI symposia in Nantes, France (2016) and in Edmonton, Alberta, Canada (2018); CCEC workshop in Belval, Luxembourg (2016); GRC symposia in Washington, D.C., USA (2018); UCPS workshop in Berlin, Germany (2017), and in Wuhan, China (2018). More: <http://iugg.org/about/commissions/>

- IUGG CENTENARY. To celebrate the Centennial of the Union, IUGG established a Task Force 100 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 website (<http://100.iugg.org>) dedicated to the IUGG Centennial was launched.
- PUBLICATIONS. The Second Volume of the Special Publication of the IUGG “*Dynamics and Predictability of Global and Regional High-impact Weather and Climate Events*” was published in 2016, and the Third Volume “*Global Change and Future Earth*” in 2018. More: <http://www.iugg.org/publications/special/> A special volume on “The International Union of Geodesy and Geophysics: From Different Spheres to a Common Globe” will be published in 2019 as a part of the peer-reviewed journal *History of Geo- and Space Sciences*.
- PROGRAMS & PROJECTS. IUGG together with the International Union of Geological Sciences (IUGS) continue to support the International Lithosphere Programme (ILP; <https://www.scl-ilp.org/>).

IUGG awarded 12 grants to support scientific and outreach projects of importance to the international geophysical and geodetic community, which will explore new scientific ideas and develop future international initiatives. More: http://www.iugg.org/programs/grants_awarded.php

- SPONSORED SCIENTIFIC MEETINGS. IUGG co-sponsored 47 scientific meetings (workshops, symposia, conferences) worldwide in 2015-2018. More: <http://www.iugg.org/meetings/sponsored.php>
- SCIENCE EDUCATION. IUGG and the Abdus Salam International Centre for Theoretical Physics (ICTP) in Trieste, Italy, continued a fruitful cooperation in geophysical and geodetic science education. IUGG co-sponsored 24 science education events (schools and workshops) in 2015-2018. More:

http://www.iugg.org/education/sponsored_activities.php

- SCIENCE POLICY is essential components of IUGG activities related to dissemination of scientific knowledge among the countries and the public to promote resilience, sustainability, and peace. This activities include the dissemination of knowledge to UN agencies, G7 Science Ministers etc. More: <http://iugg.org/policy>
- HONORS AND RECONGNITION. IUGG Gold Medal were awarded to Brian Hoskins (UK) in 2015 and to W. Richard Peltier (Canada) in 2019. Thirteen distinguished scientists were elected IUGG Fellows (Honorary Members) and 20 outstanding young scientists received IUGG Early Career Scientists Awards. More: http://www.iugg.org/honors/u_awards.php
- STATEMENTS & GUIDELIENS. IUGG signed the Sendai Partnerships 2015-2025 declaration, issued Anti-Harassment Guidelines, and the statement “The Earth’s climate and responsibilities of scientists and their governments to promote sustainable development”. More: <http://www.iugg.org/about/special.php>
- COOPERATION. IUGG continued to strengthen cooperation with many International Scientific Unions including those related to Earth and space sciences (GeoUnions) and ISC interdisciplinary bodies as well as with other international and intergovernmental organizations, such as the United Nations Education, Science and Culture Organization (UNESCO) via the International Hydrological Program (IHP), the Intergovernmental Oceanographic Commission (IOC), and international Geoscience Program (IGCP), the World Meteorological Organization (WMO), the Global Framework for Climate Services (GFCS), the Comprehensive Nuclear-Test-Ban Treaty Organization (CTBTO), the Group on Earth Observations (GEO), the International Telecommunication Union (ITU), the Intergovernmental Panel on Climate Change (IPCC), International Civil Aviation Organization (ICAO), and with national and regional professional societies such as AGU, AOGS, EGU, and some other international and intergovernmental organizations. More: <http://www.iugg.org/about/liaisonsreps.php>.

Particularly,

- a) IUGG President and I took part in the extraordinary General Assembly of the International Council for Science (ICSU) held in Oslo, Norway (2016), at the ICSU General Assembly held in Taipei (2017), and inaugural General Assembly of the International Science Council in Paris, France (2018), and in the

meeting of ICSU Scientific Unions in Paris, France, in 2016. I participated in the World Science Forum organized by ICSU and UNESCO and held in Amman, Jordan, in 2017.

- b) I participated in several meetings of the ISC GeoUnions Steering Committee held in Trieste, Italy (2015), in Paris, France (2016 and 2018), Potsdam, Germany (2017), Taipei (2017), and Istanbul, Turkey (2018). I chaired of the GeoUnions Steering Committee for 2014-2016.
- c) As a Council Member of the International Geoscience Program (2017-2018), I participated in the UNESCO meetings and evaluation of the grant program related to Geohazards.
- d) I participated in the GFCS workshop of the Intergovernmental Board on Climate Services held in Offenbach, Germany, in 2017.
- e) As GEO Principal representing IUGG, I participated in the GEO Plenary XII in St. Petersburg, Russia, organizing an IUGG-GEO side event on disaster risk reduction.
- f) I participated in the Disaster Risk Resilience Forum organized by Science Council of Japan, UN Office for Disaster Risk Reduction (UNISDR), and ICSU in Tokyo, Japan, in 2017.
- g) I was invited to join the Scientific Program Committee for the 2017 and 2019 Science and Technology Conference of the Preparatory Commissions for Comprehensive Nuclear Test-Ban Treaty Organization (CTBTO), and participated in the work of the conferences representing IUGG.

ADMINISTRATION

The Council

The IUGG Council is a standing body of the Union. The Council of the Union consist of the Delegates, designated by the Adhering Bodies of the Member Countries, one Council Delegate for each Adhering Body.

Major decision of the Council

- To approve the IUGG Strategic Plan (2016-2023) (to be viewed at: http://www.iugg.org/special/IUGG_StrategicPlan_2016-2023.pdf)
- To approve changes to the IUGG Statutes and By-Laws
- To appoint an IUGG Liaison to the Group on Earth Observations (GEO)
- To appoint an IUGG Liaison to the Partner Advisory Committee (PAC) of the Global Framework for Climate Services (GFCS)

The Bureau

The IUGG Bureau consists of the

President: Michael Sideris (Canada)

Vice-President: Kathryn Whaler (UK)

Secretary General: Alik Ismail-Zadeh (Germany/Russia)

Treasurer: Aksel W. Hansen (Denmark), and

Members: Isabelle Ansoorge (South Africa), Pierre Hubert (France), and Chris Rizos (Australia).

The Bureau met three times during the term: in Paris, France (2016), in Montreal, Canada (2017), and in the Mexico City (2018).

Major decisions of the Bureau

Administration

- To approve the revised version of the Guidelines on IUGG Administration.
- To approve the draft Implementation Plan (2016-2023).
- To approve the membership and the Terms of Reference of the IUGG Committees and request the Executive Committee to endorse them.
- To approve the proposed membership of the IUGG Nominating Committee, Site Comparison Committee, and Resolution Committee.
- To approve the revised Terms of Reference of the International Lithosphere Program (ILP), and to request the Executive Committee to endorse this decision.
- To request the Statutes & By-Laws Committee to analyze the (professionally) reformatted IUGG Statutes & By-Laws, and to summarize the reformatted changes to be presented to the IUGG Council at its meeting in Montreal in 2019.
- To recommend the IUGG Bureau (2019-2023) to terminate the IUGG Working Group on History (WGH) as the WGH's mission is fulfilled.
- To request the IUGG Site Comparison Committee to shortlist two bids, if four or more bids to host the IUGG General Assembly 2023 are received.

Membership

- To accept payments for multiple year memberships.
- To explore the idea of introducing a new membership category for least developed countries.
- To request the IUGG Executive Committee to approve the decision made by the Bureau Members

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to lower the price of one unit for least developed countries to USD 500. The IUGG Council should take the final decision.

- To urge Adhering Bodies and Union Associations to add further nominations for members to the IUGG Bureau and Finance Committee (2019-2023) and to consider gender, discipline and regional balance.

Science

- To approve new IUGG projects (2016-2017).
- To release the special call for the IUGG Grants Program (2018-2019).
- To request the Executive Committee to call for nomination of candidates for the executive committee (EC) of the IUGG Union Commission on Data and Information (UCDI); and to co-opt IUGG Liaisons to CODATA and UCDI as members of the UCDI-EC.
- To recommend the Executive Committee to request the Chair of the IUGG Working Group on History to provide information on (i) an outline of the history book dedicated to the 100th anniversary of IUGG, (ii) a report/plan about their ideas for the Centennial celebrations, and on the associated financial matters.

Education

- To recommend the IUGG Council to extend the IUGG-ICTP science education program for the next quadrennial (2020-2023).

Honor and Recognition

- To introduce “Certificate of Appreciation” and award it to scientists who offered exceptional service to IUGG.
- To approve the recommendation of the Early Career Scientist Award Committee regarding the 2019 awardees
- To remove the hard age limit of 40 years in the guidelines for the Early Career Scientist Award (2023), and instead focus on the achievements since the PhD was completed.
- To approve the recommendation of the Fellows Selection Committee regarding the 2019 IUGG Fellows
- To approve the recommendation of the Gold Medal Committee regarding the 2019 Gold Medalist

Cooperation

- To approve the Memorandum of Understanding between IUGG and AGU on joint celebration of

the 100th anniversary.

- To explore ways for organizing joint IUGG/AOGS and IUGG/EGU activities.
- To sign a Memorandum of understanding between IUGG and the local organizers of an IUGG general assembly three years before the beginning of the General Assembly and to mention this in the guidelines for IUGG General Assemblies.
- To request Associations to nominate liaisons and representatives to IUGG Partner organizations.

The Executive Committee

The IUGG Executive Committee consists of the Bureau, the immediate past President of IUGG (Dr. Harsh Gupta, India), and the Presidents of the IUGG Associations. Association Secretaries-General and the Chair of the IUGG Finance Committee are always invited to attend the meetings, with voice but without vote. The Executive Committee met twice in Paris, France (2016) and in Montreal, Canada (2017).

Major decisions of the Executive Committee

- To approve the IUGG Implementation Plan (2016-2023).
- To ask the Associations to nominate candidates for the executive committee (EC) of the IUGG Union Commission on Data and Information (UCDI); and to co-opt IUGG Liaisons to CODATA and UCDI as members of the UCDI-EC.
- To request the IUGG Working Group on History to accelerate the work on the history book and prepare a list of actions regarding the 2019 centennial.
- To approve the Terms of Reference of the IUGG Committees.
- To approve the revised ILP Terms of Reference.
- To explore possibilities to develop an IUGG early-career scientist network starting from the Association level.
- To approve joint IUGG-Association logos.
- To approve the Memorandum of Understanding between IUGG and the 2019 LOC-Montreal.
- To approve the agreement between IUGG and C-IN company (to be in charge of the scientific program of the IUGG2019).

The Secretariat

The Statutes and By-laws provide that the daily affairs of the Union are managed by an elected Secretary General who attends to correspondence, circulates information, preserves the records, prepares reports of the Union’s activities, and arranges meetings of the

General Assembly, the Council, the Executive Committee and the Bureau, including preparing and distributing the agendas and the minutes of all their meetings. Additional activities of the Secretariat:

- Produced the monthly IUGG E-Journal, the annual Yearbook, and the annual Report.
- Maintained, redesigned and expanded the IUGG webpage.
- Conducted ballots by correspondence concerning the Union admission.
- Issued the calls for support of meetings and interdisciplinary projects, and facilitated the awards.
- Facilitated the work of the IUGG Commissions and Committees.
- Revised the Guidelines on IUGG Administration.
- Maintained close cooperation with the ICSU Secretariat and with GeoUnions Officers and promoted joint activities of IUGG with other international organizations.
- Supported the Scientific Programme Committee and the Local Organizing Committee in preparations for the 2015 and 2019 General Assemblies.

The Secretariat is hosted by the GFZ-Potsdam, Germany, and managed by the IUGG Secretary General and the Assistant Secretary General / Executive Secretary. The German Research Foundation (DFG) supports the IUGG Secretariat, and IUGG is very thankful for this generous support from GFZ-Potsdam and DFG.

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 and the GeoUnions, news and reports related to IUGG scientific programs and co-sponsored scientific meetings, about awards and honors bestowed on IUGG scientists as well as obituaries, and a meeting calendar (<http://www.iugg.org/publications/ejournals>).

IUGG Yearbook

The IUGG Yearbook is a reference document of IUGG members, administrative officers, and Association and Union Commission officers that is updated annually and distributed free of charge. Each issue endeavors to update the contact information for hundreds of persons who are actively participating in IUGG scientific activities. Information is compiled throughout the year until end December. The Yearbooks are published and

posted at the IUGG website at the beginning of the year (<http://www.iugg.org/publications/yearbooks/>).

IUGG Annual Report

The IUGG Annual Report summarizes the activities of the Union, IUGG Associations and Union and Inter-Unions Commissions. The Annual Reports are published and posted at the IUGG website (http://www.iugg.org/publications/reports/annual_report).

IUGG Webpage and social media

The IUGG web site <http://www.iugg.org>, in English and French, was maintained by Dr. D. Krupsky, IUGG Webmaster, and permanently updated for 2018. In addition, a new web site dedicated to the 100th anniversary of IUGG was developed (<http://100.iugg.org>) and linked to the main IUGG web site.

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/UCgsIvZyuEJ-RA9JkZv3MN-w>

IUGG Web-Conferencing Software

The Secretariat adopted a web-conferencing software for the IUGG, which supports real-time communication among IUGG Bureau and Executive Committee Members 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.

IUGG Exhibition Booth

To further increase the visibility of the IUGG and to promote the IUGG General Assembly 2019, the IUGG Secretariat together with LOC-Montreal organized an exhibition booth at the EGU General Assembly 2018, Vienna, Austria, the AOGS Annual Meeting 2018, Honolulu, USA, and the AGU Fall Meeting 2018, Washington, D.C., USA. The IUGG Brochure can be downloaded from the IUGG web site: <http://www.iugg.org/about/brochure.pdf>.

Travel of the Secretary General

Presence of IUGG officers at business and scientific meetings of IUGG, Union Associations, Union Commissions, National Committees, sister geoscience organizations and other international and

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intergovernmental organizations help to strengthen a cooperation between IUGG bodies and other organizations and to increase visibility of the Union. During the quadrennium, I attended the several important meetings on behalf of IUGG, which were

supported by IUGG, the German Science Foundation (DFG) and from other sources.

My special thanks go to DFG, which provided a travel support to the IUGG Secretary General for since 2008.

Place and date	Event
Trieste, Italy, 2-6 November 2015	IUGG-ICTP conference on Future of Earth and Space Science and Education
San Francisco, USA, 14-18 December 2015	Fall Meeting of the American Geophysical Union (AGU)
Geneva, Switzerland, 26-29 January 2016	UNISDR Science and Technology Conference
Jena, Germany, 2 February 2016	Opening Ceremony of the International Year for Global Understanding
Paris, France, 10-13 April 2016	Scientific Unions Meeting of the International Council for Science (ICSU)
Vienna, Austria, 18-22 April 2016	General Assembly of the European Geosciences Union (EGU)
Paris, France, 5-10 June 2016	IUGG Conference on Mathematical Geophysics / IOC-UNESCO Executive Committee Meeting
Paris, France, 16-18 June 2016	IUGG Bureau and Executive Committee meetings
Geneva, Switzerland, 21-24 June 2016	Executive Council Meeting of the World Meteorological Organization (WMO) <ul style="list-style-type: none"> - Meeting with the WMO Secretary General Prof. P. Taalas - Meeting with the UNISDR Staff Members - Meeting with the IPCC Executive Secretary Mr. Abdalah Mokssit
Cape Town, South Africa, 27 August – 4 September 2016	35 th International Geological Congress
St. Petersburg, Russia, 13-16 September 2016	UArctic Congress
Nanjing, China, 23-25 September 2016	Second Congress of China Geodesy and Geophysics
Luxemburg, 20-22 October 2016	IUGG-CCEC Workshop “Global Change and Future Earth”
Oslo, Norway, 24-24 October 2016	Extraordinary ICSU General Assembly
Frankfurt, Germany, 3 November 2016	Annual Meeting of the German National Committee for Geodesy and Geophysics
St. Petersburg, Russian, 8-12 November 2016	Plenary XIII of the Group on Earth Observation (GEO)
San Francisco, USA, 12-16 December 2016	Fall Meeting of the American Geophysical Union (AGU)
Paris, France, 20-22 February 2017	UNESCO-IGCP Council Meeting
Vienna, Austria, 24-28 April 2017	General Assembly of the European Geosciences Union (EGU)
Cancun, Mexico, 22-26 May 2017	UNISDR Global Platform for Disaster Risk Reduction
Ljubljana, Slovenia, 29 May - 2 June 2017	World Landslides Forum

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Offenbach, Germany, 19-20 June 2017	Scoping workshop for the development of the GFCS
Vienna, Austria, 25-30 June 2017	CTBTO Science and Technology Conference
Kobe, Japan, 29 July – 4 August	IAG-IASPEI Scientific Assembly
Potsdam, Germany, 1-2 September 2017	ICSU GeoUnions Steering Committee meeting
Montreal, Canada, 18-23 September 2017	IUGG Bureau, Executive Committee and Science Program Committee meetings
St. Petersburg, Russia, 8-13 October 2017	ICSU-CODATA conference
Taipei, 21-27 October 2017	General Assembly of the International Council for Science (ICSU)
Frankfurt, Germany, 2 November 2017	Annual Meeting of the German National Committee for Geodesy and Geophysics
Amman, Jordan, 6-10 November 2017	World Science Forum
Tokyo, Japan, 23-25 November 2017	UNISDR Global Forum on Science and Technology for Disaster Resilience
Paris, France, 29 November – 2 December 2017	UNESCO Conference on Landslides
Paris, France, 14 December 2017	Meeting with the Secretary of the UNESCO International Geoscience Program Prof. Patrick McKeever
Paris, France, 19-22 February 2018	UNESCO-IGCP Council Meeting
Istanbul, Turkey, 18-21 March 2018	ISPRS-URSI International Conference “Geoinformation for Disaster Management”
Vienna, Austria, 8-13 April 2017	General Assembly of the European Geosciences Union (EGU)
Izmir, Turkey, 30-31 May 2018	Congress of the Turkish Union of Geodesy and Geophysics
Honolulu, USA, 3-8 June 2018	AOGS General Assembly
Nizhny Novgorod, Russia, 23-28 June 2018	IUGG Conference on Mathematical Geophysics
Paris, France, 2-6 July 2018	General Assembly of the International Science Council (ISC)
Beijing / Lanzhou, China, 21-25 August 2018	IUGG 100 th Anniversary Celebration in China / Third China Congress on Geodesy and Geophysics
Mexico City / Puerto Vallarta, Mexico, 24 October – 2 November 2018	IUGG Bureau Meeting IUGG 100 th Anniversary Celebration in Mexico - Conference in Colegio Nacional, Mexico City - Mexican Geophysical Union Annual Meeting
Istanbul, Turkey, 9-11 November 2018	Steering Committee meeting of the ISC GeoUnions
Washington, D.C., USA, 8-14 December 2018	AGU-IUGG Joint symposium on disaster science AGU Fall Meeting 2018
Beijing, China, 25-27 February 2019	IUGS International Forum on Deep-time Digital Earth

ACKNOWLEDGMENTS

It has been a great honor and a privilege to serve IUGG in this office since July 2007. I have benefited enormously from the guidance and assistance of the members of the IUGG Executive Committee during this period of time, especially President Tom Beer, President Harsh Gupta, President Michael Sideris, Vice President Kathy Whaler, and Treasurer Aksel Hansen. I am thankful to all Bureau Members for their cooperation and support. Also I am very grateful to the Association Presidents and Secretaries General for their contribution to our joint work for IUGG and Union Associations. I thank IUGG Council Members for confidence in electing me for the SG position. I am grateful to all IUGG distinguishes members, whom I had a pleasure to meet and to work in various Union's activities.

The office of the Secretary General has been hosted by the Karlsruhe Institute of Technology (2008-2012) and by the GFZ-Potsdam (since 2012). The position of the Assistant Secretary General (ASG) was financially supported by grants from the German Research Foundation (DFG) and by GFZ. The GFZ's generous offer permitted the hire of a full time ASG / Executive Secretary, who helped to manage the Union.

It has been my pleasure to work with Ms. Simone Oswald (2008-2012) and with Dr. Franz Kuglitsch

(since 2012), whose support of the duties of the Secretariat cannot be underestimated. I have appreciated Simone's and Franz's talent, punctuality, discipline, language skills, humor, and friendship. I have been benefited from the extraordinary experience of working with excellent scientists to promote the mission and goals of IUGG and Earth and space sciences worldwide.

I thank the Karlsruhe Institute of Technology and the Russian Academy of Sciences for their support of my voluntary work for IUGG. Without this support, I would not dedicate a part of my working time to the Union. Finally, I am very grateful to my family (my wife and son) for their understanding and love; although they were unhappy because of many travels on behalf of IUGG and spending my free time for IUGG activities, but they supported me in any difficult situation and encouraged me.

For the last twelve years, I dedicated a part of my life to IUGG and its development. Although any retirement brings a pinch of sorrow, I am happy that the Union is in a good shape and pass this important position in the Union administration to another dedicated person. I am leaving the SG position, but not IUGG – I shall continue to serve the Union in another capacity. Thank you very much for your confidence.

Alik Ismail-Zadeh, IUGG Secretary General
(2007-2019)

QUADRENNIAL REPORT OF THE TREASURER

Introduction

This report will be presented to the Council at the upcoming XXVII IUGG General Assembly in Montreal, Canada, July 2019. It contains a financial part and some statistical information about the status of the members of IUGG. Accounting and budget spreadsheets are enclosed as 3 attachments:

- The final accounting of the 2012 – 2015 quadrennium (year by year + accumulated) compared to the budget (Attachment 1)
- A preliminary accounting for the present quadrennium 2016 – 2019 (year by year + accumulated) (Attachment 2)
- The 2016-2019 budget from Prague 2015 (Attachment 3)

This procedure for reporting on the finances is a continuation of what was done at the General Assemblies in Prague in 2015 and earlier.

With the General Assemblies normally taking place in the middle of the last year of a budget period it is not possible to give a full report on the finances of the quadrennium. Instead it is accepted to present it at the next GA together with a preliminary accounting for the present quadrennium. Therefore in Montreal the final accounting for the quadrennial report for 2012 – 2015 will be shown.

At the time of writing the preliminary report for 2016 - 2019 includes two columns for the year 2019: one column, P, accounting for the first 6 months plus a column, Q, showing an estimate of major remaining expenses for the last 6 months. This column is commented in column R.

For comparison the budget for the period 2016 to 2019 is given in attachment 3.

The final accounting for 2012 - 2015

As stated at the GA in Melbourne an undesired accumulation of funds took place for several years. This was clearly seen in the final accounting for the whole period 2008 - 2011. In Melbourne it was therefore decided to approve a budget for 2012 - 2015 that would lower the balance considerably. The balance was lowered by the end of 2015, but the deep cut was, however, not fully realized. All in all, the balance at the end of the period was more than USD 300,000 higher than anticipated in the budget from Melbourne (see attachment 1).

The reason for this difference is partly a higher incoming balance on January 1, 2012 than estimated in Melbourne, and partly because the resulting expenditure

during the full period was lower. For instance, line 18.3 (liaison officers) and line 18.4 (International Scientific Programs) were both significantly lower than estimated in Melbourne. The amount allocated to liaison officers was already reduced in the approved budget for the present quadrennium, see budget from Prague.

Preliminary accounting for 2016 - 2019

Overall view:

Income/expenditures basically match the budget. The first 3 years of the budget period 2016 – 2019 show an income from members close to the budget. And also the expenditure follows the budget closely. The net result is a small surplus, but taking the uncertainty into account the accounting matches budget very well.

However, by inspection of attachment 2 one notices immediately the much higher balance by the end of the period. This is because we did not anticipate the incoming balance correctly in Prague.

The higher incoming balance and expenditures that follow the budget closely result in a higher outgoing balance too. The cost of the centennial celebrations in Paris on July 29, 2019 must be seen in the light of this difference.

The price of 1 unit:

The price in 2019 of IUGG's basic unit is USD 2,020, which is very close to the budget value of 2018!

The shift of one year happened because there was no increase using the US inflator index from 2015 to 2016.

Since 2004/2005 I have used a US Labor Department inflator index for September as the basis for calculation of the price of 1 unit for the following year. Over time the increase of the index is close to 2%, with 2009 - 2010 and 2015 - 2016 as exemptions.

The 2%/yr inflation rate is also used in the budget proposal for the coming period.

Membership issues and income:

One country has withdrawn from IUGG in the present quadrennium. Three new members have been admitted in the same period. One paying member has moved to A-membership, one is expected to do the same in the near future. One country paid its long-term debt and is now a paid up member.

IUGG has 72 members (January 1, 2019). Please, see appendix 1 for details.

The union is gradually losing units paid as dues by members. In the period 2008 - 2011 a total of 1102 units were paid. For the last complete period, the number is 1084. For the year 2018, the number is 258. It should be

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compared to the 276 in total for all paying members. The 2018 number will go up a little when members in debts hopefully will pay their dues in arrears.

Expenditures:

If we compare budget and accounting line by line we notice a reasonably good match between the two set of numbers as a whole. However, some lines are above budget, others below.

There is one major difference. I will use line 11.6 to account for the expenses in connection with 100 yr celebration in Paris on July 29. This expenditure was not included in the budget. IUGG Bureau decided to organize the event in the light of the higher than budget balance brought forward from the previous period.

IUGG has not received any ICSU grants during the present period. And the line will not be used in future budgets.

Balance:

Based on the above analysis it is expected that the total assets of IUGG at union level will be close to USD 650.000 by the end of 2019 which is only a bit above one year's turnover.

The US dollar has varied a lot during the last quadrennium, as usual one can say. This gives very variable buying power in different countries. It has been discussed if IUGG should change its basic currency to Euro, but no convincing arguments for a change have been put forward.

Appendix

- 1) Membership statistics

Attachments:

In general, one can say that the economical situation of IUGG is sound and that the net balance allows IUGG some flexibility.

However, it is very important that IUGG takes the necessary steps to keep its members in the union and at the same time attract new members. The problem of keeping the members in the union is becoming more and more visible. It needs the full attention of the union and the member countries.

Acknowledgements:

I want to thank everybody I have been in contact with as IUGG Treasurer. In particular, I will send my sincere thanks to President Michael Sideris and the other members of the Bureau. I have always enjoyed the almost daily contact with Secretary General Alik Ismail-Zadeh and Executive Secretary Franz Kuglitsch. Also thanks to the Presidents and Secretary Generals/Treasurers of the Associations and the various union commissions and committees.

I have had a close and very good cooperation with the Finance Committee and its chairs: David Collins (2015-2016) and Jan Krynski (2016-2019). I want to express my deepest appreciation of the relationship.

Thanks also to my assistant Simon Jacobsen who have helped me in carrying out my daily duties.

Aksel Walløe Hansen, IUGG Treasurer

- 1) final accounting 2012 – 2015
- 2) preliminary accounting 2016 – 2019
- 3) budget 2016 – 2019 approved in Prague 2015

Appendix 1)

Membership statistics

In the following a summary of the relevant membership information is given.

First of all as of January 1, 2019, IUGG has 72 member countries (2 up compared to 2015). IUGG has lost 1 member since early 2015, but we have welcomed 3 new members.

The Philippines have left the union. New Members are Algeria (cat 1), Serbia and Uruguay (cat A).

Recently, F.Y.R. Macedonia moved to cat A. Nicaragua is expected to follow soon.

New Zealand has moved to cat 2 in 2019.

The 72 members represent a total of 276 units. 14 members are A-members, 4 more than in 2015.

In early June 2019 we have received full payments from 48 members representing a total of 258 units for 2018. The missing units are distributed over 10 members with various lengths of time spent in observer status.

Membership table 2018/2019

Payments for 2018 and member distribution 2019

Category	Units in Category	Number countries	Number units	Paid 2018 (June 2019)	
				numbers	units
A	0	14	0		
1	1	18	18	14	14
2	2	16	32	12	24
3	3	5	15	3	9
4	5	6	30	6	30
5	7	3	21	3	21
6	10	5	50	5	50
7	15	1	15	1	15
8	20	3	60	3	60
9	25				
10	30				
11	35	1	35	1	35
12	40				
13	45				
14	50				
Total		72	276	48	258
			(number of units from paid-up members only)		
USD (2019 values)	557.520				

10 members are in observer status, representing 17 units in arrears. The total amount of dues in arrears is USD 104,355 (June 10).

Over time, it is a substantial amount of money that is not paid by members in observer status. It happens often that these members withdraw without paying their debt.

Status of IUGG Members, June 1, 2019

Countries in arrears with payments of dues are put in observer status, indicated in the table below with the first year without payment.

Member Country	Category	Member Country	Category
14 adhering bodies in	A	5 adhering bodies in	3 15 units
Bolivia		Argentina	observer, 2018
Peru		Austria	
Mauritius		Brazil	observer, 2016
Georgia		Finland	
Albania		South Africa	
Armenia			
D.R. Congo		16 adhering bodies in	2 32 units
Ghana		Chile	
Morocco		Czech Republic	
Bosnia & Herzegovina		Egypt	
Serbia		Greece	
F.Y.R. Macedonia		Hungary	
Uruguay		Ireland	
Nicaragua		Korea, South	
		Mexico	
1 adhering body in	11 35 units	New Zealand	new in cat 2 in 2019
USA		Nigeria	observer, 2015
		Pakistan	observer, 2018
3 adhering bodies in	8 60 units	Poland	
Germany		Portugal	
Great Britain		Saudi Arabia	observer, 2016
Japan		Thailand	
		Turkey	
1 adhering body in	7 15 units	18 adhering bodies in	1 18 units
France		Azerbaijan	observer, 2016
		Bulgaria	
5 adhering bodies in	6 50 units	Colombia	
Canada		Costa Rica	
China		Croatia	
India		Estonia	
Italy		Iceland	
Russia		Indonesia	observer, 2015
		Iran	observer, 2012
3 adhering bodies in	5 21 units	Israel	
Australia		Jordan	observer, 2018
Spain		Luxembourg	
Switzerland		Mozambique	
		New Zealand	
6 adhering bodies in	4 30 units	Romania	
Academia Sinica		Slovak Republic	
Belgium		Slovenia	
Denmark		Vietnam	observer, 2017
Netherlands			
Norway			
Sweden			

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Attachment 1, Final accounting 2012-2015

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
1	IUGG Accounting and Budget, 2012 - 2015, Final														
2	to be used at GA, Montreal 2019														
3	US dollars		2012	2013	2014	2015	Budget 2012-2015	Accounting 2012-2015	ACCOUNTING						
4									2012	2013	2014	2015			
5	RECEIPTS														
6		Price of 1 uni	1.800	1.835	1.870	1.900			1815	1850	1875	1905			
7	1.	Membership Subscription	495.000	504.600	514.200	522.500	2.036.300	1.948.690	429.172	499.163	437.189	583.166			
8	2.	Contracts with ICSU	30.000				30.000	65.707	25.707	0	40.000				
9	3.	Assembly Surcharge				20.000	20.000	118.680	0	0	0	118.680			
10	4.	Sales of Publications	200	200	200	200	800	1.479	0	0	1.068	412			
11	5.	Miscellaneous					50.000	11.347							
12	a.	Interest	12.500	12.500	12.500	12.500	50.000	0	0	0	0	0			
13	b.	Gain on exchange					0	10.347	8.361	1.985	0	0			
14	c.	Other					0	0	0	0	0	0			
15	d.	Cash in hand					0	1.000	0	0	1.000	0			
16	6. Total Receipts														
17			537.700	517.300	526.900	555.200	2.137.100	2.145.903	463.241	501.148	479.257	702.257			
18	8.	Balances on 1/1 2012	766.600	708.700	638.500	588.100	766.600	876.641	876.641	831.029	733.088	674.276			
19	EXPENDITURES														
21	11. Administration														
22	11.1	Personnel	20.000	20.000	20.000	20.000	470.000	494.968	18.086	14.632	14.067	7.018			
23	11.2	Equipment	5.000	5.000	5.000	5.000	20.000	2.996	0	2.908	88	0			
24	11.3	Supplies	5.000	5.000	5.000	5.000	20.000	0	0	0	0	0			
25	11.4	Communications	8.000	8.000	8.000	8.000	32.000	28.800	12.497	11.212	714	4.377			
26	11.5	Travel, Administration only	50.000	65.000	50.000	70.000	235.000	247.653	43.757	93.994	47.701	62.202			
27	11.6	Miscellaneous	1.000	1.000	1.000	5.000	8.000	5.695	242	2.434	1.015	2.005			
28	11.6a	Surcharge						111.403	58.384			53.019			
29	11.7	Travel, representation	15.000	15.000	15.000	30.000	75.000	44.617	26	12.662	22.326	9.604			
30	12.	New Initiatives					240.000	241.872							
31	12.1	Education and outreach	30.000	30.000	30.000	30.000	120.000	95.186	20.000	30.043	22.000	23.143			
32	12.2	Science	30.000	30.000	30.000	30.000	120.000	146.686	57.000	28.309	41.746	19.631			
33	13.	General Assemblies					70.000	53.199							
34	13.1	Organization				10.000	10.000	26.766	0	0	14.123	12.644			
35	13.2	Travel				60.000	60.000	26.432	0	0	0	26.432			
36	14.	Symposia	30.000	30.000	30.000	0	90.000	85.239	29.960	23.338	31.941	0			
37	15.	Annual allocations					997.500	954.264							
38	15.1	Annual allocations	240.600	247.500	252.300	257.100	997.500	954.264	181.464	306.763	206.223	259.814			
39	16.	Dues and Grants					100.000	102.467							
40	16.1	ICSU	25.000	25.000	25.000	25.000	100.000	102.467	24.936	26.501	27.441	23.588			
41	17.	ICSU grants					30.000	62.130							
42	17.1	MAGNIO/eGY-Africa	30.000				30.000	62.130	7.879	14.138	40.113	0			
43	18.	Union activities					372.000	163.539							
44	18.1	GRC, SEDI, CMG, UCIDI	18.000	18.000	18.000	18.000	72.000	52.000	24.000	12.000	16.000	0			
45	18.2	Inter-Union Science (ILP)	15.000	15.000	15.000	15.000	60.000	60.776	15.000	15.000	15.928	14.848			
46	18.3	Liaison Officers	30.000	30.000	30.000	30.000	120.000	21.096	13.289	0	4.766	3.041			
47	18.4	International Scientific Programs	25.000	25.000	25.000	25.000	100.000	9.667	0	3.000	6.667	0			
48	18.5	New commissions (CCEC)	5.000	5.000	5.000	5.000	20.000	20.000	0	0	15.000	5.000			
49	19.	Countries in need					90.000	106.443							
50	19.1	Travel Grants, General Assemblies	0	0	0	90.000	90.000	106.443	0	0	0	106.443			
51	20.	Fees					32.000	25.179							
52	20.1	Professional services	5.000	5.000	5.000	5.000	20.000	15.661	0	0	0	15.661			
53	20.2	Bank fees	3.000	3.000	3.000	3.000	12.000	9.518	2.332	2.156	3.111	1.919			
54	21.	Contingencies	5.000	5.000	5.000	5.000	20.000	0				0			
55	22.	Loss on exchange					0	8.543			7.100	1.443			
56	23. Total Expenditures														
57			595.600	587.500	577.300	751.100	2.511.500	2.297.841	508.852	599.089	538.069	651.831			
58	24.	Balances on 31/12 2015	708.700	638.500	588.100	392.200	392.200	724.702	831.029	733.088	674.276	724.702			
59	60														
60	61														

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Attachment 2, preliminary accounting 2016-2019

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T
1	2016 - 2019 PRELIMINARY REPORT FINANCIAL REPORT, Montreal, 2019																			
2	BUDGET			Budget		Accounting		ACCOUNTING			Estimate	1. half year	remaining	major expenses						
3	US dollars		2016	2017	2018	2019	2016-2019	2016-2019	2016	2017	2018	2019	June 16	2019	June 16	June 16				
4																				
5	RECEIPTS	No. Of units	270	270	270	270		paid units	263	262	258	270	127	123						
6		Price of 1 unit	1.940	1.980	2.020	2.050			1905	1935	1975	2020	2.020	2.020						
7	1. Membership Subscription		523.800	534.600	545.400	553.500	2.157.300	2.173.230	509.991	552.563	538.566	572.110	322.110	250.000	120 units					
8	2. Assembly Surcharge					20.000	20.000	20.000	0	0	0	20.000	0	20.000	surcharge					
9	3. Sales of Publications		200	200	200	200	800	911	134	102	0	675	675							
10	4. Miscellaneous							0												
11	a. Interest		0	0	0	0	0	20	-1	-1	0	22	22							
12	b. Gain on exchange							3.326		3.326	0									
13	c. Other							15.000	0	0	0	15.000	0	15.000	ECCC grant					
14	d. Cash in hand							0	0	0	0									
15																				
16	6. Total Receipts		524.000	534.800	545.600	573.700	2.178.100	2.212.486	510.124	555.989	538.566	607.807	322.807	285.000						
17	8. Balances on 1/1		500.000	513.800	518.700	544.000	500.000	724.699	724.699	666.531	774.040	799.611	799.611							
18																				
19																				
20	EXPENDITURES																			
21	11. Administration						400.000	510.361												
22	11.1 Personnel		15.000	15.000	15.000	15.000	60.000	51.468	13.026	11.138	11.947	15.357	9.357	6.000	webmaster + assistant					
23	11.2 Equipment		1.000	1.000	1.000	1.000	4.000	3.265	1.158	1.801	308	0	0							
24	11.3 Supplies		4.000	4.000	4.000	4.000	16.000	1.035	816	45	168	8	8							
25	11.4 Communications		4.000	4.000	4.000	5.000	17.000	1.039	934	87	0	18	18							
26	11.5 Travel, Administration only		65.000	80.000	65.000	85.000	295.000	301.550	55.400	89.485	70.240	86.425	56.425	30.000	Montreal, Bureau					
27	11.6 Miscellaneous		1.000	1.000	1.000	5.000	8.000	108.829	3.036	5.439	2.473	97.881	22.881	75.000	Paris, July 29					
28	11.6a Surcharge							37.415	37.415											
29	11.7 Travel, representation						0	5.760	2.560	288	988	1.925	1.925							
30	12. New Initiatives						160.000	166.611												
31	12.1 Education and outreach		20.000	20.000	20.000	20.000	80.000	71.638	20.000	15.000	21.638	15.000	15.000							
32	12.2 Science		20.000	20.000	20.000	20.000	80.000	94.973	40.000	5.014	20.045	29.913	4.913	25.000	Two IUGG grants 2018-2019					
33	13. General Assemblies						110.000	150.363												
34	13.1 Organization					10.000	10.000	50.363	0	0	0	50.363	5.363	45.000	Montreal					
35	13.2 Travel					60.000	60.000	100.000	0	0	0	100.000	0	100.000	Montreal grants					
36	13.3 Other travel grants					40.000	40.000	0	0	0	0	0	0							
37	14. Symposia		20.000	20.000	20.000	0	60.000	50.658	24.207	7.918	18.532	0	0							
38	15. Annual allocations						1.059.100	1.085.892												
39	15.1 Annual allocations		257.200	261.900	267.300	272.700	1.059.100	1.085.892	289.727	255.788	268.349	272.028	167.028	105.000	3 associations					
40	16. Dues and Grants						120.000	106.669												
41	16.1 ICSU		30.000	30.000	30.000	30.000	120.000	106.669	24.144	25.233	27.292	30.000	0	30.000	ISC					
42	17. ICSU grants							0												
43	17.1 ---						0	0	0	0	0									
44	18. Union activities						250.000	169.285												
45	18.1 GRC, SEDI, CMG, UCIDI, CCEC, I		26.000	26.000	26.000	26.000	104.000	66.000	24.000	0	34.000	8.000	8.000							
46	18.2 Inter-Union Science (ILP)		15.000	15.000	15.000	15.000	60.000	59.049	14.771	14.278	15.000	15.000	0	15.000	ILP					
47	18.3 Liaison Officers		10.000	10.000	10.000	10.000	40.000	19.608	4.335	725	9.579	4.969	2.969	2.000	Liaison officers					
48	18.4 International Scientific Programs		6.000	6.000	6.000	6.000	24.000	2.000	0	2.000	0	0	0							
49	18.5 New commissions (UCPS)		5.500	5.500	5.500	5.500	22.000	22.629	0	11.629	0	11.000	0	11.000	UCPS					
50	19. Fees						32.000	24.648												
51	19.1 Professional services		5.000	5.000	5.000	5.000	20.000	14.191	3.972	0	6.719	3.500	0	3.500	PwC					
52	19.2 Bank fees		3.000	3.000	3.000	3.000	12.000	10.457	3.594	2.612	2.974	1.277	1.277							
53	20. Contingencies		2.500	2.500	2.500	2.500	10.000	0												
54	21. Loss on exchange							7.945	5.198		2.746		2.517							
55																				
56	22. Total Expenditures		510.200	529.900	520.300	640.700	2.201.100	2.272.431	568.293	448.480	512.995	742.664	297.681	447.500						
57	23. Balances on 31/12		513.800	518.700	544.000	477.000	477.000	664.755	666.531	774.040	799.611	664.755	824.738	-162.500						
58																				
59																				

Attachment 3, IUGG Budget 2016 – 19

	A	B	C	D	E	F	G	H	I
1	IUGG Budget 2016 - 19								
2	Prague, June 30 2015								
3	All figures, except the value and number of units, are in thousands of US dollars								
4									
5	Year	2015	2016	2017	2018	2019	2016 - 2019		
6	Estimated unit value	\$1.905	\$1.940	\$1.980	\$2.020	\$2.050	\$1.940-\$2.050		
7	Estimated number of units	270	270	270	270	270	1080		
8									
9	INCOME							Budget	
10			2016	2017	2018	2019	2016-2019		
11	1. MEMBERSHIP DUES	514,4	523,8	534,6	545,4	553,5	2157,3		
12	2. ASSEMBLY SURCHARGE					20,0	20,0		
13	3. SALES OF PUBLICATIONS, ETC		0,2	0,2	0,2	0,2	0,8		
14	4. MISCELLANEOUS (interest)		0,0	0,0	0,0	0,0	0,0		
15	5. ICSU GRANTS						0,0		
16	6. TOTAL INCOME		524,0	534,8	545,6	573,7	2178,1		
17	7. INCOMING BALANCE 2016	500,0	500,0	513,8	518,7	544,0			
18									
19	EXPENDITURES							Budget	
20			2016	2017	2018	2019	2016-2019		
21	11. ADMINISTRATION		90,0	105,0	90,0	115,0	400,0		
22	11.1 Personnel		15,0	15,0	15,0	15,0	60,0		
23	11.2 Equipment		1,0	1,0	1,0	1,0	4,0		
24	11.3 Supplies		4,0	4,0	4,0	4,0	16,0		
25	11.4 Communication		4,0	4,0	4,0	5,0	17,0		
26	11.5 Travel, organizational		65,0	80,0	65,0	85,0	295,0		
27	11.6 Miscellaneous		1,0	1,0	1,0	5,0	8,0		
28	12. NEW INITIATIVES		40,0	40,0	40,0	40,0	160,0		
29	12.1 Education and outreach		20,0	20,0	20,0	20,0	80,0		
30	12.2 Science		20,0	20,0	20,0	20,0	80,0		
31	13. ASSEMBLIES		0,0	0,0	0,0	110,0	110,0		
32	13.1 Organization		0,0	0,0	0,0	10,0	10,0		
33	13.2 Travel Grants for countries in need		0,0	0,0	0,0	60,0	60,0		
34	13.3 Other Travel Grants		0,0	0,0	0,0	40,0	40,0		
35	14. SYMPOSIA		20,0	20,0	20,0	0,0	60,0		
36	14.1 Symposia		20,0	20,0	20,0	0,0	60,0		
37	15. ASSOCIATIONS		257,2	261,9	267,3	272,7	1059,1		
38	15.1 Allocations		257,2	261,9	267,3	272,7	1059,1		
39	16. DUES		30,0	30,0	30,0	30,0	120,0		
40	16.1 ICSU		30,0	30,0	30,0	30,0	120,0		
41	17. ICSU GRANTS		0,0	0,0	0,0	0,0	0,0		
42	17.1 --		0,0	0,0	0,0	0,0	0,0		
43	18. UNION ACTIVITIES		62,5	62,5	62,5	62,5	250,0		
44	18.1 GRC, SEDI, CMG, UCIDI, CCEC, WG		26,0	26,0	26,0	26,0	104,0		
45	18.2 Inter-Union Science (ILP)		15,0	15,0	15,0	15,0	60,0		
46	18.3 Liaison Officers		10,0	10,0	10,0	10,0	40,0		
47	18.4 International Scientific Programs		6,0	6,0	6,0	6,0	24,0		
48	18.5 New commissions (UCPS)		5,5	5,5	5,5	5,5	22,0		
49	19. FEES		8,0	8,0	8,0	8,0	32,0		
50	19.1 Professional Services		5,0	5,0	5,0	5,0	20,0		
51	19.2 Bank Fees		3,0	3,0	3,0	3,0	12,0		
52	20. CONTINGENCIES		2,5	2,5	2,5	2,5	10,0		
53	21. TOTAL EXPENDITURES		510,2	529,9	520,3	640,7	2201,1		
54	22. OUTGOING BALANCE 2019		513,8	518,7	544,0	477,0	477,0		
55									
56									

QUADRENNIAL REPORTS OF THE ASSOCIATIONS

QUADRENNIAL REPORT OF THE INTERNATIONAL ASSOCIATION OF CRYOSPHERIC SCIENCES

INTRODUCTION

The International Association of Cryospheric Sciences (IACS) is the eighth and youngest Association of the International Union of Geodesy and Geophysics (IUGG). IACS is concerned with snow and ice science, and it provides expert advice on cryospheric issues to governmental and non-governmental organisations. Most snow and ice research within IUGG was previously covered within the International Commission on Snow and Ice (ICSI), a commission of the International Association of Hydrological Sciences (IAHS). The IUGG Council voted to establish IACS at the IUGG General Assembly in Perugia, Italy in 2007. This is hence the third Quadrennial report of IACS as an independent Association, the first having covered the period from 2007-2010, and the second from 2011-2014.

The objectives of IACS are to:

- promote studies of cryospheric subsystems of the Earth solar systems,
- 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

The business of IACS is managed by a Bureau of elected officers. Members of the present Bureau were elected at the Plenary Administrative Session in Prague in 2015 and has mostly remained stable during the last quadrennium. The officers have been President (Charles Fierz until February 2017 whence he became immediate Past-President), President-Elect (Regine Hock – until February 2017 whence she became President), Secretary General (Andrew Mackintosh, New Zealand), three Vice-Presidents (Olga Solomina, Russia, replaced by

Stanislav Kutuzov, Russia in May 2018; Xiao, Cunde, China, and Ian Allison, Australia) and the heads of five disciplinary Divisions (Glaciers and Ice Sheets, Liss Marie Andreassen, Norway; Snow and Avalanches, Ethan Greene, USA; Marine and Freshwater Ice, Hirouyuki Enomoto, Japan; Planetary and Other Ices of the Solar System, Christine Schott Hvidberg, Denmark; and Cryosphere, Atmosphere and Climate, Valérie Masson-Delmotte, France, deputised by Anais Orsi, France). The President, President Elect/Immediate Past President, and Secretary General make up the IACS Executive (EC). Most internal business of the Association and interaction with other scientific agencies is conducted by email. In addition, the EC conducts monthly teleconferences, which bureau members are invited to join. The Bureau meets in person once per year. Bureau meetings (BM) during this quadrennium were held in Prague, Czech Republic (BM11), by Video conference BM12), in Christchurch, New Zealand (BM13), and Davos Switzerland/and by videoconference (BM14). Minutes of these meetings are available on the IACS website, www.cryosphericciences.org. A plenary meeting with the IACS stakeholders, and the cryospheric science community, was held in Prague in 2015, while an Open Bureau Meeting was held in Wellington in 2017.

The current four-year term of most Bureau members finishes in July 2019, and a “nominating panel” of members independent of the Bureau (Ralf Greve, Japan, Barbara Stenni, Italy and Samuel Morrin, France) was established in November 2018 to identify suitable candidates for election to the Bureau. The nominating panel’s role is to ensure that candidates for the IACS Bureau provide a good coverage of world regions and cryospheric disciplines. The new slate of candidates will be circulated to National Committees at least three months prior to its Plenary Administrative Session, to be held in Montreal on Friday July 12th, 2019.

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/iacsryo>. Together, the website and twitter presence are helping to connect IACS to a larger community of engaged scholars and the public.

IACS bureau members working on Intergovernmental Panel on Climate Change report

Since October 2017, 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, which will be published towards the end of 2019. IACS officers attended four Lead Author meetings (in Nadi, Fiji, October 2017, Quito, Ecuador, February 2018, Lanzhou, China, July 2018, Kazan, Russia in February 2019), and spent many 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'.

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. Here is a summary of IACS Working Group Activity during the last four years.

- The MICROSNOW Working Group (2012-2016) held a series of very useful workshops and scientific intercomparison exercises. For more information, see [here](#).
- The Randolph Glacier Inventory and infrastructure for glacier monitoring Working Group (2014-2019) 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 IACS Working Group on Glacier ice thickness estimation (2014-2019) has been very successful, and has just had its second scientific output published in the leading journal [Nature Geoscience](#).
- The IACS Working Group on Debris Covered Glaciers was established in late 2018, and will extend until 2022. The aim of this 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.

International Symposium on the Cryosphere in a Changing Climate, Wellington, NZ

IACS held its 2017 scientific assembly from 12-17 February 2017 in Wellington, New Zealand. This meeting brought together three of the leading international associations focusing on the cryosphere; the International Association of Cryospheric Sciences (IACS), the International Glaciological Society (IGS) and the World Climate Research Programme Climate and Cryosphere Project (WCRP CliC). This conference was held at Victoria University of Wellington, Andrew Mackintosh's home institution. Andrew chaired the Local Organising Committee while Ian Allison chaired the Scientific Steering Committee. Around 250 delegates from ~30 countries attended this conference. IACS provided travel grants to allow more than 15 early career scientists and scientists from developing countries to attend this meeting. Attendees included senior and chief editors of the

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journals *Nature* and *Nature Climate Change* respectively. About 30 delegates also attended the pre- and post-conference field trips to Tongariro and Aoraki/Mt Cook National Parks. Overall, this conference was a major success.

Other meetings and symposia sponsored by IACS

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. Below we list the meetings or events that we have sponsored between 2014-2018.

1. International Glaciology Society *International Symposium on Glaciology in High Mountain Asia*, 1-6 March 2015, Kathmandu Nepal.
2. First *APECS World Summit: The Future of Polar Research*, Sofia, Bulgaria, 6-8 June 2015.
3. 1st *Snow Science Winter School*, Sodankylä, Finland, 8-14 February 2015.
4. 2nd *Snow Science Winter School*, Preda, Switzerland, 14-20 February 2016.
5. World Glacier Monitoring Service *Training Course for Glacier Mass Balance Measurements and Analysis*, Bolivia, 10-16 July 2016.
6. *International Summer School in Glaciology*, McCarthy, AK, USA, June 2016.
7. 6th International Conference on Mars Polar Science and Exploration, Reykjavik, Iceland, 5-9 September 2016.
8. *International Glacial Seismology Training School*, 11-17 June 2017, Fort Collins, CO, USA.
9. Past Antarctic Ice Sheet Dynamics (PAIS) conference, September 10-15, 2017, Trieste, Italy.
10. *International Workshop on Cryospheric Change and Sustainable Development*, 1-2 August 2017, Lanzhou, China.
11. *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).

12. *International Summer School in Glaciology*, McCarthy Alaska from June 5-15, 2018
13. *International Workshop on Cryospheric Changes and their Regional and Global Impacts*, Dunhuang China, from July 31 - August 1, 2018.
14. *4th Nordic Workshop on Cosmogenic Nuclides; Landscape development and geohazards*. 4-6 June 2018, Norway.
15. *4th Snow Science Winter School* at Col du Lautaret, France, from 11-17 February 2018.

IACS early career scientist award

The IACS early career scientist award was initiated in 2016. This award is 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 1st, 2019).

FUTURE ACTIVITIES AND ANNOUNCEMENTS

27th 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 has begun planning for a joint meeting with IAMAS and IAPSO (MOCA-21) to be held in the Northern Hemisphere summer in Busan, South Korea.

Regine Hock, IACS President
Andrew Mackintosh, IACS Secretary General

QUADRENNIAL REPORT OF THE INTERNATIONAL ASSOCIATION OF GEODESY

INTRODUCTION

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

IAG Council

The Council met during the IUGG General Assembly 2015 in Prague, Czech Republic, and the IAG-IASPEI Scientific Assembly 2017 in Kobe, Japan. The list of delegates forming the IAG Council was updated regularly in contact with the IUGG Secretariat. The Council was also informed by e-mail about activities of the Bureau and the Executive Committee.

IAG Executive Committee (EC)

The Executive Committee is composed by the IAG President, immediate Past-President, Vice-President, Secretary General, the four Commission Presidents, the Chairperson of GGOS, the President of the COB, three representatives of the Services, and two members at large. 7 EC meetings were held from July 2015 to the end of 2018: Prague, Czech Republic, July 2015, San Francisco, CA/USA, December 2015, Potsdam, Germany, April 2016, Vienna, Austria, April 2017, Kobe, Japan, July-August 2017, Vienna, Austria, April 2018, and Washington DC, USA, December 2018. Minutes are available for the EC members, and meeting summaries published in the IAG Newsletter (by e-mail, in the IAG Homepage <http://www.iag-aig.org> and in the IAG Office Homepage <http://iag.dgfi.tum.de>) and in IAG's Journal of Geodesy.

IAG Bureau

The IAG Bureau, consisting of the President, the Vice-President and the Secretary General, had steady contact by e-mail, held teleconferences and met before EC meetings. The President and Secretary General participated in the IUGG Executive Committee Meetings.

IAG Office

The IAG Office assists the Secretary General in the administrative organization of all IAG business, meetings and events. This includes the budget management, the record keeping and fee accounting of the individual IAG membership, and the preparation and documentation of all Council and Executive Committee meetings with detailed minutes for the EC members and meeting summaries published in the IAG Newsletters and the IAG Homepage. Important activities were the preparation and execution of the joint IAG-IASPEI Scientific Assembly 2017, the edition of the Geodesist's Handbook 2016 as the organizational guide of IAG with the complete description of the IAG structure (reports, terms of reference, documents), and the Mid-Term Reports 2015–2017 (Travaux de l'AIG Vol. 40). The accounting of the Journal of Geodesy and the IAG Symposia series, both published by Springer, were supervised. Travel grants for young scientists to participate in IAG sponsored symposia were handled.

Communication and Outreach Branch (COB)

The task of the COB is the IAG public relation in particular by maintaining the IAG Homepage and publishing the monthly Newsletter online and in the Journal of Geodesy. It also keeps track of all IAG related events by the meetings calendar. The IAG newsletter is sent to all IAG Officers, individual members, the Presidents and Secretaries General of the IUGG Associations and liaison bodies. The COB prepared, printed and distributed the IAG leaflet and IAG brochure and participated in the preparation of the Geodesist's Handbook 2016.

Commissions and Inter-Commission Committee

The four IAG Commissions (Reference Frames, Gravity Field, Earth Rotation and Geodynamics, Positioning and Applications) and the Inter-Commission Committee on Theory established their structure and scientific programme for the period 2015 – 2019 (published in the Geodesists' Handbook 2016) and coordinated their implementation. They reported regularly to the EC and prepared the mid-term reports 2015 – 2017 for publication in the IAG Reports (Travaux de l'AIG). Each Commission maintained its individual Homepage and held several symposia, workshops and other meetings (see below). All of them organised a symposia at the IAG-IASPEI Scientific Assembly 2017 and planned symposia for the General Assembly 2019.

Services

There are thirteen IAG Services, which split into three general fields: geometry (IERS, IDS, IGS,

ILRS, and IVS), gravity (IGFS, ICGEM, IDEMS, IGeS, IGETS and BGI) and overlapping (BIPM and PSMSL). All of them maintain their own Homepages and data servers and hold their administrative meetings (Directing Board or Governing Board, respectively). They published their structure and programme 2015 – 2019 in the Geodesists' Handbook 2016, and the progress reports 2015 – 2017 in the IAG Reports (Travaux de l'AIG). Most of the Services held international meetings (see below).

Global Geodetic Observing System (GGOS)

The GGOS is IAG's observing system to monitor the geodetic and the global geodynamic properties of the Earth as a system. A new structure was implemented during the period 2015 to 2018 and the Terms of Reference were updated. It includes a Consortium composed by representatives of the Commissions and Services, the Coordinating Board as the decision-making body, the Executive Committee, and the Science Panel. The scientific work of GGOS includes Bureaus, Focus Areas, and Working Groups. A new GGOS Coordinating Office was established for all organizational affairs, to maintain the GGOS website (www.ggos.org), an exhibit booth, and brochures and books. Informative GGOS days were held annually.

Coordination with other organizations

IAG maintains close cooperation with several organizations outside IUGG. There were frequent meetings with the Advisory Board on the Law of the Sea (ABLOS, together with IHO), Group on Earth Observation (GEO, with IAG as a participating organization), International Standards Organization (ISO, TC211 Geographic Information / Geomatics), 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

At present IAG counts 207 individual members, students are free of charge.

Meetings

IAG sponsored meetings from July 2015 to December 2018 were:

- International DORIS Service (IDS) Analysis Working Group Meeting, Greenbelt, MD, USA, 15-16 October 2015.
- International Laser Ranging Service (ILRS) Analysis Working Group Meeting, Matera, Italy, 24 October 2015.

- International Laser Ranging Service (ILRS) Technical Workshop 2015, Matera, Italy, 26-30 October 2015.
- Latin American Reference System (SIRGAS) Symposium, Santo Domingo, Dominican Republic, 18-20 November 2015.
- 9th International Symposium on Mobile Mapping Technology (MMT2015), Sydney, Australia, 9-11 December 2015.
- IGS Workshop, Sydney, Australia, February 15-19, 2016;
- 9th IVS General Meeting, Ekudeni (Johannesburg), South Africa, March 13-17, 2016;
- 3rd Joint Symposium on Deformation Monitoring, Vienna, Austria, March 30 – April 1, 2016;
- 4th IAG Symposium “Terrestrial gravimetry: Static and mobile measurements”, Saint Petersburg, Russia, April 12-15, 2016;
- European Reference Frame Symposium (EUREF 2016), San Sebastian, Spain, May, 25-27, 2016;
- 18th Geodynamics and Earth Tide Symposium 2016, Trieste, Italy, June 5-9, 2016;
- Joint IAU/IAG/IERS Symposium “Geodesy, Astronomy and Geophysics in Earth Rotation (GAGER2016)”, Wuhan, Hubei, China, July 18-23, 2016;
- Int. Symposium on Geodesy and Geodynamics (ISGG2016), Tianjin, China, July 22-26, 2016;
- 1st International Conference on GNSS+ (ICG+2016), Shanghai, China, July 27-30, 2016;
- IAG Commission 4 “Positioning and Applications” Symposium, Wroclaw, Poland, September 4-7, 2016;
- 18th General Assembly of WEGENER “Understanding earth deformation at plate boundaries”, Ponta Delgada, Azores, Portugal, September 12-15, 2016;
- 1st Joint Commission 2 and IGFS Meeting, International Symposium on Gravity, Geoid and Height Systems 2016 (GGHS2016), Thessaloniki, Greece, September 19-23, 2016;
- First International Workshop on VLBI Observations of Near-field Targets, Bonn, Germany, October 5-6, 2016;
- 20th International Workshop on Laser Ranging, Potsdam, Germany, October 9-14, 2016;
- GGOS Days, Cambridge, MA, USA, October 24-28, 2016;
- IDS Workshop, La Rochelle, France, October 31 – November 1, 2016;

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- Reference Frame for South and Central America Symposium (SIRGAS2016), Quito, Ecuador, November 16-18, 2016;
- 1st International Symposium - Applied Geomatics and Geospatial Solutions, Rosario, Argentina, April 3-7, 2017;
- 9th IVS Technical Operations Workshop, Westford, MA, USA, April 30 – May 4, 2017;
- EUREF 2017 Symposium, Wroclaw, Poland, May 17-19, 2017;
- DORIS Analysis Working Group Meeting, London, UK, May 22-24, 2017;
- 21st Meeting of the Consultative Committee for Time and Frequency, Sèvres, France, June 6-9, 2017;
- 1st IUGG Symposium on Planetary Science, Berlin, Germany, July 3-5, 2017;
- IGS Workshop 2017, University of Paris-Diderot, France, July 3-7, 2017;
- IAG/GGOS/IERS Unified Analysis Workshop, Paris-Diderot, France, July 10-12, 2017;
- 2017 GNSS Tsunami Early Warning System Workshop, Sendai, Japan, July 25-27, 2017;
- IAG and IASPEI Joint Scientific Assembly, Kobe, Japan, July 30 – August 4, 2017;
- Asia-Pacific Space Geodynamics Symposium, Shanghai, China, August 15-18, 2017;
- Workshop on Glacial Isostatic Adjustment and Elastic Deformation, Reykjavik, Iceland, September 5-7, 2017;
- 3rd COSPAR Symposium “Small Satellites for Space Research”, Jesu, South Korea, September 18-19, 2017;
- IAG Workshop “Satellite Geodesy for Climate Studies”, Bonn, Germany, September 19-21, 2017;
- Journées des Systèmes de Référence et de la Rotation Terrestre, Paris, France, September 25-27, 2017.

The following IAG Schools were sponsored from July 2015 to June 2017:

- VII SIRGAS School on Reference Systems, Santo Domingo, Dominican Republic, 16-17 November 2015.
- 2nd IVS Training School on VLBI for Geodesy and Astrometry, Hartebeesthoek, South Africa, March 9-12, 2016;
- ISG Geoid School, Ulaanbaatar, Mongolia, June 6 – 10, 2016;
- SIRGAS School on Vertical Reference Systems, Quito, Ecuador, November 21 – 25, 2016;

Publications

The Journal of Geodesy, the official IAG scientific periodical with an Editor in Chief approved by the IAG Executive Committee, published continuously monthly issues in Springer-Verlag.

The IAG Symposia Series published the following volumes 2015-2017:

- VIII Hotine-Marussi Symposium on Mathematical Geodesy 2013, IAG Symposia Vol. 142, Springer 2016;
- IAG Scientific Assembly, Potsdam 2013, IAG Symposia Vol. 143, Springer 2016;
- 3rd International Gravity Field Symposium 2014, IAG Symposia Vol. 144, Springer 2017;
- International Symposium on Geodesy for Earthquake and Natural Hazards (GENAH), IAG Symposia Vol. 145, Springer 2017;
- IAG Commission 1 Symposium REFAG 2014, IAG Symposia Vol. 146, Springer 2016.

The IAG Reports (Travaux de l’AIG) Vol. 39 (2015) and 40 (2017) include reports of all IAG components.

Awards, anniversaries, obituaries

The following medals and prices have been awarded:

- Levallois Medal to Rainer Rummel, Germany (2015);
- Bomford Prize to Yoshiyuki Tanaka, Japan (2015);
- Young Author Award to Xingxing Li, Germany (2015);
- Young Author Award to Olga Didova, The Netherlands (2016);
- 102 Travel Awards to young scientists for participating and presenting their research at 19 IAG sponsored symposia with a total of 58900 EURO.

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

- Bob Schutz, USA, 1940 – 2015;
- Suriya Tatevian, Russia, 1937 – 2015;
- Camil Gemael, Brazil, 1922 – 2015;
- Graciela Font, Argentina, 1940 – 2015;
- John Wahr, USA, 1951 – 2015;
- Alexander Kopaev, Russia, 1962 – 2016;
- Heinz Henneberg, Venezuela, 1926 – 2016;
- Hermann Seeger, Germany, 1934 – 2016;
- Barbara Kolaczek, Poland, 1931 – 2017;
- Bernard Guinot, France, 1925 – 2017;
- Dieter Lelgemann, Germany, 1939 – 2017;
- Klaus Linkwitz, Germany, 1927 – 2017;
- József Závoti, Hungary, 1949 – 2017;

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- Yoshihide Kozai, Japan, 1928 – 2018;
- Marcin Barlik, Poland, 1944 – 2018;
- Jean O’Brien Dickey, USA, 1945 – 2018;
- Jean Kovalevsky, France, 1929 – 2018;
- Hermann Maelzer, Germany, 1925 – 2018;
- Michel Louis, France, 1930 – 2018;
- Mikhail Tikhonovich Prilepin, Russia, 1929 – 2018.

PLANNED FUTURE ACTIVITIES

Main activities in the coming period concern the implementation of the updated IAG strategy, a new IAG structure, the cooperation in the Subcommittee on Geodesy of the United Nations Committee of Experts on Global Geospatial Information Management (UN-GGIM), and the next IAG Scientific Assembly in 2021.

The Executive Committee wrote a strategy document 2019, which lists visions and options that may lead to a revision of the present Statutes and

Bylaws, and presented it to 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).

Based on the responses to a call for bids, the IAG Council elected the Chinese Adhering Organization to host the next IAG Scientific Assembly 2021 in Beijing.

Hermann Drewes, IAG Secretary General

QUADRENNIAL REPORT OF THE INTERNATIONAL ASSOCIATION OF GEOMAGNETISM AND AERONOMY

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

In 2015, during the IUGG General Assembly, the Conference of Delegates elected a new Executive Committee for the quadrennium 2015-2019. The new leaders for the Divisions and Commissions and their Working Groups were appointed by the Executive Committee and confirmed by the Conference of Delegates. Important to note is that since 2015, IAGA moved from five to six Divisions and four Inter-divisional Commissions, each led by a Chair and a Co-Chair.

ACTIVITIES

Outstanding frontiers of research in geomagnetism and aeronomy in the period 2015-2018 have included a wide range of new results, in diverse domains of Association activities. The increased interest in studying the Earth's magnetic field is underlined by the Swarm satellite mission launched by ESA in 2013. This constellation of three satellites offers an unprecedented opportunity to achieve an improved separation between the internal and external magnetic field sources, a detailed mapping of the large-scale lithospheric magnetic field, and multi-point monitoring of magnetic disturbances and related aeronomic processes for space weather applications.

ASSEMBLIES

2015: The XXVIth IUGG General Assembly

The IAGA programme efficiently run over the first part of the meeting, held in a conference centre which provided an excellent space for poster viewing and the exhibition, as well as plenty of varied sized rooms for oral presentations. This gave us the chance to catch up with latest developments in our own research, as well as take in some of the more inter-disciplinary topics. The meeting provided many opportunities for scientists to discuss different themes, over breaks, poster sessions, and the IAGA special dinner.

2017: The Joint IAPSO-IAMAS-IAGA Assembly

The main event in 2017 was the Joint IAPSO-IAMAS-IAGA Scientific Assembly which officially closed on Friday 1st September 2017. The conference was a highly successful Joint Assembly organised at Cape Town's CTICC, and the first of its kind between the three IUGG associations. Lasting a full 5 days, the Joint Assembly had a total of 1038 registrations (383 for IAGA). IAGA was indeed well represented, with 557 out of 1356 abstracts (the conference abstracts are available on the IAGA web).

IAGA Awards & Honors

In Prague and Cape Town it was a pleasure to recognise the achievements of IAGA scientists at all stages of their careers at the Open and Awards ceremonies:

Recipients of the Shen Kuo Award for Interdisciplinary Achievements

Jeffrey Forbes	USA	2017	IAGA News 54
Daniel Baker	USA	2015	IAGA News 52

Recipients of the IAGA Long Service Medal

Jean Rasson	Belgium	2017	IAGA News 54
Hans-Joachim Linthe	Germany	2015	IAGA News 52
John Riddick	UK	2015	IAGA News 52

Recipients of the IAGA Young Scientist Award

Emma Douma	NZ	2017	IAGA News 54
Katarzyna Dudzisz	PL	2017	IAGA News 54
Federico Gasperini	USA	2017	IAGA News 54
Erin Dawkins	UK	2015	IAGA News 52

Rémi Thiéblemont	Germany	2015	IAGA News 52
Israel Silber	Israel	2015	IAGA News 52
Maria Mendakiewicz	Poland	2015	IAGA News 52

IAGA SCHOOLS

The 2nd IAGA School

The second IAGA School took place in Prague, June 15-21, 2015. The IAGA School was very successful, based on feedback received to date. Twenty-two students from 14 countries (of 13 nationalities) participated; most were nominated by Division and Working Group Chairs. Seven lectures, followed by practical and computational exercises, by distinguished experts covered a large variety of IAGA topics. All students stayed in same hotel; this greatly prompted friendship and networking among them.

The whole event took place in a very informal and friendly — though hard-working! — atmosphere. Not only the students, but also the lecturers enjoyed the event very much. All the students became highly visible during the IUGG General Assembly.

The 3rd IAGA School

The third IAGA Summer School took place at SANSa Space Science in Hermanus, South Africa, from 20-26 August 2017 (the week before Scientific Assembly of IAPSO-IAMAS-IAGA). The event was attended by 19 post-graduate students from 15 countries worldwide (e.g., Algeria, Brazil, Mexico, India, Japan, Russia, Poland, UK, South Africa). The attendees included students nominated for the IAGA Young Scientist Award, or nominated by the IAGA Division and Working Group leaders. Altogether 6 topics across all the disciplines of IAGA were covered by lectures given by experts in their fields. Lectures were accompanied by practical projects that students worked on in groups and presented on the last afternoon. Interactions among students and between students and lecturers were very friendly and informal, and friendships and networks were formed. Both, students and lecturers gave very positive feedback on the event.

IAGA Sponsored Topical Meetings

Over the four-year period (2015-2018) IAGA sponsored 25 topical meetings covering large parts of the IAGA science. The meetings were well distributed geographically to make them available to a larger number of scientists. The IAGA financial contributions were directed mainly at helping young and needy scientists attendance.

IAGA Publications

IAGA News 52-55, containing information about IAGA activities and the Executive Committee decisions have been distributed annually, and can be found on the IAGA website http://www.iugg.org/IAGA/iaga_pages/pubs_prods/public_relation.html.

Similarly, there is much valuable information via the IAGA website <http://www.iaga-aiga.org>

PLANNED 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 meeting 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 this centenary, a paper will be published in 2019 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

QUADRENNIAL REPORT OF THE INTERNATIONAL ASSOCIATION OF HYDROLOGICAL SCIENCES

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 (HSJ), 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

Elections were held during the 2015 General Assembly. Every elected person took position immediately except Presidents of Association itself and of the 10 Commissions, who became Presidents elect and then acting Presidents during the 2017 Plenary in Port Elizabeth. At the Association level, Günter Blöschl (Austria) became President, after Hubert Savenije (The Netherlands). Bureau meetings have been held in Prague (2015), UNESCO – Paris (2016), Port Elizabeth (2017), Vienna (2018).

Zbigniew Kundzewicz (Poland), Mike Acreman (United Kingdom) and Demetris Koustoyiannis (Greece) stepped down from positions of co-editor of Hydrological Sciences Journal, respectively in 2015, 2017 and 2018; and Attilio Castellarin (Italy), Ross Woods (New Zealand) and Stacey Archfield (USA) became co-editors respectively in 2015, 2016 and 2018. The IAHS Press and executive secretariat keeps on benefitting of an excellent hosting by CEH in Wallingford (United Kingdom) and went through important changes. Cate Gardner retired from the IAHS Press office head after many years of services, and Claire Lupton has been recruited as the new executive secretary in 2015. Frances Watkins celebrated 25 years of services in editing articles of Hydrological Sciences Journal in 2018, and was joined by Sara Rafferty. As Charles Onstad (USA) stepped down from the position of treasurer in 2016, all the IAHS finances have been reorganized in the United Kingdom, Cate Gardner playing a key role as transitional Treasurer, until Kate Heal (United Kingdom) became Treasurer in 2018. The board of the IAHS UK Charity Limited was reorganized to reflect evolutions of the publication activity, of the IAHS Press staff, and of the financing organisation. In addition to changes in the association governance, trustees and secretary of the board with UK Citizenship have rotated – Des Walling, John Rodda, Gwyn Rees and Mike Acreman stepping down, Helen Houghton-Carr joining, Cate Gardner and Kate Heal chairing.

The IAHS bureau set up in 2018 an Early Career Committee composed of one representative from every commission and chaired by Nilay Dogulu (Turkey); and a committee for Africa chaired by Gil Mahé (France, both President of ICSW and co-chair of UNESCO Friend).

ACTIVITIES

In the frame of the IUGG 2015 General Assembly in Prague (Czech Republic), IAHS organized 21 Symposia and Workshops and co-convened several

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inter-association and union events. Miroslav Tesar has been a key focal point for IAHS in the Local Organizing Committee. WMO and UNESCO co-convoked two of these symposia.

The Xth Scientific Assembly of the Association was held in Port Elizabeth, South Africa, from 10 to 14 July 2017. The assembly was organized by the South African National Committee of the IAHS and Rhodes University, Grahamstown; ultimately by Denis Hughes, Graham Jewitt and their teams, in close cooperation with the IAHS secretariat. Waternet, a major Southern African regional network of universities and institutes in the field of integrated water resources management, has been involved as a key partner. The overall theme of the meeting was “Water and Development: Scientific Challenges in Addressing Societal Issues”. UNESCO, WMO and UNU co-convoked several sessions, and UNESCO further inscribed a specific workshop on Hydro-diplomacy in the Assembly.

Many efforts have been also dedicated to organize the IAHS programme and presence, as well as Joint events with sister Associations and UN partners (WMO, UNESCO, UNU), for the IUGG 2019 General Assembly in Montreal (Canada). Montpellier (France) has been selected in 2017 for the 2021 IAHS Scientific Assembly.

IAHS and its Commissions and Working Groups have (co-)organized many conferences across the World, in particular the following series:

- STAHY International workshops on Statistical Hydrology in Québec (Canada), 2016; Warsaw (Poland), 2017; Adelaide (Australia), 2018;
- ICCE Symposia on Erosion and Sedimentation in Exeter (United Kingdom), 2016; Moscow (Russia), 2018;
- ICWRS Conferences on Water Resources Management in Bochum (Germany), 2016; Beijing (China), 2018;
- HydroEco on HydroEcology in Vienna (Austria), 2015; Birmingham (United Kingdom), 2017;
- GQ Conferences on Groundwater Quality in Shenzhen (China), 2016;
- ICRS Conferences on Remote sensing applied to Hydrology in Cordoba (Spain), 2018;
- Concerenced on Panta Rhei and development issues in Shenzhen (China), 2016; Gorgan (Iran), 2017; Harare (2018);
- Panta Rhei sessions in EGU and AGU Assemblies every year, respectively in Vienna (Austria) and San Francisco / New Orleans / Washington DC (USA);

- Summer schools on PUB – Prediction in Ungauged Basins in Vienna (Austria), every year;
- MOXXI workshops at ESA, Frascati (Italy), 2016; WMO, Geneva (Switzerland), 2017;
- WMO-IAHR-IAHS International hydrometry workshops in Queenstown (New Zealand), 2016; Grenoble (France), 2018;
- UNESCO-IAHS Kovacs colloquium on ‘Water related SDGs’ and its evolution towards the SPIC – Science Policy Interface Colloquium in UNESCO, Paris (France), respectively in 2016 and 2018;

the following stand alone events:

- Colloque International sur les Ressources en Eau et le Développement Durable in Algiers (Algeria), 2016;
- Drought in the Anthropocene Panta Rhei workshop in Freiburg (Germany), 2017;
- Atlas Georesources International Congress in Hammamet (Tunisia), 2017, 2018;
- Panta Rhei Symposium on comparative socio-hydrology of floods, droughts and water management in Beijing (China), 2018;
- International Symposium of Eco-hydrology and water security in Xi’ian (China), 2018;

and the following contributions to:

- Freshwater sessions at the Pre-COP21 of the UN Convention against Climate Change, Our common future under climate change conference in Paris (France), 2015;
- ESA 3rd Space for hydrology workshop in Frascati (Italy), 2015;
- NISOLS, International symposium on land subsidence in Nagoya (Japan), 2015;
- Waternet Symposia in Gaborone (Botswana), 2016; Swakopmund (Namibia), 2017; Livingstone (Zambia), 2018;
- WMO Conference for Prosperity through Hydrological Services (HydroConference) in Geneva (Switzerland), 2018;
- UNESCO Friend African large river basins hydrology in Hammamet (Tunisia), 2015; Algiers (Algeria), 2018;
- UNESCO Friend World Conference in Beijing (China), 2018;

WMO, UNESCO, Taylor and Francis allocated funds to IAHS, and IAHS allocated proper funds to support delegates from countries in need to participate to the Assemblies. The IAHS bureau set

up in 2018 a permanent mechanism to support early career scientists from disadvantaged countries to attend IAHS conferences, named SYSTA – Sivapalan Young Scientist Travel Award, named after Murugesu Sivapalan (Sri Lanka, USA).

IAHS coordinated the IAHS-UNESCO-WMO International Hydrology Prize, Dooge and Volker Medals; and bestowed the Tison Award for young hydrologist every year. The Prize ceremonies were held during the 2015 Prague and 2017 Port Elizabeth Assemblies; and during the UNESCO-IAHS Kovacs colloquium in UNESCO Headquarters in 2016, and the WMO Conference for Prosperity through hydrological services in WMO Headquarters in 2018.

IAHS Press published in cooperation with Taylor and Francis the Hydrological Sciences Journal, HSJ, increasing the number of annual issues from 12 to 16 in 2016. The bureau decided in 2015 to discontinue bilingualism of Hydrological Sciences Journal and the last paper in French was published in 2017. 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 from the online display, on Author’s paying principle. An Editorial retreat of HSJ was held with many of the Associate Editors, articulation with the bureau members, and support from Taylor and Francis, in Port Elizabeth in 2017.

Three special issues have been published in 2015, (Evaluation of water resources with SWAT; Modelling temporally-variable catchments; African hydrology research); two in 2016 (Hydrology and Peace in the Middle East; Facets of Uncertainty); and three are under preparation (Hydrological change in Chinese rivers; Hydrological data: Opportunities and barriers; Advancing socio-hydrology: a synthesis of coupled human-water systems across disciplines). A special series of HSJ Opinion Papers directly linked to Panta Rhei was launched in 2016, and is lively with key papers and following up discussions and replies, on a broad range of stakes from socio-hydrology to experimental needs and Water-Energy-Food Nexus methods and epistemologies.

IAHS Press also published the two last Red books of the series began in 1924 and supervised the transition in 2015 towards the new PIAHS open-access e-book series, in cooperation with Copernicus, with numbering and indexing in continuity with the Red Book series. Volumes are now published on a regular basis from IAHS Assemblies and conferences as well as as outcomes of partners’ events and initiatives.

The IAHS TFDC (Task Force for Developing Countries) finished its action in distributing free of charge all IAHS publications to more than 60 selected Universities and Research Institutions of Africa, Asia, South-America and Eastern Europe since decades; as PIAHS volumes are now open access and digitized archives of the IAHS Red books have been made available within the recently relaunched website. Complimentary access to hydrologists from many countries in needs can have free online access to HSJ.

The second and third joint editorials have been published in seven and eleven major hydrological journals, including HSJ and PIAHS:

- Koutsoyiannis D. et al. 2016. Joint editorial – Fostering innovation and improving impact assessment for journal publications in hydrology. HSJ 61 (7) 1170-1173.
- 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 coordinating teams operating over the 2015-2017 and 2017-2019 biennia, respectively chaired by Hillary McMillan (New Zealand, USA), and Giuliano di Baldassare (Italy, Sweden). Stand alone and joint events, a special series of conferences in emerging and developing countries, the opinion paper series in HSJ, labelled articles in other Journals, and the following progress article have been structuring the agenda-setting initiative:

- McMillan et al., 2016. Panta Rhei 2013–2015: global perspectives on hydrology, society and change. HSJ 61 (7), 1174–1191.

The MOXXI Working Group, chaired by Flavia Tauro (Italy) is transversal to most of the Commissions and ran three dedicated workshops, the two latter jointly with WMO Hydrohub, facilitating dialogue between academia, hydrometeorological operational services, and innovating companies. A MOXXI community article has been published:

- Tauro F. et al., 2018. Measurements and observations in the XXI century (MOXXI): innovation and multi-disciplinarity to sense the hydrological cycle. HSJ 63 (2), 169–196.

The CANDHY working group was created in 2017, chaired by Fernando Nardi (Italy), and joined the MOXXI working group in organising a workshop for early 2019 in New York City (USA).

In Port Elizabeth, 2017, President Günter Blöschl initiated the UPH – Unsolved Problems in Hydrology initiative. IAHS coordinated the corporate process over 2017-2018 to identify the list

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of UPH, relying on an online forum, meetings, articulation with IAH - AGU - EGU divisions of hydrology, and the collective writing of an agenda setting article to be published in HSJ in 2019.

The close cooperation of IAHS with UNESCO, WMO and the UN Water mechanism has been continued. We have especially contributed to the World Water Development Reports WDRR 2015-2019, the UN-Task Force on Water and Climate; and attended the UNESCO IHP Intergovernmental Council and Bureau meetings (Paris, France – also as IUGG liaison), the WMO CHy Commission and Advisory Working Group Meetings (Geneva, Switzerland; Rome, Italy – also as IUGG liaison), the WMO HydroHub Innovation committee meetings (Geneva Switzerland, and remote), UN Water meetings (Geneva, Switzerland; Stockholm,

Sweden; 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

QUADRENNIAL REPORT OF THE INTERNATIONAL ASSOCIATION OF METEOROLOGY AND ATMOSPHERIC SCIENCES

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)

President:	John Turner	UK
Vice-Presidents:	Joyce Penner Laura Gallardo Klenner	USA CHILE
Immediate Past President:	Athéna Coustenis	FRANCE
Secretary General:	Teruyuki Nakajima	JAPAN
Deputy Secretary General:	Peter Pilewski	USA
Assistant Secretary General (not voting):	Yoshinobu Sasaki	JAPAN
Members at large:	Daren Lu Colin Price Lisa Alexander Keith Alverson Iracema Cavalcanti	CHINA ISRAEL AUSTRALIA Kenya/USA BRAZIL

Commission presidents (ex officio):

ICACGP:	John P. Burrows	GERMANY
ICAE:	Daohong Wang	JAPAN
ICCL:	Neil Holbrook	AUSTRALIA
ICCP:	Andrea Flossmann	FRANCE
ICDM:	Richard Grotjahn	USA
ICMA:	Elisa Manzini	GERMANY
IOC:	Christos Zerefos	GREECE
ICPAE:	Sanjay Limaye	USA
ICPM:	Tom Lachlan-Cope	UK
IRC:	Werner Schmutz	SWITZERLAND

- 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

2015: John TURNER was elected to serve as president, and Joyce PENNER and Laura GALLARDO KLENNER as vice-presidents. Lisa ALEXANDER, Keith ALVERSON and Iracema CAVALCANTI were elected as new members at large. The immediate past-president Athéna COUSTENIS continues contributing her expertise and experience to assist with IAMAS matters. For the term 2015-2019, the IAMAS Executive Committee consists of the following officers:

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2016: The 2016 Bureau meeting was held in April 2016 in Japan. The Bureau reviewed the IAMAS financial status and activities in 2015, and discussed important items related to the IAMAS management, the plan for future activities such as IAMAS program arrangement for the IAPSO-IAMAS-IAGA Assembly 2017, the host proposals for IAMAS Assembly 2021, and award nominations. New commission officers were elected as follows:

ICCP: President	Andrea Flossmann (Second term)
Vice-President	Greg McFarquhar
Secretary	Darrel Baumgardner (Second term)
IO3C: President	Sophie Godin-Beekman
Vice-President	Paul A. Newman
Secretary	Irina Petropavlovskikh
IRC: President	B.J. Sohn
Vice-President	Peter Pilewskie
Secretary	Marcia Yamasoe

2017: The IAMAS Bureau elected Steven A. Ackerman (USA) as the new Deputy Secretary General, a replacement for Peter Pilewskie. The host of the 2021 IAMAS Science Assembly (Busan, South Korea) was selected. A new commission officer was elected as follows:

ICDM:	Vice-President
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2018: The 2018 physical meeting of the Bureau was held in 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.

ACTIVITIES

IUGG Assembly 2015: The 26th General Assembly of IUGG was held in Prague, Czech Republic over 22 June to 2 July 2015. The meeting was a great success with over 4,300 participants taking part, of which around 550 were associated with IAMAS. There were more than 5,300 presentations given in 202 symposia. IAMAS provided 22 scientific

programmes. The 2015 IAMAS Early Career Scientist Medal was presented to Dr. Yuan Wang of Jet Propulsion Laboratory, USA at the IAMAS Executive Meeting.

IAMAS Scientific Assembly 2017: The IAPSO-IAMAS-IAGA 2017 joint Scientific Assembly was held successfully over 27 August - 1 September 2017 in Cape Town, South Africa. The IAMAS-registered participants constituted 36% of the total attendees of more than 1,000 scientists from 64 countries. IAMAS supported the registration fee/accommodation of 21 young scientists and scientists from developing countries. IAMAS led four joint symposia. Fifteen IAMAS-only symposia were held.

IAMAS Plenary Session 2017: The IAMAS Plenary Session was held on 31 August 2017 which was a great opportunity for the whole IAMAS community to meet together and discuss the possible future direction of the association. The highlight of the plenary session was the presentation of the 2017 IAMAS Early Career Scientist Medal to Corinna Hoose (Karlsruhe Institute of Technology, Germany).

IAMAS Early Career Scientist Event 2017: An Early Career Scientist (ECS) Event was held on 31 August 2017 with about 40 scientists participated, including ECSs, officers of IAMAS and its commissions, mid-career scientists and scientists involved with other ECS organisations. The event was a mixture of talks and networking.

Website and Newsletter: The new official website of IAMAS was launched in January 2016. Also the Newsletter "IAMAS Info-Email" was redesigned and made more readable and attractive, enhancing the interaction and the sharing of information with the commissions.

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.

Publications:

According to the MOU between IAMAS and Advances in Atmospheric Sciences (AAS), AAS has published the articles:

- Special Issue: Impact of a Rapidly Changing Arctic on Eurasian Climate and Weather (Guest Editor Andrew Orr from ICPM)
- Special Issue: Aerosols, Clouds, Radiation, Precipitation, and Their Interactions (Guest

Editors Teruyuki Nakajima and Byung-Ju Sohn from IRC)

- The 10th Antarctic meteorological observation, modeling, and forecasting workshop (ICPM)
- 3rd ANtarctic Gravity Wave Instrument Network (ANGWIN) science workshop (ICPM)
- The Quadrennial Ozone Symposium 2016 (IO3C)
- The International Radiation Symposium 2016 (IRC)
- Putting faces to names: Snapshots of two committee meetings, 95 years apart, emphasize continuous international cooperation in the atmospheric sciences (Hans Volkert, past Secretary General of IAMAS)
- Atmospheric precursors of and response to anomalous Arctic sea ice in CMIP5 models (James Screen, IAMAS Early Career Scientist Medalist)
- Aerosol microphysical and radiative effects on continental cloud ensembles (Yuan Wang, IAMAS Early Career Scientist Medalist)
- A new IASI channel selection and assessment of its impact on Met Office NWP forecasts (IRC)
- 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 (ICPM)
- 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 organized two sessions: JM3 Geochemical Processes and Cycles; M06 Observations of Anthropogenic Aerosol-Cloud Interactions for IUGG Assembly 2015. The International Global Atmospheric Chemistry (IGAC) 2016 Science Conference was held in September 2016 in the USA. iCACGP organized the session M01 Atmospheric Chemistry and Physics for the 21st Century with 44 oral presentations and 11 posters for Cape Town Assembly 2017. The Commission also supported The 3rd Atmospheric Composition and Asian Monsoon Workshop in China in 2017. iCACGP co-hosted the joint 14th iCACGP Quadrennial Symposium and 15th IGAC Science Conference in Japan, in September 2018, which celebrated the 60th anniversary of the establishment of the Commission, and included a keynote presentation on the Commission’s history and awarding of the inaugural Paul Crutzen Early Career Award.

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

ICAE has organized one session for the IUGG 2015 Assembly and one session for the IAPSO-IAMAS-

IAGA Scientific Assembly 2017. ICAE successfully held the 16th International Conference on Atmospheric Electricity in June 2018 in 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 (co-)organized and (co-)sponsored five IAMAS symposia for the IUGG 2015 Assembly. The 13th General Circulation Model Simulations of the East Asian Climate (EAC) workshop took place in China in March 2016 with about 100 participants. ICCL co-organized and co-sponsored five IAMAS symposia and one joint symposia at IAPSO-IAMAS-IAGA 2017 Assembly in South Africa. 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. Prof. Jianping Li, ICCL Executive Secretary-General, attended the IPCC-48 and the 1st Joint Session of Working Groups I, II and III 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/>)

ICCP co-organized four symposia at the IUGG 2015 Assembly. ICCP held its 17th 4-yearly International Conference in UK in July 2016 attending over 450 scientists from 26 countries. The EUFAR/IAMAS/IUGG/ICCP Workshop on Processing of Cloud Probe Data was held in July 2017 in Germany. The 20th International Conference on Nucleation and Atmospheric Aerosols was held in Helsinki, Finland during 25-30 June 2017. Workshop on Evaluation of Cloud Probe Processing Software was held in July 2018 in Canada.

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

ICDM co-sponsored a workshop on “Dynamics of Atmosphere-Ice-Ocean Interactions in the High-Latitudes” held in Norway in 2015: three joint symposia and five IAMAS symposia at the IUGG 2015 Assembly. Commission members completed their book project, the second volume in the IUGG Special Publication Series with Cambridge University Press. ICDM co-sponsored the Workshop on Atmospheric Blocking held in UK in April 2016; three joint and eight IAMAS-only symposia for the IAPSO-IAMAS- IAGA Joint Assembly 2017 in South Africa; five Joint and seven IAMAS symposia for the 27th IUGG Assembly in Montreal in July 2019. The President assisted in developing the IAMAS Strategic Plan document. The commission promoted IAMAS and IUGG support for ‘The 8th GEWEX Science Conference’ held in Canada in 2018.

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

ICMA held the symposium on Middle Atmosphere Science for the IUGG 2015 Assembly. ICMA has also co-sponsored 4 symposia with IAGA. ICMA held the symposium on Middle Atmosphere Science for the IAPSO-IAMAS-IAGA Assembly 2017. ICMA also co-led the joint IAGA-IAMAS JA4 Solar-related Variability of the Atmosphere Symposium. The training school on Stratosphere-Troposphere Interactions was held in September 2017 at the University of Cape Town. ICMA sponsored two workshops; the 10th "Long-Term Changes and Trends in the Atmosphere" workshop, in May 2018 in China and the 4th International "Antarctic Gravity Wave Instruments Network" (ANGWIN) Workshop, in April 2018 in Brazil.

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

The 2016 Quadrennial Ozone Symposium (QOS-2016) was held in UK in September 2016. The Symposium had more than 300 participants from 39 countries, and featured six keynote talks, 75 oral presentations and 270 poster presentations. IOC organized the Symposium for the 30th Anniversary of the Montreal Protocol in September 2017 in France. The proceedings were published in a special issue of *Comptes-rendus Geosciences*.

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

ICPAE has organized oral and poster sessions on terrestrial atmospheres and outer planet atmospheres during the IUGG 2015 Assembly. ICPAE was engaged in the sessions for the IAPSO-IAMAS-IAGA 2017 Assembly in South Africa. ICPAE endorsed a proposal for funding of student travel support for the 74th Fujihara seminar, "International Conference on Venus" held in September 2018 in Japan.

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

ICPM hosted several sessions included Clouds, Precipitation and Aerosols and their Influence on Climate at High Latitudes for the IUGG 2015 Assembly. The 12th Antarctic Meteorological Observations, Modeling, and Forecasting Workshop (AMOMFW) was held in USA in June 2016. The 3rd Antarctic Gravity Wave Instrument Network (ANGWIN) Science Workshop was held in UK in April 2016. Several sessions sponsored and chaired by ICPM members at the 2017 Joint IAPSO-IAMAS-IAGA Assembly in South Africa. The 13th Workshop on Antarctic Meteorology and Climate (WAMC), co-hosted by ICPM, was held in USA, in July 2018.

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

IRC organized five sessions in the symposia "Radiation in the Climate System" for the IUGG 2015 Assembly. The IRC International Radiation Symposium 2016 was held in New Zealand in April 2016. The Business Meeting 2017 was held during the IAMAS-IAPSO-IAGA Joint Assembly. The Business Meeting 2018 was held on July 2018 in Canada, in conjunction with the American Meteorological Society Radiation conference. The next quadrennial International Radiation Symposium, IRS2020 will be hosted by Aristotle University of Thessaloniki, in Greece, in July 2020.

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

QUADRENNIAL REPORT OF THE INTERNATIONAL ASSOCIATION FOR THE PHYSICAL SCIENCES OF THE OCEANS

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 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: Isabelle Ansorge (South
Africa)

Trevor McDougall
(Australia)

Members: Agatha de Boer (Sweden)

Hans van Haren (The
Netherlands)

Toshiyuki Hibiya (Japan)

Christa von Hildebrandt-
Andrade (USA and
Puerto Rico)

Chris Meinen (USA)

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 on the Facebook social network, with the aim of facilitating the spread of information to 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 in person during Scientific Assemblies. Other business has been managed by email where appropriate.

ACTIVITIES

Scientific Assemblies

2015

The principal activity in this year was the participation in the **IUGG General Assembly in Prague** (IUGG 2015), Czech Republic, from 22 June to 2 July. The meeting was characterized by the central theme: ‘Earth and Environmental Sciences for Future Generation’. The Assembly attracted 4231 registered delegates, including exhibitors, from 90 countries covering all five inhabited continents. IAPSO organized 12 IAPSO-only symposia (311 oral presentations and 120 posters), 5 IAPSO-lead Union and Association-Joint symposia (107 oral presentations and 75 posters) and 1 Union Lecture; with a total of 353 registered IAPSO delegates. In addition, IAPSO co-sponsored 6 Joint and 7 Union symposia.

2016

The principal activity in this year was the preparation of the **Joint IAPSO-IAMAS-IAGA Assembly to be held in Cape Town South Africa, from 27 August - 1 September,**

2017. The President and the Secretary General were active in the planning process and participated in several video conference and a site visit 16-18 May, 2016. During this visit, the Presidents and SGs of the 3 organizations were introduced to the conference organizers and shown around the venue and attractions. A preliminary list of sessions was drawn up and finalised during two video conferences.

2017

Three of IUGG's constituent Associations, IAPSO, IAMAS and IAGA, met for a **Joint Scientific Assembly entitled 'Good Hope for Earth Sciences' in Cape Town**, South Africa, during the week 27 August - 1 September, 2017. Details of the assembly can be found at <http://www.iapso-iamas-iaga2017.com>. The Assembly had a total of 1038 registrations from 64 different countries, although there were 57 'no-shows' despite having paid registration fees. About 230 participants registered as IAPSO scientists. The Assembly's opening day was marked by a joint plenary session with a lecture from each Association. The plenary lecturer for IAPSO, Dr Essam Yassin Mohammed (United Kingdom), emphasized the importance of investing in the blue economy, discussing the why and what of investing in marine and coastal ecosystems. Each Association offered a broad programme of lectures and posters, organized in parallel sessions. IAPSO organised 6 IAPSO-only symposia (107 oral presentations and 59 posters), 3 IAPSO-lead Association-Joint symposia (89 oral presentations and 43 posters). In addition IAPSO co-sponsored 5 Joint symposia lead by another Association (88 oral presentations and 29 posters).

2018

The principal activity during 2018 was preparation 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 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 at the Assembly's website: <http://www.iugg2019montreal.com/p.html>.

Working Groups, Commissions and Services

IAPSO is sponsoring/co-sponsoring Working Groups, Commissions and Services relevant to its prime goal. Information on Working Groups, Commissions and Services, including their reports, are maintained and updated on the IAPSO website (<http://iapso.iugg.org/working-groups29.html>). Those active in the period of this report are:

IAPSO Early Career (EC) Scientist Working Group. Established during 2018, it has the main goal of supporting IAPSO to provide a significant platform for early career scientists to network and integrate into the scientific community. Chair: Alejandra Sanchez-Franks (United Kingdom). Vice-Chairs Robert Graham (Norway) and Malin Ödalen (Sweden). Website: <http://iapso.iugg.org/working-groups29.html>.

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

Joint Committee on the Properties of Seawater, JCS (with SCOR and IAPWS). Chair: Rich Pawlowicz (Canada). Vice-Chairs: Rainer Feistel (Germany) and Trevor McDougall (Australia) replaced by Steffen Seitz (Germany) in 2018. Website: <http://www.teos-10.org/>.

Detailed information and reports are available on the IAPSO website (<http://iapso.iugg.org/working-groups29.html>).

Commission on Mean Sea Level and Tides (CMSLT). President: Gary T. Mitchum (USA). Website: <http://iapso.iugg.org/working-groups29.html>.

Joint Tsunami Commission (with IAPSO/IASPEI/IAVCEI). Chair: Dr. Vasily V. Titov (USA). Vice-Chairs: Fumihiko Imamura (Japan) and Ahmet Cevdet Yalçiner (Turkey). Secretary: Phil Cummins (Australia). IAPSO Representative: Efim Pelinovsky.

Website: <http://research.jisao.washington.edu/tsunamicommission/index.htm>.

Permanent Service for Mean Sea Level (PSMSL), hosted by Proudman Oceanographic Laboratory, Director: Lesley J. Rickards (UK). IAPSO Liaison: Philip L. Woodworth (UK). Website: www.psmsl.org/.

IAPSO Standard Seawater Service, hosted by OSIL. Director: Richard Williams (UK). Website: www.osil.co.uk.

Medals

IAPSO delivers three prizes in the form of medals every two years.

- 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 to a most prominent scientist chosen by a specially appointed IAPSO Award Committee. The award ceremony is held at an IAPSO Assembly, where the recipient delivers the Prince Albert I Medal Memorial Lecture. The first medal was presented in 2001.
- The **Eugene LaFond Medal** is awarded to an ocean scientist from a developing country making a presentation (poster or oral) in an IAPSO-sponsored or co-sponsored symposium at the IUGG or IAPSO assemblies. The first medal was presented in 2007.
- Starting from 2019, IAPSO will present the **Early Career Scientist Medal** to honour 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, at the biannual IAPSO Assembly, where the Awardee will be expected to give a talk on a scientific topic of their own choice.
- The **Prince Albert I Medal 2015** was awarded to Emeritus Professor Toshio Yamagata (Japan) for ‘his ground-breaking work and exceptional contribution to our understanding of El Niño/Southern Oscillation and the newly discovered Indian Ocean Dipole’. The Award ceremony took place on June 29, during IUGG 2015 in Prague, when Prof. Yamagata gave the Albert I Memorial Lecture.
- The **Eugene LaFond Medal 2015** was awarded to Dr. Sana Ben Ismail (Tunisia) for her oral presentation ‘Surface circulation features along the Tunisian coast (central Mediterranean sea): the Atlantic Tunisian

current’ delivered within the IAPSO symposium ‘Physics and Biogeochemistry of Semi-Enclosed and Shelf Seas’ during the IUGG 2015 General Assembly.

- The **Prince Albert I Medal 2017** was awarded to Prof. Lynne Talley (United States) for ‘her seminal contributions to our understanding of all ocean basins, including landmark discoveries in the Pacific, Atlantic and Southern Oceans’. The Award ceremony took place on August 30, during the Joint Assembly in Cape Town, when Prof. Talley delivered the Albert I Memorial Lecture ‘A case for sustained observations of the ocean: observing the overturning circulation and its variability’.
- The **Eugene LaFond Medal 2017** was awarded to Dr. Jonathan Durgadoo (Mauritius) for his oral presentation ‘Indian Ocean sources of Agulhas leakage’, delivered within the IAPSO-IAMAS joint symposium ‘The Second International Indian Ocean Expedition (IIOE-2) and related oceanic and coupled Atmospheric research in the Indian Ocean’ during the Joint Assembly in Cape Town.

The next medals will be delivered during the 2019 IUGG General Assembly in Montreal.

SCOR Administration and collaboration

IAPSO participates in the activities of ICSU's Scientific Committee on Oceanic Research (SCOR) and has maintained its formal relations with SCOR during the period. An important part of the co-operation with SCOR is the formation of joint working groups. Each year IAPSO EC members are involved in the evaluation of proposals for SCOR Working Group funding. The IAPSO President participated in the SCOR Annual Meetings held in Goa India, 6-9 December 2015, in Sopot, Poland, 5-7 September 2016, in Cape Town, South Africa, 4-6 September 2017, and in Plymouth UK, 4-7 September 2018. The primary topic during these meetings was to hear reports of current working groups and other SCOR related organizations and to decide which of the new proposals to fund.

A working group of experts on the Future of the Ocean and its Seas was established in November 2015 jointly by IAPSO and SCOR in response to the marine science issues raised by the G7 Science Ministers in October 2015.

The group completed its work in April 2016 by producing the report - *Future of the Ocean and its Seas: a non-governmental scientific perspective on seven marine research issues of G7 interest* (Marine Litter, Ocean Acidification, Biodiversity Loss, De-oxygenation, Ocean Warming, Ecosystem degradation, Deep-sea mining). The report was submitted to the Science Ministers prior to their meeting in Japan, May 2016. A copy of the report can be found at <http://www.icsu.org/news-centre/news/pdf/Report%20to%20G7%20SMi ns%20on%20FOSS.pdf>.

IUGG/IAPSO support to scientific meetings

IAPSO endorsed nine scientific meetings that were supported by IUGG in 2016, 2017 and 2018:

- The workshop *Arctic Subarctic Ocean Flux Study (ASOF)*, held on 30-31 March 2016 in Lerici, Italy.
- The *48th International Liège Colloquium on Ocean Dynamics*, held on 23-27 May 2016 in Liège, Belgium.
- The conference *A connected ocean – the challenge of observation data integration*, held on 11-12 October 2016 in Brest, France.
- The *IndOOS Review Workshop*, held from 30 January to 1 February 2017 in Perth, Australia.
- The conference *Past Antarctic Ice Sheet (PAIS)*, held from 10 to 16 September 2017 in Trieste, Italy.
- The workshop *THEMES 2017 - Physics and biogeochemistry of marine*

environments: multiscale analysis of past and present variability, held on 15-17 November 2017 in Venice, Italy.

- The *2nd IndOOS Review Workshop*, held from 21 to 23 March 2018 in Jakarta, Indonesia.
- The International Conference *Understanding the Problems of Inland Waters: Case Study for the Caspian Basin*, held from 12 to 14 May 2018 in Baku, Azerbaijan.
- The *X Jornadas Nacionales de Ciencias del Mar* (Conference on Science of Seas), hosted by the University of Buenos Aires, Argentina, and held from 30 July to 3 August 2018.

PLANNED FUTURE ACTIVITIES/ ANNOUNCEMENTS

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

QUADRENNIAL REPORT OF THE INTERNATIONAL ASSOCIATION OF SEISMOLOGY AND PHYSICS OF THE EARTH'S INTERIOR

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, propagation of seismic waves, 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.

During 2015 and 2017, most of the IASPEI efforts were directed towards the IUGG2015 General Assembly in Prague, Czech Republic and the First Joint Scientific Assembly of IASPEI together with IAG in Kobe, Japan, 2017.

During 2016 and 2018, most of the IASPEI efforts were directed towards the General Assemblies of IASPEI's four Regional Commissions (Africa, Asia, Europe, Latin America and Caribbean), which were sponsored by IASPEI and IUGG.

In addition, several scientific workshops have been supported or sponsored by IASPEI and several ongoing projects continued.

ADMINISTRATION

EC & Bureau meetings

The IASPEI Bureau and Executive Committee met several times in Prague during the GA in June/July 2015 and twice during the Scientific Assembly in Kobe in 2017.

In September 2016 and in December 2018, the IASPEI Bureau met via phone conference.

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 each year.

Information about the actual Members of IASPEI Bureau and Executive Committee and Commission Chairs and National Correspondents can be found on the IASPEI website (<http://iaspei.org>).

Changes in administration (setting up of new Commissions, Working Groups, etc., or termination of old Commissions, Working Groups, etc.)

During the GA in Prague in 2015, the name of the IASPEI **Commission on Earthquake Source**

Modeling and Monitoring for Prediction was changed to **Commission on Earthquake Generation Process – Physics, Modeling and Monitoring for Forecast** and a new Commission was established with the title **Commission on Earthquake Source Mechanics (ESM)**.

During the Joint Scientific Assembly of IAG and IASPEI in Kobe, Japan a new inter-association working group for “**Seismo-Geodesy**” was initiated.

Other matters

Website. The IASPEI website has the address <http://iaspei.org>. The website is managed by the International Seismological Centre in Thatcham, UK.

Statutes. After discussing the possibility of personal membership in IUGG Associations, the Statutes and By-laws of IASPEI were modified during the GA in Prague and the SA in Kobe. The IASPEI Statutes and By-laws are available for download from the IASPEI website. IASPEI is registered as a Norwegian organisation (Norwegian Org. Number 916 047 495).

Newsletters. IASPEI Newsletters have been regularly sent as pdf-file attachments to more than 3000 e-mail addresses (status 2018). The Newsletters are also available for downloading from the IASPEI website. Four issues were distributed in 2015, 2016 and 2017 and five issues in 2018.

ACTIVITIES

Scientific Assemblies, Workshops/Symposia etc.

During the years 2015 – 2018, IASPEI organized and (financially) supported the following Assemblies, Conferences, Workshops and Summer Schools. Some of them were in addition financially supported directly by IUGG.

2015

38th IASPEI General Assembly in Prague, Czech Republic

This IASPEI GA (<http://www.iaspei.org/assemblies-conferences>) had 505 officially registered as IASPEI delegates. The scientific program included 13 IASPEI, 16 Inter-Association symposia with IASPEI participation and an ad-hoc symposium about the Nepal 2015 Earthquake.

ECGS Workshop on “Earthquake and Induced Multi-hazard early warning and rapid response” IASPEI supported this workshop which was held 18 – 20 November 2015 in Luxembourg (<http://www.ecgs.lu/ewrr2015/>).

XXVII General Assembly of the International Union of Geodesy and Geophysics
Quadrennial Reports of the IUGG Associations and Union Commissions

IRIS workshop “Managing Data from Seismic Networks”

IASPEI supported this workshop, also via donations received for this purpose, which was held Hanoi, 9 – 15 September 2015 with 37 participants from 19 countries.

2016

1st General Assembly of the African Seismological Commission (AfSC)

The first GA of the AfSC was held during a Nile cruise in Egypt, 2 – 5 April 2016. The assembly had 92 participants and was followed by the “2nd African Workshop on Seismic Hazard” (6 – 9 April 2016).

2nd General Assembly of the Latin America and Caribbean Seismological Commission (LACSC)

The second GA of the LACSC was held in San José, Costa Rica, 20 – 22 June 2016. The assembly had 207 participants. A one-week course on “Seismic Moment Inversion” was given before the assembly.

35th General Assembly of the European Seismological Commission (ESC)

The ESC GA was held in Trieste, Italy, 4 – 9 September 2016. The assembly had 536 participants. A one-week “School on Seismology beyond Textbooks” was organized before the assembly (29 August – 3 September 2016).

11th General Assembly of the Asian Seismological Commission (ASC)

The 11th ASC GA was held in Melbourne, Australia, 25 – 27 November 2016. The assembly had 45 participants. A workshop on “Seismological Contributions to Earthquake Risk Reduction” was organized before the assembly.

Xth International Workshop on “Physics and Forecasting of Rock Destruction”
(<http://www.xmsc.ru>)

IASPEI supported this workshop, which was held in Apatity, Murmansk region, Russia, 13 – 17 June 2016.

2017

39th IASPEI Scientific Assembly and First Joint Scientific Assembly of IAG and IASPEI

The 39th IASPEI Assembly (<http://www.iaspei.org/assemblies-conferences>) was held as Joint Assembly with the International Association of Geodesy (IAG) at the Kobe International Conference Center, Japan, from July 30 through August 4, 2017. The conference had 1107 registered participants from 65 different countries of which 747 gave IASPEI as their primary Association. The scientific program

consisted in total of 43 symposia (7 IAG, 27 IASPEI and 9 Joint Symposia).

IRIS Workshop “Managing Data for Seismic Networks”

This workshop was held in Pretoria, South Africa, 20 – 26 August 2017
(<http://ds.iris.edu/ds/workshops/>).

12th International Seismological Workshop “Modern Methods of Processing and Interpretation of Seismological Data”

This workshop was held in Almaty, Kazakhstan, 11 – 15 September 2017.

6th Scientific Biennial Conference “Problems of Complex Geophysical Monitoring of the Russian Far East”

This Conference was held Petropavlovsk-Kamchatsky, Russia, 1 – 7 October 2017 (<http://www.emsd.ru/en/conf2017/>).

2nd Cargèse “School on Seismogenesis”

This summer school was held in Cargèse, France, 2 – 6 October, 2017 (<http://earthquakes2.sciencesconf.org/>).

2018

2nd General Assembly of the African Seismological Commission (AfSC)

The second AfSC GA 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).

12th General Assembly of the Asian Seismological Commission (ASC)

The 12th ASC GA with 129 ASC participants 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 4th International Conference on Continental Earthquakes. 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.

3rd General Assembly of the Latin America and Caribbean Seismological Commission (LACSC)

The third GA of the 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 122 participants from LACSC countries.

36th General Assembly of the European Seismological Commission (ESC)

The 36th ESC GA 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).

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

In 2014, a rigorously updated and amended electronic second edition of the IASPEI New Manual of Seismological Observatory Practice, 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 website of the GFZ Library

(<http://bib.telegrafenberg.de/publizieren/vertrieb/nmsop/>). Several colleagues have worked on translations of the Manual or parts of it from English to their language. During the last years, efforts were made to translate the whole Manual to Russian and Arabic.

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) take over the IDEA Project from W.H.K. Lee. A project for scanning old Batavia seismograms continued in 2015 – 2017.

During the whole quadrennium, IASPEI continued to support the Inter-Associations working group “Electromagnetic Studies of Earthquakes and Volcanoes (EMSEV)” (<http://emsev-iugg.org/>) jointly organized together with the International Associations of Geomagnetism and Aeronomy (IAGA) and Volcanology and Chemistry of the Earth's Interior (IAVCEI).

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 2nd year during the IASPEI Assemblies.

During IASPEI General Assembly in Prague, the 2015 IASPEI medal was awarded to **Willie H.K. LEE**.

During the IASPEI Scientific Assembly in Kobe, the 2017 IASPEI medal was awarded to the former IASPEI President and former Secretary General of IASPEI **Eric Robert ENGDAHL**.

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 three 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

Obituaries for prominent scientists were regularly published in the IASPEI Newsletters and on the IASPEI website (<http://www.iaspei.org/about/bios-obituaries>).

FUTURE ACTIVITIES

- In 2019, the main focus will be on the 40th General Assembly of the Association during the Centennial General Assembly of the IUGG in Montreal, Canada in July 2019.
- In 2020, the IASPEI main activity will be again concentrate on the General Assemblies of the four regional commissions of IASPEI (AfSC, ASC, ESC, LACSC). Some preparation work will already be ongoing in 2019.
- The 2021 41st Scientific Assembly of IASPEI is planned as a joint assembly together with IAGA, to be held in Hyderabad, India in August 2021.

Johannes Schweitzer, IASPEI Secretary General

QUADRENNIAL REPORT OF THE INTERNATIONAL ASSOCIATION OF VOLCANOLOGY AND CHEMISTRY OF THE EARTH'S INTERIOR

ACTIVITIES REPORT FOR THE PERIOD 2016-2018

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

This report will summarise the activities carried out between 2016 and 2018, which is the period I (as SG) have been in duty.

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 webpages
- Continuous updating of web site. 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 2016 the membership fee was reintroduced for IAVCEI. This induced a lowering in the number of IAVCEI members, which was in the order of 800 people at the end of 2016. Among them, the life members are 90, around 500 regular members and around 200 student members.
- In 2017 and 2018 the IAVCEI membership grew constantly to more than 1000 members.

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Among them, the life members are 100, around 600 regular members and around 300 student members.

Webpage

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

Newsletters

- Publication of newsletters was constant during the 2016-2018 period. Four issues of the newsletter "IAVCEI News" have been published through the website, during 2016, 4 during 2017, and 4 during 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:

2016:

- Cities on Volcanoes 9 (COV9). Understanding volcanoes and society: the key for risk mitigation, November 20-25, 2016 Puerto Varas, Chile
- 6th International Maar Congress, Changchun (China) in July 30–August 3, 2016
- 3rd Workshop on Volcano Geology, Etna and Aeolian Islands (Italy), July 3-10, 2016
- Chapman Conference on Submarine Volcanism: New Approaches and Research Frontiers. Hobart (Tasmania, Australia), January 30-February 3, 2017
- 5th International Post-graduate Course of Volcanology, Olot, Girona, Spain, 12-25 October 2016 http://www.gvb-csic.es/CURSO/CURSO_OLOT/Home.html
- XXIII Central Andes Volcanological Field Course, Universidad Nacional de Salta – Salta – Argentina, November, 11-21, 2016, http://www.unsa.edu.ar/~geonorte/cursos/curv_o2014.htm

2017:

- IAVCEI SA, Portland, Oregon (USA), August 14-18, 2017
- 4th International Workshop on Volcano Geology, October 3-6, 2017, Romania
- 13th CCVG workshop, September 24-October 3, 2017, Ecuador.

- 10th International AIV summer school, September 2-9, 2017, Bolsena, Italy
- 6th International Post-graduate Course of Volcanology, Olot, Girona, Spain, 12-25 October 2017 http://www.gvb-csic.es/CURSO/CURSO_OLOT/Home.html
- XXIV Central Andes Volcanological Field Course, Universidad Nacional de Salta – Salta – Argentina, November, 11-21, 2017, http://www.unsa.edu.ar/~geonorte/cursos/curv_o2014.htm

2018:

- IAVCEI COV10, Naples (Italy), September 2-7, 2018
- 4th International Workshop on Volcano Geology, October 3-6, 2017, Romania
- 13th CCVG workshop, September 24-October 3, 2017, Ecuador.
- 11th International AIV summer school, August 28-September 4, 2018, Bolsena, Italy
- 7th International Post-graduate Course of Volcanology, Olot, Girona, Spain, 12-25 October 2018 http://www.gvb-csic.es/CURSO/CURSO_OLOT/Home.html
- 7th International Maar Conference, May 21-28, 2018, Olot, Catalunya, Spain
- 7th International Workshop on Collapse Calderas, Toba (Indonesia), September 21-28, 2018
- 1st IAVCEI/GVM Workshop “From volcanic hazard to risk assessment” Geneva (Switzerland), 27 – 28 June 2018
- 1st IASPEI/IAVCEI Inter-Association Commission on “Volcano Seismology & Acoustics” La Réunion (France), September 29th – October 4th, 2018

FUTURE ACTIVITIES

- Organization of meetings and workshops from IAVCEI commissions
- Financial support to International schools
- 2020: organization of 11th Cities on Volcanoes meeting in Crete (Greece)
- 2021: organization of Scientific Assembly in Rotorua, New Zealand

Roberto Sulpizio, IAVCEI Secretary General

QUADRENNIAL REPORTS OF THE UNION COMMISSIONS

QUADRENNIAL REPORT OF THE IUGG COMMISSION ON CLIMATE AND ENVIRONMENTAL CHANGE

INTRODUCTION

The Union Commission on Climatic and Environmental Change (CCEC) promotes the advancement of scientific understanding of climatic and environmental change; boosts research in reducing uncertainties in climate and environmental models, and defines criteria for collaborative trans-disciplinary research on climate and environmental change, by providing an all-Union perspective on climatic and environmental change, and making available the knowledge and insights developed through scientific research to the benefit of society and planet Earth. See the web site at: <http://www.ccec-iugg.org/>

ADMINISTRATION

Officers and members of the Commission were elected on 30 June 2015 during the Business Meeting held at the Prague General Assembly. Harry Bryden replaced Lawrence Mysak as the IAPSO representative. Domenico Giardini agreed to serve as IASPEI representative. Members of CCEC for the 2015-2019 quadrennium are given in the IUGG Yearbook. However, CCEC Executive Committee Member and IUGG Fellow Eigil Friis-Christensen passed away on 21st September 2018 after a severe illness. The October 2018 IUGG Newsletter published an obituary and all CCEC members offer condolences to his family.

ACTIVITIES

CCEC activities during the past quadrennium were:

At the IUGG General Assembly (GA) in Prague CCEC: (1) Organised and held a successful session (Session U1 “Future Earth and Sustainability”) (2) held its first business meeting to elect officers (3) organised and held a panel session on the WMO Global Framework for Climate Services. In addition, CCEC (4) finalised and documented the work of the Weather, Climate and Food Security (WeatCliFS) initiative by publishing a monograph titled: Global Change and Future Earth. (5) held the second CCEC Scientific Meeting in Luxembourg in 2015 (the first was in Beijing in 2013). (6) Interacted with representatives of other scientific unions and other IUGG scientific associations.

Session U1 Future Earth and Sustainability at the Prague General Assembly

This was an all-day session held on 23 June 2015 titled: Future Earth and Sustainability with only invited speakers.

In addition to the invited oral contributions that were presented in the Plenary Hall of the Congress Centre, there were six contributed presentations that were organised as posters during the Assembly poster session.

Panel Discussion on Global Framework for Climate Services (GFCS), Co-sponsored by IUGG and WMO.

On behalf of CCEC, Arthur Askew organised a panel discussion on GFCS that was held on Wednesday 24 June 1800-1930. The Panel drew an audience of approximately 80 participants. The panel was chaired by Dr Tom Beer, Chair of CCEC, and the other panelists (on stage) were: Arthur Askew (Introduction), Roger Pulwarty [NOAA, USA] who spoke on the Challenge to IUGG, Vlad Kattsov (WCRP) who spoke of the need for a dialogue between scientists and users, Harald Kunstmann (IAHS) who pointed out the numerous ways in which IAHS can assist WMO, including their Panta Rhei research program, and finally Filipe Lucio (WMO) who summarised the WMO position after he had heard the presentations and the audience discussion. The open discussion included statements from Roxana Bojaru (Romania), Mike MacCracken (USA), Pierre Hubert (IUGG Bureau), and Gordon McBean (ICSU President).

Global Change and Future Earth: The Geosciences Perspective

On 18 October 2018 Cambridge University Press published Global Change and Future Earth as the third title of the IUGG Series of publications. The Editors are Tom Beer, Jianping Li, Keith Alverson.

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/), the main CCEC research effort became one of examining how our activities could be included in Future Earth. We ran a global series of symposia titled: Weather, Climate and Food Security, and persuaded the contributors to those symposia, as well as the eminent speakers at the U1 session of the Prague GA as well as other leaders of international scientific unions, and eminent scientists to write chapters.

Second CCEC Scientific Meeting

The second scientific meeting of the IUGG Commission on Climatic and Environmental Change (CCEC) took place at the Université du Luxembourg in Belval, Luxembourg from 21-22

October 2016. The meeting was conducted as a workshop of chapter authors of the monograph “Global Change and Future Earth: The Geosciences Perspective” described above. Sixteen authors from Austria, Australia, Canada, China, Denmark, England, Germany, India, Japan, Luxembourg, New Zealand, Turkey, and USA presented, discussed, and finalized the content and structure of their chapters and the monograph’s eight key sections.

Fumiko Kasuga, Future Earth Global Hub Director, Japan, attended the meeting and gave an overview of Future Earth as an international global change research activity. This was followed by two days of presentations by the chapter authors in attendance. The meeting invited a social scientist Catherine Wong (University of Luxembourg), to provide a social science perspective on the proposed monograph, the work programme, the meeting, and the organization.

The workshop was facilitated by the local host, CCEC Member Tonie van Dam, Vice Rector of the University of Luxembourg, whose hard work and organizational capacities were greatly appreciated by all participants. Financial support to assist was provided by IUGG and IAMAS.

Interactions

CCEC together with UNEP, IAMAS and the IAMAS commission on climate (ICCL), organised a session “Resilience: the science of adaptation to climate change” (M16) at the IAMAS/IAPSO/IAGA Congress in Capetown (29Aug-3Sep, 2017). An edited book of the same title was published by Elsevier in March 2018. See <https://www.elsevier.com/books/resilience/zommer/978-0-12-811891-7>

IAMAS and CCEC were co-sponsors of M18: Advances and Frontier challenges in Global Monsoon Studies, also at the Capetown Congress.

Session AS1.18/CL3.09: The global monsoons in current, future and palaeoclimates and their role in extreme weather and climate events at the EGU 2017, April 23-28 was co-sponsored by CCEC.

Session AS13: Seasonal to Decadal Climate Variability in Southeast Asia and Indo-pacific: Impact and Predictions at the AOGS 14th Annual Meeting, 6-11 August 2017, Singapore was also co-sponsored by CCEC

Liaison with other Unions

In March 2016, CCEC was represented by the CCEC Chair at a conference in New Delhi organised by the International Geographical Union (IGU). The proceedings of that conference have been published as a Springer monograph “Climate Change, Extreme Events and Disaster Risk Reduction” available at:

<http://www.springer.com/gp/book/9783319564685>

The contribution of the CCEC Chair comprises Chapter 8:

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.

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. CCEC has been requested to propose names for an official IUGG Liaison to IPCC.

FUTURE ACTIVITIES

IUGG General Assembly, Montreal July 2019

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”.

The CCEF business meeting is presently scheduled for 3pm on Sunday 14 July 2019.

Tom Beer, CCEC Chair

QUADRENNIAL REPORT OF THE IUGG COMMISSION ON MATHEMATICAL GEOPHYSICS

SUMMARY

During 2015 – 2018 the commission was primarily working on organizing and convening the two biennial IUGG meetings on Mathematical Geophysics. In 2016 the commission organized and held the 31st biennial CMG meeting in Paris, France during June 6-10 at Université Pierre et Marie Curie. In 2018 the commission organized and held the 32nd biennial CMG meeting in Nizhny Novgorod, Russia during June 23-28. Business meetings were held during the conferences. 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

The administration of CMG remained the same during the quadrennial: **Chair:** Yehuda Ben Zion (USA); **Vice-Chairs:** Einat Aharonov (Israel) and Claudia Pasquero (Italy); **Secretary General:** Ilya Zaliapin (USA); **Past Chair:** Dan Rothman (USA)

A CMG business meeting was held during the 31st CMG conference at the Institut de Physique du Globe de Paris, Room 108, June 9, 2016, 12:30 – 14:00. **Attendance:** Yehuda Ben-Zion (Chair), Alexander Feigin (Russia), Alik Ismail-Zadeh (IUGG Secretary General), Sang-Moon Lee (South Korea), Claudia Pasquero (Vice-Chair), Klaus Regenauer-Lieb (Australia), Malcolm Sambridge (IASPEI), Daniel Schertzer (IAHS), Gordon Swaters (IAPSO), Manolis Veveakis (Australia), Ilya Zaliapin (Secretary).

The **agenda** included presentation of proposals to hold the 32nd CMG meeting in 2018, and a proposal from IUGG secretary general Dr. Ismail-Zadeh on celebrating 100th anniversary of the Union. The Commission received fixe excellent proposals. Considering the potential for close interaction between participants, expanding scientific collaborations, availability of sponsorship and support to young scientists, and overall readiness by the local organizing committee, the Committee and IUGG Association Representatives selected the proposal presented by Alexander Feigin, Russian Academy of Science.

Executive Committee meeting on June 28, 2018 in Nizhny Novgorod, Russia. The meeting was attended by Yehuda Ben-Zion (President), Ilya Zaliapin (Secretary General), and Alik Ismail-Zadeh (IUGG Secretary General). Agenda: 1) Selecting local organizing committee for CMG 2020, 2) Future CMG leadership and organization.

ACTIVITIES (most recent first)

32nd CMG biennial meeting in Nizhny Novgorod, Russia

The IUGG Commission on Mathematical Geophysics (CMG) held its 32nd 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.

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

CMG biennial meeting 2016 in Paris, France

The IUGG Commission on Mathematical Geophysics (CMG) held its 31st meeting during June 6-10 at Université Pierre et Marie Curie in Paris, France. This year’s meeting had a strong emphasis on computational and experimental science. In particular, it reached out to experimental science

communities via a special session on “*Experimental Geophysics*”, which focused on bridging the gap between theory and field observation. The scientific program included 16 special sessions divided into four thematic blocks: *Earth System and Planets*, *Fluids and Granular Flows*, *Seismology, tectonics and Rock Mechanics*, and *Cross Disciplinary Approached, Methods, and Data*.

The meeting featured invited plenary talks by Maria T. Zuber, Department of Earth, Atmospheric and Planetary Sciences, Massachusetts Institute of Technology, on *Advances in Planetary Gravity Mapping* and by Chris Paola, Department of Earth Sciences and St. Anthony Falls Laboratory, University of Minnesota on *Using unscaled and partially scaled experiments in geophysics*.

Each session included talks by several invited speakers, as well as contributed talks and posters. The meeting was attended by 218 researchers, postdocs, and students from 23 countries, including France (98 participants), USA (24), UK (17), Australia (11), Netherlands (11), Germany (7), Switzerland (6) and many other (see Fig. 1). The social program included a field trip “*Geology of Paris: the birth of a capital*”, organized by young geologists of IPGParis.

The IUGG CMG 2016 local organizing committee: Philippe Claudin (CNRS, École Supérieure de Physique et Chimie Industrielles), Alexandre Fournier (Institut de Physique du Globe, Paris), Valérie Vidal (CNRS, École normale supérieure de Lyon), and Renaud Toussaint (CNRS, Institut de Physique du Globe, Strasbourg).

Additional information and detailed meeting program is available at: <https://cmg2016.sciencesconf.org/>

FUTURE ACTIVITIES

The Commission is organizing the 33rd CMG meeting in 2020. 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 27th 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).

Yehuda Ben-Zion, CMG Chair

QUADRENNIAL REPORT OF THE IUGG COMMISSION ON GEOPHYSICAL RISK AND SUSTAINABILITY

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.

The GRC website is available at www.iugg-georisk.org.

Special efforts were expended by the GRC in recognition and celebration of the Centennial Years 2018-2019 of the IUGG, AGU, and the US National Committee for Geodesy and Geophysics. The AGU-IUGG agreed to jointly sponsor two successive meetings in association with the AGU 2018 Fall Meeting in Washington, D.C., USA, 10-14 December 2018 (Meeting 1: **AGU-IUGG Centennial Symposium on Disaster Science: Risk Reduction, Resilience, Response, and Recovery** and the 27th IUGG General Assembly in Montreal, Canada, 8-18 July 2019 (Meeting 2: **Symposium on GeoRisk Reduction: Science, Resources, and Governmental Action**). These meetings seek to create mechanisms for improved coordination between scientists, engineers, decision-makers, disaster managers, and financiers to address the challenges of the growing impacts of natural hazards upon society.

The meetings will (i) address genesis of natural mega-hazard events and resultant disasters; (ii) focus upon models for implementation and the building of partnerships for science-based disaster prevention, mitigation and recovery, and present exemplary case studies; (iii) bring together representatives of the scientific community, government agencies, policy experts, and commercial entities such as the insurance and banking sectors; (iv) focus upon the promotion of collaborations between new technologies for disaster early warning and improved forecast

modelling; and (v) strive for the development of a holistic model for hazard and disaster mitigation.

ADMINISTRATION

July 2015 - November 2017:

The GRC Business meeting at the 26th IUGG General Assembly in Prague elected the following leadership:

Executive Committee:

- Chair:** Joan Marti (IAVCEI, Spain)
- Vice-Chair:** John LaBrecque (IAG, USA)
- Vice-Chair:** Vyacheslav Gusiakov (IAPSO, RUSSIA)
- Secretary-Treasurer:** Paula Dunbar (IAPSO, USA)
- **Past Chair:** Kuniyoshi Takeuchi (IAHS, JAPAN) takeuchi@yamanashi.ac.jp
- Mohsen Ghafory-Ashtiany (IASPEI, IRAN)
- Michael Krautblatter (IACS, GERMANY)
- Christa von Hillebrandt-Andrade (IAPSO, PUERTO RICO)
- Guy Brasseur (IAMAS, Germany)

Members in Advisory Status

- Kosuke Heki (IAG, Japan)
- Stephen McNutt (IAVCEI, USA)
- Martin Funk (IACS)
- David Boteler (IAGA, Canada)
- Vladimir Kossobokov (IASPEI, Russia)
- Tom Beer (IAMAS, Australia)
- Ramesh Singh (IASPEI, USA)

November 1, 2017 - Present: The IUGG Bureau revised the GRC leadership on November 1, 2017 following the resignation of the Chair.

Executive Committee:

- Chair:** John LaBrecque (IAG, USA)
- Vice-Chair:** Vyacheslav Gusiakov (IAPSO, RUSSIA)
- Vice-Chair:** Alan Thomson (IAGA, UK)
- Secretary-Treasurer:** Paula Dunbar (IAPSO, USA)
- **Past Chair:** Joan Marti (IAVCEI, Spain)
- 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 (IAMAS, Australia)
- Harsh Gupta (IASPEI, India)

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- Alik Ismail-Zadeh (IASPEI, Germany/ Russia)
- Yekaterina Kontar (IACS, IAHS, USA)
- Vladimir Kossobokov (IASPEI, Russia)
- Gordon McBean (IAMAS, Canada)
- Ramesh P. Singh (IASPEI, USA)
- Linda Rowan (IAG, USA)

Business Meetings (2015-2019):

2015: **Venue:** 26th General Assembly: **Purpose:** Elect Executive Committee

2017: **Venue:** Internet: **Purpose:** Implement GRC reorganization, Plan for Centennial Symposia

2019: **Venue:** 27th General Assembly: **Purpose:** Elect Executive Committee

Current GRC Financial Status: Paula Dunbar (GRC Treasurer):

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

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

ACTIVITIES

2015:

- Preparation and presentation of Union Symposium on Natural Hazards during the 26th General Assembly in Prague.
- The Introduction of IUGG Resolution #4 for the implementation of the GNSS Augmentation of Tsunami Early Warning Systems.

2016:

The GRC activities concentrated on the endorsement and participation in risk reduction initiatives organized by other institutions that included:

- IASPEI-IAVCEI International Workshop on Earthquakes and Volcanoes, Barcelona, Spain, 7-9 November 2016;

- International Conference "Data Intensive System Analysis for Geohazard Studies", Sochi, Russia, 18- 21 July 2016;

- Plenary XIII of the Group on Earth Observations (GEO), St. Petersburg, Russia, 7-10 November 2016.

- We also note that Kuniyoshi Takeuchi (Japan, IAHS Past President and previous Chair of the GRC) was bestowed a certificate of appreciation by the Jakarta Office of the UNESCO International Hydrological Program in recognition of his long-term support and contributions to UNESCO Natural Science programs in Asia and the Pacific region, especially in the area of water management.

2017:

- 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. The GTEWS 2017 workshop report is in preparation. The presentation viewgraphs and videos can be accessed at:

<https://www.dropbox.com/s/s0c03xv34zfz7y4/2017%20GTEWS%20Program.pdf?dl=0>

- John LaBrecque (GRC Chair) received the Gilbert F. White Distinguished Lecture Award from the AGU Natural Hazards Program (<http://nh.agu.org/awards/gilbert-f-white-distinguished-lecture-award/>). The Lecture entitled The New Geodesy: A Powerful Tool in the Mitigation of Natural Hazards was presented at the AGU 2017 Fall Meeting. The Lecture can be viewed at

<https://www.youtube.com/watch?v=MwwMAkdUt0o>

- The GRC sponsored a Panel Discussion on Seismo-Geodesy- IAG-IASPEI meeting Kobe, Japan Session J04-7; The Promise and Challenges of Seismo-Geodesy for Earthquake

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and Tsunami Early Warning on August 4, 2017.

- 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 is participating 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.
- A session Contribution of Science and Technology to Achieving the 2020 Sendai Target was co-organized at the United National Global Platform for Disaster Risk Reduction held in Cancun, Mexico, 25 May 2017. The session discussed the contribution of science and technology in achieving Target E of the Sendai Framework with a focus on illustrating how appropriate global, national and local disaster risk assessments and scientific analysis have been used to inform disaster risk reduction planning and monitoring at national and local levels. The concept note of the session can be downloaded from: https://www.unisdr.org/files/globalplatform/5922450322c17170519_Concept_Note_of_ST_working_session-2017_GP.pdf
- A meeting of representatives of international and intergovernmental organizations dealing with disaster risk reduction was organized in Cancun during the Global Platform to discuss cooperation plans to further develop the initiative on disaster risk assessment. The meeting was attended by representatives of the Mexican Academy of Sciences; World Meteorological Organization (WMO); German Federal Foreign Office; Science Council of Japan; International Council for Science (ICSU); World Bank; United Nations Office for Disaster Risk Reduction (UNISDR); United Nations Educational, Scientific, and Cultural Organization (UNESCO).
- GRC participated in the Fourth World Landslide Forum held in Ljubljana, Slovenia, in June 2017. Scientists, engineers, and policymakers working in the area of landslide technology, landslide disaster investigation and landslide remediation attended the Forum to share their work with the global community.

A high-level panel discussion was held at the Forum with participation of IUGG.

- GRC participated in the Global Forum on Science and Technology for Disaster Resilience held in Tokyo, Japan, 23-25 November 2017.
- GRC participated in the UNESCO Conference on Landslides organized by the International Consortium for Landslides (ILC) and the International Programme on Landslides. During the conference, ICL organized a business meeting related to the Sendai Partnerships in Disaster Risk Reduction (DRR) and Promotion of Landslide Science, signed in 2015 in Sendai, Japan, by several international and intergovernmental organizations including IUGG. GRC discussed possibilities to participate in the World Landslides Forum in Kyoto, Japan in 2020 and to organize a session of landslide-induced tsunamis.

2018:

- Preparation of reports for the GNSS Tsunami Early Warning (GTEWS 2017) Workshop in Sendai, Japan on July 25-27, 2017 co-sponsored by the IAG/GGOS, NASA, APRU, and the NEID of Tohoku University. The first report 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 was prepared and 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,

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while simultaneously strengthening diplomatic ties between countries with shared risks.

- The GRC worked closely with the AGU and the US National Committee for 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>

Early 2019:

- The GRC is jointly organizing with the AGU and the USNC/GG the sequel joint AGU-IUGG-US National Academy Centennial Disaster Science meeting to be held as a daylong Union Symposium during the IUGG General Assembly in Montreal on July 14, 2019. The union symposium entitled “Georisk Reduction: Science, Resources, and Governmental Action” will include four panel discussion sessions with strong audience interaction. The GRC will participate in the preparation of a report summarizing the findings of these two centennial meetings on Disaster Science.

John LaBrecque, GRC Chair

QUADRENNIAL REPORT OF THE IUGG COMMISSION ON THE STUDY OF THE EARTH'S DEEP INTERIOR

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. The SEDI website is available at www.sedigroup.org.

Since 1987, SEDI has been a Union Commission of the International Union of Geodesy and Geophysics ([IUGG](#)). As such, it cuts across the traditional discipline-oriented bounds of the Associations of the IUGG [such as the International Association of Geodesy ([IAG](#)), the International Association of Geomagnetism and Aeronomy ([IAGA](#)), the International Association of Seismology and Physics of the Earth's Interior ([IASPEI](#)), and the International Association of Volcanology and Chemistry of the Earth's Interior ([IAVCEI](#))], 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

Over the 2015 to 2018 time window, SEDI has been 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. SEDI's membership has remained at about 600, as recorded on the email list used to broadcast information related to SEDI activities, upcoming meetings, funding opportunities, and academic openings.

MAIN ACTIVITIES (2015 – 2018)

IUGG 2015 General Assembly

The main activity in 2015 was the IUGG General assembly. At the IUGG 2015 General Assembly, several symposia were held that were closely related to SEDI interests. In particular, the Union Symposium U05 entitled "New Discoveries in Deep Interiors of Earth and Planets" was co-convened by Satoru Tanaka (SEDI), Dominique Jault (IAGA), Richard Gross (IAG), Thorn Lay (IASPEI), and John Gamble (IAVCEI). This was a well attended session, with good interdisciplinary discussions relevant to deep Earth processes and structure.

In addition to a poster session, twelve invited speakers made oral presentations: Arwen Deuss "Seismic Inner Core Structure"; Steve Grand "Global Seismic Mantle Structure"; Gauthier Hulot "Satellite Observation of the Geomagnetic Field"; Hikaru Iwamori "Hemispherical Mantle Geochemical Heterogeneity"; Andy Jackson "Dynamo Simulations Without Viscosity"; Alexey Kuvshinov "Global and Regional Geo-Electromagnetic Mantle Structure"; Allen McNamara "Mantle Convection and ULVZs"; Yangxin Pan "Geomagnetic Field and Life"; Isabella Panet "Satellite Gravity"; Barbara Romanowicz "Global Mantle Seismic Structure"; Christopher Russell "Vesta and Ceres"; and Dave Stevenson "A Habitable Planet".

The Business Meeting was held on July 28th, 2015. The new chair and vice-chair and continuation of the secretary were approved. The new executive committee members were also approved. Finally, it was suggested that we consider creating an Associate Secretary position, in order to lower the workload taken on by the Secretary General. However, the creation of an Associate Secretary position has yet to be acted upon.

SEDI Meeting 2016 (Nantes, France)

The 15th Symposium of [SEDI](#) meeting was held in Nantes, France, from 24th to 29th July 2016. The [Laboratoire de Planétologie et Géodynamique](#) was in charge of the local organization. The symposium gathered 205 students and scientists coming from 20 different countries. As is usually the case with SEDI meetings, the meeting was organized by eight sessions led by discussion leaders. Each session had one keynote talk and two shorter more focused talks, followed by ample time for discussion of posters and key scientific issues. These eight sessions were: S1: Mantle – Observations, S2: Mantle – Modeling & Dynamics, S3: The Core-Mantle Boundary, S4: Inner Core, S5: Outer Core – Observations, S6:

Outer Core – Dynamics, S7: Experiments, and S8: Other Planets.

Highlights of the meeting included the Zatman Lecture on “Force balance and wave motion in Earth’s core” by Alex Fournier (IPGP) and the awarding of the Doornbos Prizes for outstanding work by early career scientists. At the meeting, the Doornbos Prizes were awarded to:

- **Chris Davies**, for linking core dynamics to paleomagnetic observations and seminal work on the geophysical implications of deep earth diffusivities;
- **Kumiko Hori**, for novel studies of core physics, including the development of a new tool to give us an independent source of information about the geomagnetic field;
- **Shigehiko Tateno**, for cutting edge experimental studies of the structure of deep Earth minerals made over the entire range of deep Earth conditions.

The proceedings of the 2016 SEDI meeting were published in a special issue of the *Physics of Earth and Planetary Interiors*. Jonathan Aurnou, Michael Bergman, Christine Thomas and Michael Le Bars (IRPHE, Marseille) joined the editorial team as Associate Editors.

The business meeting was held on July 28th, 2016, and was attended by most of the participants. After a lively discussion, it was agreed that the location of the next (16th) SEDI international symposium would be left undecided until after the November 2016 US election. Based on the election results, the SEDI Executive Committee decided to hold the 2018 SEDI meeting in Edmonton, Canada, with Profs. Mathieu Dumberry and Moritz Heimpel as lead organizers.

IAG-IASPEI Meeting 2017

The joint scientific assembly of IAG and IASPEI was held from July 30 to August 4, 2017, in Kobe, Japan. Various SEDI-related symposia (7 IAG, 27 IASPEI and 9 joint symposia) were convened there.

IAPSO-IAMAS-IAGA Meeting 2017

The IAPSO/IAMAS/IAGA Joint Assembly was held from August 27 - September 1, 2017, in Cape Town, South Africa. It features over 60 total sessions covering a variety of SEDI-focussed topics. These sessions included “A02 - Earth’s core dynamics and planetary dynamos,” which featured 2 oral sessions with attendance of ~30 scientists in each session, and “Geomagnetic secular variation and rapid core dynamics,” which featured a single oral session attended by ~50 researchers.

SEDI Meeting 2018 (Edmonton, Canada)

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 Mathieu Dumberry and Moritz Heimpel, with 155 scientists in attendance. (<https://sedi2018.sciencesconf.org>)

The Zatman Memorial Lecture was given by Harriet Lau (Harvard University) on “Tidal Tomography”. The Doornbos Prize winners were

- **Paula Koelmeijer**: For careful and broad analysis of body and normal mode seismic data, integrated with mineral physics to constrain the state and dynamics of the lowermost mantle.
- **Maylis Landeau**: For innovative laboratory experiments on core formation and for numerical dynamo models that link past history of the geomagnetic field to the evolution of the core.
- **Ryuichi Nomura**: For development and execution of high pressure experiments that improve our understanding of melting and deformation of Earth’s mantle and core.

The proceedings of the 2018 SEDI meeting are to be published in a special issue of the *Geophysical Journal International*. Jonathan Aurnou, Michael Bergman, Christine Thomas, Mathieu Dumberry and Moritz Heimpel joined the editorial team as Associate Editors, with Richard Holme (U. Liverpool) as lead editor of the special issue.

The business meeting was held on July 12th, 2018, and was attended by most of the participants. Presentations were made for the next SEDI meeting to be held in Canberra, Australia, and in Taipei, Taiwan. Based on the straw poll at the business meeting and online polling results, the SEDI Executive Committee decided to hold the 2020 SEDI meeting in Taipei, as described further below.

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 to consider Christine Thomas to become SEDI Chair and for Mathieu Dumberry (University of Alberta, Canada) to become SEDI Vice-Chair.

XXVII General Assembly of the International Union of Geodesy and Geophysics
Quadrennial Reports of the IUGG Associations and Union Commissions

In 2020, the SEDI meeting will be held at the Taiwan at the Institute of Earth Sciences (Academia Sinica) in Tapei. 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 will be 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

QUADRENNIAL REPORT OF THE IUGG COMMISSION ON DATA AND INFORMATION

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. The UCDI website is available at www.iugg-ucdi.org

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 Sheno (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: The newly appointed committee had its first meeting over telepresence on 3 April 2017. Eight members of UCDI attended the meeting. Dr. Alik Ismail Zadeh, Secretary General, IUGG and Dr. Franz Kuglitsch, Executive

Secretary, IUGG also attended the meeting as observers and guides.

The meeting discussed on the major items like the activities to be taken up by UCDI during the next two years, collaborations with other organizations, symposia/conferences to be organised by UCDI or in collaboration with other organisations, etc. It was decided that, though UCDI has no plans to set up the infrastructure for the generation or management of data, UCDI shall advocate on the cross utility of data available with various associations of IUGG. For example, the utility of geodetic data for ocean sciences and vice versa. It was also decided to work in close collaboration with WDC on formats and contents of meta-data. The meeting also decided to organise a session at the CODATA conference in St. Petersburg scheduled to be held in October 2017.

No formal business meeting was held in 2018, but extensive discussions over email were held on specific issues and topics.

ACTIVITIES (2017-2018)

2017

(i) **Organised a session titled “Modern strategies for data collection and analysis for the better understanding of the Earth system” at the CODATA conference in St. Petersburg** scheduled to be held during 8-13 October 2017. UCDI Vice-chair Anatoly Soloviev and UCDI member Ms. Silvia Massaro took the lead in organising the session.

The international scientific conference of the Committee on Data for Science and Technology (CODATA) “Global Challenges and Data-Driven Science” was held in St. Petersburg on 8-13 October 2017 (<http://codata2017.gcras.ru/>). The CODATA conference was held in the Russian Federation for the first time. It brought together more than 150 participants from 35 countries¹. Among the participants were leading scientists, specialists in BIG DATA and modern methods of data processing, pattern recognition and data mining, data collection engineers and technologists. International multidisciplinary scientific dialogue between representatives of various fields of knowledge was held under the aegis of promoting Open data principles and FAIR (Findable, Accessible, Interoperable and Re-usable) data. The conference covered a wide range of issues related to data

¹ Armenia, Australia, Austria, Bangladesh, Brazil, Canada, China, Egypt, Fiji, Finland, France, Germany, Ghana, Hong Kong, India, Ireland, Israel, Italy, Japan, Jordan, Kenya, Laos, Morocco,

Namibia, New Zealand, Nigeria, Poland, Russian Federation, Sweden, Saudi Arabia, South Africa, Sri Lanka, Switzerland, United Kingdom, USA

science, including the collection and processing of large data amounts, the use of system analysis methods, machine learning and artificial intelligence algorithms. During four days of the conference, more than 160 scientific presentations were delivered at 25 scientific sessions; several business meetings and workshops were held.

The session “Modern strategies for data collection and analysis for the better understanding of the Earth system” (ID 10) was organized by the Union Commission for Data and Information (UCDI) established by the IUGG. The session provided modern insights into creation of integrated systems for Earth and environmental observations, their collection and analysis in order to manage efficiently the increasing data volumes and provide easy access to the research and civil communities. The session also considered the state-of-the-art and perspectives in data science relevant to Earth observations and environmental research. It brought together more than 30 scientists from South Africa, USA, Japan, Russian Federation and several European countries. The session was convened by the UCDI co-chair Dr. Anatoly Soloviev (Geophysical Center RAS, Russia).

(ii) Participation in the First workshop on Data Standards for Science organized by CODATA in Paris during 19-21 June 2017. Dr. Alena Rybkina represented UCDI at the workshop.

Twenty-five data experts and researchers attended the workshop. The general goal of the workshop was to consider an ambitious, coordinated programme of work to promote shared vocabularies and standards to enable data interoperability and integration. This initiative is expected to contribute to the integration between ICSU bodies/ICSU Programms/ISSC on the first stage and broader scientific community on the second stage. Dr. Alena Rybkina presented the past and future activities of UCDI and reported on its new membership and enthusiasm for future collaboration. UCDI’s decision to organize a special session at the St. Petersburg conference of CODATA also was reported.

During the workshop, the gaps in the existing data infrastructure and possible technical solutions were discussed. In short term, a road map will be developed and distributed among the ICSU Unions. Though the initiative is very ambitious, the beginning of this long path is expected to acquaint the Unions on identifying their needs and the needs of ICSU in general.

(iii) Participation in the Second workshop on “Science and the Digital Revolution: Data, Standards and Integration” organized by CODATA at the Royal Society in London during 13 to 15 November 2017. Ms. Silvia Massaro represented UCDI at the workshop.

Main discussion in the workshop revolved around (i) to exploit emerging online data collections to unleash the potential for game-changing discoveries across the whole spectrum of research domains and (ii) on the development of user-friendly processes that enables linking and integration of datasets between disparate disciplinary areas in ways that are compatible with existing disciplinary standards. Basically, the outcome of the three-day meeting was expected to prepare a roadmap for better understanding the complex phenomena that are vital for the human condition and the planetary function through interdisciplinary collaboration in data-rich world.

Hence, the discussions at the workshop stressed on mobilizing community support and advice for discipline-based initiatives to develop online data capacities and services, priorities for work on interdisciplinary data integration and projects, funding and coordination, and on the issues of international data governance.

Presentations on the first day provided different case-studies from (i) specific disciplines (Earth observations; Health system; Food security; Resilience in cities; Natural disasters), (ii) interdisciplinary Research Areas and (iii) global monitoring and observation. The speakers highlighted on the major scientific questions on monitoring issues, the requirement of data from multiple disciplines, and the challenges of data interoperability and integration.

The second day was devoted to explore how disciplines and interdisciplinary initiatives have addressed the specific challenges of interoperability and data integration. Example surveys, scientific impacts, tools necessary for effective data registration and sharing, etc. were explored to illustrate some case-studies and platforms for interoperability and data sharing. Finally as a possible next step towards providing a roadmap it was proposed to take up a pilot project to promote the integration and interoperability of scientific data, covering practices, support, coordination and governance.

The final recommendations of the workshop include:

- Identify interdisciplinary pilot projects;
- Coordination of efforts: union and association liaisons, data science and standards organizations liaison, and other existing efforts;
- Create timescales: updates on the work plans of unions and, community engagement;
- Find funding: funding agencies, foundations, and international consortia;
- Talk more efficiently with the Governance.

2018

(i) UCDI Chair, Dr. Satheesh Shenoï 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.

(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 Shenoï (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-convenors – 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 Shenoï, UCDI Chair

QUADRENNIAL REPORT OF THE IUGG COMMISSION ON PLANETARY SCIENCES

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)

EC Members

- Christine Schott Hvidberg (IACS, Denmark)
- Michael Purucker (IAGA, USA)
- Fabrizio Capaccioni (IAHS, Italy)
- Philippe Lognonne (IASPEI, France)
- Jose Luis Macias-Vasquez (IAVCEI, Mexico)

Members (NON-Executive Committee membership)

- Oliver Baur (Austria, IAG)
- Jean-Pierre Bibring (France, IAHS)

- Anil Bhardwaj (India)
- Shane Byrne (USA)
- Nader Haghighipour (USA)
- Paul Hartogh (Germany)
- Masato Iguchi (Japan)
- Wing-Huen Ip (Taiwan, China)
- Takahiro Iwata (Japan)
- Catherine Johnson (Canada, IAGA.)
- Sanjay Limaye (USA)
- Jesus Martinez-Frias (Spain)
- Jürgen Oberst (Germany)
- Rosanna de Rosa (Italy)
- Binod Sreenivasan (India, IAGA)
- Darrell Strobel (USA)
- Feng Tian (China, IAMAS)
- Dmitri Titov (Germany)
- Pieter Visser (The Netherlands, IAG)

ACTIVITIES

UCPS-AOGS Special Session: Recent advances in planetary exploration and geophysics, July 31 - August 5, 2016, Beijing, China,
<http://www.asiaoceania.org/aogs2016>

To advance planetary sciences, the UCPS in collaboration with AOGS held a joint Special Session at the 13th Asia Oceania Geophysical Sciences Society Meeting: “Recent Planetary Exploration and Geophysics”. Papers on planetary atmosphere, geophysics, geodesy, magnetism, cryosphere, seismology, volcanology, the physics and chemistry of the interior of the planets in our solar system and around other stars, and future mission opportunities were presented and discussed.

Conveners:

- Shuanggen Jin (SHAO, China)
- Jorn Helbert (DLR, Germany)
- Noriyuki Namiki (NAO, Japan)
- Wing-Huen Ip (NCU, Taiwan)
- Paul Hartogh (MPG, Germany)

AOGS session: Terrestrial Planetary Atmospheres and Their Evolution, July 31 - August 5, 2016, Beijing, China,
<http://www.asiaoceania.org/aogs2016>

The AOGS held a session at the 13th Asia Oceania Geophysical Sciences Society Meeting relevant to the UCPS: “Terrestrial Planetary Atmospheres and Their Evolution”. Understanding the nature, variability, physical and chemical mechanisms, and the evolution of planetary atmospheres is a main component of planetary sciences. While the long-

term evolution of our own planet is constrained by a wealth of geological/geochemical data, the evolutionary paths of other terrestrial planetary bodies in and outside our solar system must be reconstructed from less abundant planetary mission data and astronomical observations. The Discovery of exoplanets provides additional opportunities for interdisciplinary collaborations between geoscientists, astronomers, and planetary scientists. Our understanding of the Earth and other planets can greatly benefit from comparative studies of terrestrial planetary atmospheres. This session welcomes both observational and theoretical studies relevant to current physical and chemical states of terrestrial planetary atmospheres in and outside of our solar system (including the Earth) and their evolution.

Conveners:

- Feng Tian (Tsinghua University, China)
- Eric Chassefiere (Univ Paris-Sud, France)
- Yongyun Hu (Peking University, China)

Special Session SS7 4: The Effects of Solar and Stellar Magnetic Activity on Planets, at European Week of Astronomy and Space Science, 4-8 July 2016, Athens, Greece, <http://eas.unige.ch/EWASS2015>

The magnetic activity of cool stars in the form of flares, winds and coronal mass ejections have a direct impact on planets. This activity varies with the mass, age and rotation rate of the star and can be damaging for life, even in the case of a fairly inactive star like the Sun. During periods of intense solar activity, the solar wind is enhanced and geomagnetic storms produce auroras, disrupt radio transmissions, affect power grids, damage orbiting satellites, and can be hazardous to astronauts. By analogy, the magnetic activity of cool stars may be hazardous for the creation and development of life and is therefore of potential importance for habitability.

In this Special Session, we aim to bring together observers/theoreticians whose diverse research interests are linked with solar and stellar activity and its effect on orbiting planets. Questions that will be addressed are:

- 1) How do stellar magnetic activity influence the exoplanets orbiting main-sequence stars?
- 2) Which lessons learned from our own solar system can be incorporate in exoplanetary research?
- 3) How can stellar activity affect habitability?

Scientific organizers:

- Heidi Korhonen, University of Turku, Finland
- Aline Vidotto, University of Geneva, Switzerland

COSPAR2016 - Scientific Event B0.2: Mars Exploration and Science, July 30 - August 7, 2016, Istanbul, Turkey, <http://www.cospar-assembly.org>

Mars has been extensively explored by spacecraft. At present several orbiters (e.g., MRO, MAVEN, MOM, Mars Express) and the Curiosity and Opportunity rovers are exploring the Mars surface and atmosphere, history, and habitability. Additional missions to study the interior structure and the habitability of Mars are expected to fly by the time of COSPAR 2016 Assembly (e.g. InSight, Trace Gas Orbiter and they accompanying demonstration lander). This session is to mainly address new results on Mars exploration and science, including theory, methods, measurements, and findings as well as comparative studies with the Earth in the atmosphere, surface, and interiors. Papers describing future Mars missions, in flight or planned and simulated results are also welcome.

Main Scientific Organizer (MSO):

- Shuanggen Jin (SHAO, China)
- Oleg Korablev (IKI, Russia)

1st IUGG Symposium on Planetary Science (IUGG-PS 2017) and 3rd IAPS Scientific Assembly (IAPS2017)-Interdisciplinary observation and understanding of the Solar System, July 3-5, 2017, Berlin, Germany, <http://www.dlr.de/iugg-ps2017>

The IUGG-PS 2017 and IAPS2017 brought together international scientists and engineers focused on interdisciplinary observation and understanding of the Solar System with 11 sessions. 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. About 100 participants attended IUGG-PS 2017 from 14 countries with about 45 oral talks and 25 posters. The IUGG-PS 2017 provided a very good platform for progress presentations and detailed discussion as well as communication.

Conveners: Prof. Shuanggen Jin, Dr. Jörn Helbert

Prof. Dr. Shuanggen Jin attended Asia Oceania Geosciences Society (AOGS) Annual Meeting with co-organizing one Session “Exploration and Science of Mars and Venus” and was elected President of AOGS Planetary Science Section, 6-11 August, 2017, Singapore, <http://www.asiaoceania.org/aogs2017>

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 (e.g., ExoMars Mars Express,

Venus Express, Mars Odyssey, MRO, MERs, Phoenix, Mars Science Laboratory, MAVEN, Indian Mars mission, etc.). Results were presented 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 included 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)
- Dr. Hideaki Miyamoto (University of Tokyo, Japan)
- Prof. Juergen Oberst (German Aerospace Center, Germany)

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-Chairman:

- 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.

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 (e.g., 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.

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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 (e.g., 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.

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- 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

QUADRENNIAL REPORT OF THE INTERNATIONAL LITHOSPHERE PROGRAM

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, MEDINA, etc.).

Information on ILP is available at <https://www.scl-ilp.org/>

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
Advisory Board:
Ö. Adiyaman Lopes, UNESCO
S. Dong, China
C. Ebinger, U.S.A.
D. Mueller, Australia
H. Sato, Japan

The Bureau is also supported by the past president S. Cloetingh (The Netherlands) and by the associate members: J.-P. Burg (Switzerland), A. Morozov (Russia), F. Roure (France), M. Zoback (USA), and P. Mc Keever (UNESCO); by the lifetime members M. von Knorring (Sweden) and H. Gupta (India) as well as by Honorary President A. Green

(Switzerland) and ILP Fellow J.F.W. Negendank (Germany).

Throughout the reporting period the following changes with respect to administration have been implemented:

- President: H. Thybo took over responsibility from S. Cloetingh 2017
- Secretary General: M. Scheck-Wenderoth was re-appointed for another term of 4 years 2017
- Representative of IUGG: H. Gupta replaced former representatives in the Bureau 2016
- Representative of IUGG: C. Asch replaced former representatives in the Bureau 2016
- Chair Committee National Representatives: A. Tibaldi replaced V.I. Pease 2017
- New national committees were established in Hungary and Romania and delegates from Azerbaijan, Moldova, and Ukraine and Serbia raised their interest of joining ILP.
- Advisory Board: was established 2018
- Task Forces and Coordinating Committees: A call for proposals for the funding period 2015-2020 was open 2014-2015 and new projects were chosen by the bureau 2015

Bureau meetings

ILP Bureau meetings were held during the ILP “35 years conference”, Potsdam, 23 September 2015 and at the EGU General Assembly in 2017 and 2018.

Business meetings of ILP, Vienna, Austria, 2015-2018

The annual business meetings were held at EGU General Assembly every year and were attended by most of the PIs in ILP as well as by guests from IUGG and IUGS. A short report given by the president and SG as well as by representatives of IUGG and IUGS informed on new developments and all active TF and CC reported on their activities and plans.

In the reporting period, the Flinn Hart Award went to Philippe Yamato, Rennes/France (2015, picture to the left) and to Mojtaba Rajabi, Adelaide/Australia (2016). In honour of Evgueni Burov - an enthusiastic researcher, scientist, teacher and contributor to ILP - a new medal was established for mid-career achievements that has been awarded for the first time 2018 to Francesca Funicello – Italy.

Reports to Executive Committee (EC) meetings of IUGG and IUGS

ILP reports annually to both mother unions and the president or Secretary General seek to attend the respective EC meetings as observers. The SG has attended the IUGS EC meetings held in Vancouver 2015, during the 35th IGC congress in Cape Town 2016 and in Potsdam, 2018.

ACTIVITIES

Scientific meetings, developments for the different TF and CC, selected publications:

The ILP TF and CC have been visible at the large international meetings (EGU AGU, the 35th IGC in Cape Town). Moreover, most TF and CC contributed to specific conferences within their thematic fields and held dedicated smaller international workshops. Details are given in the annual reports. The publication activity was significant for most teams and some TF and CC produced Special Issues in peer-reviewed journals. A major science highlight was the 35th Anniversary meeting of ILP in Potsdam, where all TF and CC chairs have reported on the main achievements of the past 5 years. In addition keynotes have been presented by the presidents of IUGS, IUGG and EGU on where lithosphere research should move forward. Also each of the main themes of ILP has been elucidated by a key note presentation.

Seed funding from ILP helped to initiate several collaborative projects such as the training network MEDYNA that joined North African and European countries, The ITN ZIP

For the highlights of the individual TFs and CCs we refer to the annual reports and restrict this report to some highlights only. The joint meeting of the TOPO-EUROPE Programme and ILP Task Forces Sedimentary Basins (TF6), Subducted Lithosphere (TF4), Magma and lithosphere (TF2) in Clermont-Ferrand, 2-6 October 2016 attracted an international audience and led to a Special Issue summarizing the results.

TF 1 CALE - Circum Arctic Lithosphere Evolution: (-2015).

This project was successfully completed and one outcome was a Special Issue: Pease et al., 2014. Arctic lithosphere - A review. Tectonophysics 625. The network built in ILP now continues collaboration with industry funding.

TF 2 Volcanoes and society: Environment, health and public outreach (-2015).

Structural and rheological constraints on magma migration, accumulation and eruption through the lithosphere (since 2015)

Several workshops were organized and the scientific themes were continuously developed. Several high-level papers document both the broad international

collaboration and the scientific advances. A new ITN network has been initiated and several Training Courses for Young Researchers were offered.

TF 3 Bridging the gap from micro-seismicity to large earthquakes (-2015).

The seismic cycle at continental transforms from seismological observation and forward simulation (since 2015):

This TF joins the expertise of 2 formerly independent task forces and that together have generated substantial progress. Major highlights were the initiation of the GONAF-observatory at the North Anatolian Fault and The World Stress Map database release 2016 (Heidbach et al., 2018).

TF 4 Continental Collisional Orogens: From Atomic Scales to Mountain Buildings (-2015).

Fate of the subducted continental lithosphere: insight through analytical mineralogy and microstructures (since 2015).

The TF focused throughout the second phase increasingly on subducted continental lithosphere. A specific highlight was the 2016 International Conference on the Earth's deep interior" – November 4-6, 2016 Wuhan.

TF5 LAPBOX - The lithosphere-asthenosphere boundary depth paradox (-2015)

This TF was completed 2015 after a period of successful work.

TF 6 Sedimentary Basins

Yearly dedicated workshops with associated field trips took place in Tokyo, Japan, (2015), Clermont-Ferrand, France (2016), Cyprus, Greece (2017, picture from field trip to the left) and at the International Sedimentological Congress 2018 in Quebec City, Canada. Several Special Issues were published and some are in preparation. This chain of yearly workshops is continuous for the past 15 years and has built a large international network meanwhile.

TF 7 3D Geo-mechanical modelling of geodynamic processes in the lithosphere (-2015)

This TF joined forces with TF3.

TF 8 Lithosphere dynamics: interplays between models and data

After initiating the TF, we lost E. Burov E. who was a key member of ILP and our community. In his memory ILP has created the E. Burov Medal. T. Gerya took over the TF leadership and continues in the spirit of high quality science. This is evident from the impressive list of papers in nature, science and other high level journals. A Memorial Volume honouring Evgenii Burov appeared 2018 in Tectonophysics, Volume 746, Pages 1-716.

TF 9 DISC - Deep Into the Subduction Channel
(-2015)/ Subduction across scales (since 2015)

An ITN project ZIP (Zooming in between plates) was successfully funded, initiated out of this TF. Several workshops and publications resulted from this

TF 10 The Unconventionals (-2015)

This TF was completed 2015 after a period of successful work.

CC TopoEurope

An ETN project SUBITOP (- Understanding subduction zone topography through modelling of coupled shallow and deep processes) was initiated out of this CC, several workshops were organized - and several Special volumes produced.

CC MEDYNA Mantle Dynamics and Plate Architecture beneath North Africa

Is a network that joins scientists in North Africa in times of political challenges and helps to keep and build links also with the international community. The CC has organized several cross-country workshops, has a solid publication record and successfully attracted European funding to support young geoscientists.

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, 2018
- Several workshops of individual task forces
- ILP Business and bureau meetings at EGU-GA in Vienna, April 2018
- First E. Burov medal and respective medal lecture at EGU 2018
- Strengthen links with other IUGG and IUGS programs

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

Part II

Statutes and By-Laws of the Union and the Associations

STATUTES AND BY-LAWS OF THE UNION

INTERNATIONAL UNION OF GEODESY AND GEOPHYSICS

STATUTES

(Modified by the Council on 5 April 2018)

I. OBJECTIVES AND COMPOSITION OF THE UNION

1. The objectives of the International Union of Geodesy and Geophysics (IUGG) are:
 - a) to promote the study of all problems relating to the figure of the Earth, and the physics and chemistry of the Earth's interior, surface, fresh waters, cryosphere, oceans and atmosphere, along with relevant studies of other planets;
 - b) to initiate, facilitate and co-ordinate research into, and investigation of those problems of geodesy and geophysics which require international co-operation or which are of international interest;
 - c) to provide, on an international basis, for discussion and publication of the results of the researches indicated in Article 1.b);
 - d) to promote co-ordination worldwide of scientific activities in the disciplines of interest to the Union;
 - e) to assist with scientific advice the study of practical problems of a geodetic or geophysical character when such problems present an international aspect or when they require international co-operation of specialists or facilities;
 - f) to promote and co-ordinate the scientific activities of several Permanent Services whose objectives are, on an international basis, to facilitate the standardization of measurements or to collect, analyze and publish geodetic or geophysical data, taking into account the results of planetary studies.
2. To achieve its scientific aims, the Union consists of a number of International Associations, each of which deals with a discipline of geodesy or geophysics.
3. The Union adheres to the International Science Council.
4.
 - a) Any country in which independent activity in geodesy and geophysics has been developed may adhere to the Union, provided that it takes an adequate share in the maintenance of the Union.

That country shall be represented by a single body, known as the Adhering Body, which may be either its principal scientific Academy, or its National Research Council, or any other institution or association of institutions, whether non-governmental or governmental, representing the geodetic and geophysical activities of the adhering country. Only under extraordinary circumstances, the Council of IUGG (defined in Article 5 of these Statutes) may admit a suitably designated additional Adhering Body for a country, provided a corresponding Adhering Body of that country has already been admitted as a National Member of the International Science Council. In this case, each Adhering Body shall have a separate Council Delegate and shall be treated separately in questions of Voting and Finances.
 - b) A country in which activity in geodesy and geophysics has been developed but which cannot participate financially in the maintenance of the Union may become Associate. That country shall be represented by a single body, as specified in Article 4.a.
 - c) Hereafter, adhering countries will be referred to as Member Countries.

- d) There shall be a category of adherence known as Affiliate Membership. Any multinational or regional geodetic, geophysical or other geosciences organisation shall be eligible for Affiliate Membership. Affiliate Members shall have the same rights, duties and obligations as Associate Members.
 - e) There shall be a category of membership within IUGG known as Honorary Member conferred upon individuals awarded IUGG Fellowship by the IUGG Bureau. Honorary Members shall have no rights to attend meetings of Council or participate in Council business.
5. The General Assembly shall consist of three parts: i) a meeting of the duly accredited Delegates of the Member Countries and guests invited in accordance with the By-Laws (the Council Meeting); ii) business meetings of the Union; iii) an open scientific assembly.

The Council of the Union shall consist of the Delegates known as Council Delegates, designated by the Adhering Bodies of the Member Countries, one Council Delegate for each Adhering Body. Each Council Delegate shall be formally accredited by the Adhering Body in advance of each meeting of Council. Adhering Bodies in Associate status are not entitled to appoint a Council Delegate. Each Council Delegate, normally the President of the relevant IUGG National Committee, is expected to serve until the beginning of the first session of the subsequent Council meeting. However, an Adhering Body may replace its Council Delegate during the interval between successive Council meetings, and/or appoint an Alternate Delegate for a specific meeting.

The right of a Council Delegate to vote is subject to the relevant Adhering Body meeting its financial obligations to the Union.

II. ADMINISTRATION

6. Responsibility for the direction of the Union's affairs shall be vested in the Council of the Union. Decisions of the Council shall be reported to the General Assembly.
7. Between meetings of the Council, the direction of the affairs of the Union shall be vested in the Bureau and the Executive Committee, of which the respective responsibilities are hereafter defined.
8. The Bureau of the Union shall consist of the President, President-Elect, Secretary General, Treasurer and three additional Members, all of whom shall be elected by the Council.

The duties of the Bureau shall be to administer the affairs of the Union in accordance with these Statutes and By-Laws and the decisions of the Council.

9. The Executive Committee shall consist of the Bureau, the Presidents of the International Associations, and the immediate Past President of the Union. The Secretaries of the Associations shall be invited to attend meetings of the Executive Committee of the Union in an advisory capacity.

The duties of the Executive Committee shall be to further the scientific objectives of the Associations through effective co-ordination and through the formulation of general policies to guide the scientific work of the Union.

The Executive Committee shall meet with the Council at sessions of the latter with voice but without vote.

10. Within the framework of the Statutes of the Union, the International Associations of the Union may make their own Statutes and By-Laws and control their administration and finance.

III. FINANCE

11. During the meeting of a General Assembly the Council shall elect a Finance Committee for the next period, consisting of three members drawn from the previous Finance Committee and accredited Council Delegates as specified by By-Law 10.

The Finance Committee shall meet with the Council at sessions of the latter, with voice but without vote.

12.

- a) There shall be fourteen categories of membership in the Union, numbered 1 to 14, plus special categories called A and AF.
- b) For categories 1 to 14, each Member Country shall pay annually the number of units of contribution assigned to the category in which it adheres. In each country the Adhering Body shall be responsible for the payment of the contribution. Any member country may additionally donate contributions for travel support of scientists from countries of Category A.
- c) Category A is composed of the Associates. They do not pay an annual contribution to the Union.
- d) Category AF is composed of the Affiliates. They do not pay an annual contribution to the Union.

13.

- a) A country which seeks to adhere to the Union must specify the category in which it proposes to adhere. Its application for admission may be refused if the category proposed is considered inadequate.
- b) An Associate may enter a paying category, or a paying Member Country may raise its category at any time provided the Council agrees. A paying Member Country may lower its category or become an Associate only with the consent of the Council of the Union.

14.

- a) The financial year shall be the calendar year.
- b) If at the end of any year a paying Member Country has not paid its subscription for that year, the benefits of membership in the Union will be denied to that Member Country until full payment has been made of that year's subscription and of any further subscriptions in arrears. Such Member Countries shall be deemed to be in Observer status.
- c) A Member Country in Observer status shall continue to accrue annual subscription obligations.
- d) If at the start of any year a paying Member Country has been in Observer status for four years, that Member Country shall be deemed to have withdrawn from membership unless the Secretary General has received a formal written request from the Member Country to be transferred to Associate membership (Category A).
- e) The Bureau of the Union is authorized to grant requests for transfer temporarily to Category A, until the next meeting of the Council, to Member Countries in Observer status that provide evidence that efforts to pay all subscriptions in arrears are likely to be unsuccessful.
- f) A Member Country which has been denied a transfer to Category A by the Bureau may appeal at the next meeting of the Council.

- g) Any Member Country in Observer status that is denied a transfer to Category A by Council shall cease to be a Member Country at the end of the Council meeting at which its request is considered.
 - h) Every Associate Membership shall be reviewed by the Bureau and the Finance Committee and the results communicated to Council at each General Assembly. Countries in Associate Membership will be asked to consider entering a paying category if it is deemed appropriate. If, following such a request, a Country does not enter a paying category, Council shall decide at its next meeting whether the Country can continue its membership in the Union.
15. In the event of the dissolution of any Association, its assets shall be ceded to the Union. In the event of the dissolution of the Union, its assets shall be ceded to the International Science Council.

IV. VOTING

16. Voting in Council is held (a) at meetings of the Council or (b) electronically. Electronic voting is voting using electronic systems (e.g., Internet, E-mail, Fax) and organized by the IUGG Secretariat. Electronic votes shall be open for one calendar month from the date of announcement. Electronic voting shall normally be suspended in the 6 months preceding a meeting of Council.

Associates have no voting rights.

- 17.
- a) On questions of scientific nature, or of administrative nature, or of a character partly administrative and partly scientific not involving matters of finance, voting shall be in Council by Member Countries, each Council Delegate having one vote, provided that the subscription of the Adhering Body has been paid up to the end of the calendar year preceding the voting.
 - b) On questions involving finance, voting shall be in Council by Member Countries with the provision that a voting country must have paid its subscriptions up to the end of the calendar year preceding voting in Council. The number of votes allotted to each Member Country shall be equal to the number of its category of membership.
18. Questions on admission of new Member Countries and new Affiliate Members and appeals against denial of transfer to Associate membership shall be decided by a two-thirds absolute majority vote of the Council Delegates meeting in Council or voting electronically, each Council Delegate having one vote.
19. A Council Delegate may represent only one Member Country. No member of the Bureau shall serve as a Council Delegate of a country. No Member of the Executive Committee shall vote with the Council unless under exceptional circumstances they are also the Council Delegate of a Member Country.

A paying Member Country which is not represented at a Council meeting may vote by correspondence on any specific question provided that the matter has been clearly defined on the final agenda distributed in advance to the Member Countries and that the discussion thereon has not produced any new considerations or changed its substance and provided that said vote has been received in writing by the President prior to the voting.

For the validity of the deliberations of the Council, at least one third of the Member Countries eligible to vote must be represented by their Council Delegates.

20. Before a vote in a Council meeting or an electronic vote, the President shall decide whether the matter under consideration is scientific, administrative or financial in character and whether the procedure of voting by correspondence applies.

21. Decisions of the Council shall be taken by a simple absolute majority except as otherwise specified in the present Statutes.

If a tie should occur in a Council vote, the decision shall rest with the President.

Simple or two-third absolute majorities are determined by the proportion of affirmative votes to the sum of votes (affirmative, negative, abstention), provided that the total number of delegates voting (affirmative, negative, abstention) is not less than one third of the total membership of the Union eligible to vote. Blank or invalid ballots and votes not cast by Delegates present at a Council meeting or by electronic voting are counted as abstentions.

V. GENERAL

22. These Statutes or any further modification to them shall come into force at the close of the Council meeting at which they are adopted, or in the case of electronic voting on the date at which they are adopted.

23. The Statutes of the Union may be modified only with the approval of two thirds of the Council Delegates present at a meeting or voting electronically.

24. Proposals for changes to any articles of the Statutes and By-Laws of the Union may be made by a Member Country or the IUGG Bureau.

The proposals must reach the Secretary General at least six months before the date of the meeting at which the changes are to be considered. The Secretary General shall notify all Member Countries of any proposed change at least four months before the announced date of the Council meeting.

If a proposal is submitted to Secretary General between Council meetings, the Bureau, in consultation with the Executive Committee, shall determine whether the proposal has merit to be placed for electronic voting by the Council. In the case of electronic voting, the Secretary General shall notify all Member Countries of any proposed change at least three months before the date of the vote.

25. Conduct of IUGG meetings, except as otherwise specified in the Statutes, shall be according to Robert's Rules of Order, Newly Revised. Details of the edition in current use shall be included in the reference document 'Guidelines on IUGG Administration' described in By-Law 13.

26. The official languages of the Union shall be English and French. In case of disparity between the texts, the English text shall be authoritative.

END OF STATUTES

BY-LAWS

(Modified by the Council on 5 April 2018)

I. COMPOSITION

1. The following are the constituent Associations of the Union:
The International Association of Cryospheric Sciences (IACS),
The International Association of Geodesy (IAG),
The International Association of Geomagnetism and Aeronomy (IAGA),
The International Association of Hydrological Sciences (IAHS),
The International Association of Meteorology and Atmospheric Sciences (IAMAS),
The International Association for the Physical Sciences of the Oceans (IAPSO),
The International Association of Seismology and Physics of the Earth's Interior (IASPEI),
The International Association of Volcanology and Chemistry of the Earth's Interior (IAVCEI).
2. The IUGG Executive Committee may establish Union Commissions in order to examine scientific issues of mutual interest to at least four Associations. The Union may also, through the Executive Committee, sponsor jointly with other Unions or for special purposes, specific Programmes or Committees for the conduct of inter-disciplinary science. Such bodies may create subordinate bodies as necessary. In the same way, the Union may sponsor Permanent Services. The list of Union Commissions, Programmes, Committees and Permanent Services shall be reviewed by the Executive Committee at each General Assembly.

Scientists from all countries may attend scientific meetings of the Union and of the Associations. They may also act as observers in Commissions of the Union and in the Associations.
3. The President will normally represent the Union at the General Assemblies of the International Science Council but may be represented, if necessary, by the President-Elect or Secretary General.
4. Each Adhering Body shall form a Committee for Geodesy and Geophysics hereafter known as an IUGG National Committee, which normally consists of a President, Secretary General, and National Correspondents to Union Associations. The function of the National Committee is, under the direction of the Adhering Body, to provide for the participation of the Member Country in the Union's activities.

During the interval between General Assemblies, the Bureau of the Union may directly consult by correspondence the National Committee of each Member Country on any question of scientific character or on administrative matters not involving finance. On matters of finance and on admission of new Member Countries, the Bureau of the Union shall communicate with the Adhering Bodies of paying Members.

II. ADMINISTRATION

5. General Assemblies will normally be held once every four years at the call of the President of the Union. The interval of time between the closure of two successive General Assemblies shall be known as a "period".
6. Notice of the date and of the place of the meeting of the next General Assembly shall be sent by the Secretary General to the Member Countries at least nine months before the Assembly.

Proposals concerning the agenda for meetings of the Council may be presented by the Adhering Bodies or National Committees; they must be received by the Secretary General at

least six months before the meeting. Associates may make proposals of a scientific nature only. The Secretary General must place all proposals received on the final agenda for the Council meeting. This final agenda, with explanatory comments, shall be sent to all Member Countries at least four months prior to the meeting. An item which has not been thus placed on the agenda may be discussed at a meeting of the Council if a proposal to that effect is approved by a two-thirds absolute majority vote of the Council Delegates.

7. The Secretary General may send notice of the date and place of the next General Assembly to individuals or scientific organizations in countries not adhering to the Union, but where there is evidence of activity in Geodesy and Geophysics.

Scientists from these countries will be invited to participate in the scientific programme of the General Assembly, with the status of Guest.

The President of the Union may, on their own initiative or at the request of an Association or Member Country, invite representatives of scientific bodies to attend any General Assembly as Guests provided there is no financial obligation for the Union.

8. A plenary meeting of the participants in the General Assembly shall be held during each General Assembly for discussions of Union activities.
9. The Associations shall hold business meetings and scientific sessions at the General Assemblies of the Union.

The scientific meetings at a General Assembly should include joint sessions of two or more Associations for the discussion of interdisciplinary topics. The programme of the meetings and the selection of these interdisciplinary topics shall be decided by the Executive Committee of the Union, about two years before the time of the General Assembly, on the basis of recommendations made earlier by the Associations.

Provided that the Executive Committee is informed, an Association may also arrange meetings of its own in the interval between the General Assemblies, either singly to deal with topics of specific interest, or jointly with another Association or other Associations.

10.

- a) The President of the Union shall serve for one period.

The President-Elect shall be elected for one period and become President of the Union at the closure of the next General Assembly after her/his election.

The Secretary General shall be elected for one period and may be re-elected for not more than two additional consecutive periods.

The Treasurer shall be elected for one period and may be re-elected for not more than two additional consecutive periods.

The additional Members of the Bureau shall be elected for one period and may be re-elected for not more than one consecutive period.

The Members of the Finance Committee shall be elected for one period and may be re-elected for not more than one consecutive period.

- b) At least eighteen months before a General Assembly, the President shall appoint a Nominating Committee with the advice and approval of the Executive Committee. The Nominating Committee shall consist of a Chairman and three other members, not themselves members of the Executive Committee or of the Finance Committee.

The Nominating Committee, after soliciting nominations from the Adhering Bodies of the Member Countries, and from the officers of the Union and the Associations, shall propose one or two candidates for each position in the Bureau, seeking to achieve reasonable balance in their gender, experience, and geographical and disciplinary distribution. Candidates will be required to signify their acceptance of nomination and

to prepare a resumé outlining their position, research interests and activities related to the Union.

The officers of the Union and Associations and the National Committees shall be informed by the Nominating Committee of the list of nominations at least eight months before the General Assembly. They may make further nominations and/or recommendations to the Nominating Committee at least three months before the General Assembly. If new nominations for a given position are supported by at least three Presidents or equivalent officers of National Committees of Member Countries, and if they are accompanied by the written acceptance of possible nomination and resumé outlining the position, research interests and Union related activities of the candidates, they shall be added to the list initially established. The Nominating Committee shall send the final list of nominations to the officers of the Union and Associations and to the National Committees at the latest two months prior to the General Assembly.

Re-nominations, from those previously nominated for the Bureau may also be made over a period of 48 hours following the close of the first session of the Council meeting at the General Assembly. Such nominations must be submitted in written form to the Secretary General, supported by at least three members of the Council and accompanied by the same documentation as required with the original nominations. The Council Delegates shall be informed of these additional nominations, together with their resumé, at least 24 hours before the elections.

No one can be a candidate for more than one position in the election. Elections shall be by secret ballot.

- c) The Nominating Committee shall, after soliciting nominations from the Adhering Bodies of the Member Countries, and from the officers of the Union and the Associations, propose one or two candidates for each of the three positions on the Finance Committee: one position from among the current members of the Finance Committee and two positions from among the current accredited Council Delegates or the Council Delegates accredited to any previous General Assembly excluding the current members of the Finance Committee. If there is an insufficient number of candidates from the previous Finance Committee, then an additional member or members shall be elected from among the Council Delegates. No member of the Finance Committee may at the same time be a member of the Bureau or the executive body of the Union or of an Association or of a governing body of one of the Permanent Services or programmes supported by the Union. No member may serve for more than two consecutive periods on the Finance Committee.

The officers of the Union and Associations and the National Committees shall be informed by the Nominating Committee of the list of nominations at least three months before the General Assembly. The Council may add to the list of nominations for the Finance Committee during the General Assembly until three days prior to the elections.

Candidates will be required to signify their acceptance of nomination and to provide a resumé outlining their suitability for serving on the Finance Committee.

- d) No one may be at the same time a Member of the Bureau or of the Finance Committee and President or Secretary of an Association.
- e) Scientists from any country are eligible to hold various positions within IUGG with the following exceptions: positions in the Bureau and the Finance Committee, and the positions of Presidents of the Associations, which can only be held by scientists from Member Countries whose subscription has been paid up to the end of the calendar year preceding their nomination.

11. The Council is convened by the President of the Union, and shall meet at appropriate times during each Assembly.

The Council may be convened between two General Assemblies when a written request is made by at least a third of the paying Member Countries or by a simple majority of the members of the Executive Committee, with notice of the questions to be placed on the agenda of the meeting.

Council meetings shall be open to Council Delegates, the Executive Committee, and the Finance Committee. One person from each Associate Member may attend any Council meeting with voice but without the right to vote. The IUGG President may invite guests to make presentations at Council meetings. Other individuals may, with concurrence of the President, attend Council meetings as Listeners only, except that a simple majority of Council Delegates present may declare part of any meeting closed to Listeners.

The Council shall:

- a) decide upon the admission of new Member Countries and new Affiliate Members;
 - b) decide on an appeal against a decision by the Bureau to deny a transfer to Associate membership of a Member Country in Observer Status;
 - c) elect the members of the Bureau and of the Finance Committee;
 - d) receive reports from the Secretary General and the Treasurer of the Union and ratify the decisions or actions taken by the Bureau and the Executive Committee since the last Council meeting;
 - e) consider the budget submitted by the Treasurer and adopt the final budget;
 - f) determine the amount of the unit of contribution for the ensuing period (the unit cannot be changed at a General Assembly unless proposed on the agenda distributed four months in advance to the Member Countries);
 - g) review from time to time the categories of Member Countries; review the Associates at each General Assembly;
 - h) examine questions of general policy or administration in the business of the Union and appoint such Committees as may from time to time be deemed necessary for this purpose;
 - i) consider proposals for changes in the Statutes or By-Laws.
12. The Executive Committee is convened by the President of the Union. It shall meet at each General Assembly, and also at all sessions of the Council with voice but without vote. It will also meet normally at least once between General Assemblies, two years ahead of the next General Assembly, in order to prepare an outline of the interdisciplinary scientific agenda and of the timetables for the Union and for the Associations during the next General Assembly.

At a meeting of the Executive Committee, no member of the Bureau, or the immediate Past President of the Union, may be represented by any other person. The Presidents of the Associations, in case of hindrance, may be represented by a Vice-President or the Secretary of their Association. For the validity of the deliberations of the Executive Committee, at least half of its members must be present or represented.

Proposals concerning the agenda for meetings of the Executive Committee may be submitted by Members of the Committee; they must be received by the Secretary General at least six months before the meeting.

The final agenda shall be sent to the Members of the Executive Committee at least four months prior to the meeting. No question which has not been placed on the agenda may be

discussed at a meeting of the Committee unless a proposal to that effect has been approved by a two-thirds absolute majority vote of the Members present.

The Executive Committee shall:

- a) initiate actions, as required, to co-ordinate the common interest of the Associations, such as by meetings between the Secretary General and the Secretaries of the Associations;
- b) guide the Treasurer regarding the financial needs of the Associations in achieving their objectives;
- c) fill any vacancy which may occur between General Assemblies among the Members of the Bureau and the Finance Committee (when such appointments are later confirmed by the Council, the period of office will be considered to begin from the date of its confirmation by the Council);
- d) make recommendations to the Council on matters of general policy of the Union.

13. The Bureau will normally meet once a year, at the call of the President of the Union. In a meeting, no Member of the Bureau may be represented by any other person. For the validity of the deliberations, four Members at least must be present.

Between the meetings of the Council, the Bureau shall initiate procedures to attain the general objectives of the Union; it shall manage the finances, and ensure the adequate administration of the Union, including maintenance of a reference document 'Guidelines on IUGG Administration'. It shall draw up the programmes for the meetings of the Council and of the Executive Committee.

14. Applications for membership of the Union and for transfer to Associate membership shall be referred to the Secretary General who shall report thereon to the Executive Committee, which shall decide on the scientific merits of each application. The Secretary General shall then forward the proposals through the appropriate channels to the Adhering Bodies representing the paying Member Countries; these bodies will vote electronically and the results of the ballot shall be communicated to them by the Bureau. Admission or transfer will be determined by a simple majority and is provisional until approved by Council. Simple majority is here determined by the proportion of affirmative votes to the sum of votes (affirmative, negative) provided that this sum is not less than one third of the total membership of the Union eligible to vote. Any case of refusal shall be referred to the Council.

15. The President of the Union shall:

- a) be the representative of the Union in its dealing with National or International Organisations or Institutions;
- b) convene and preside over the General Assembly and over all meetings of the Council, Executive Committee and Bureau;
- c) submit a report to the General Assembly on the scientific work of the Union during the current period.

The President-Elect shall:

- d) serve as presiding officer in the absence of the President;
- e) succeed to the office of president if the President is incapable of remaining in office; and the Council shall elect a new President-Elect from the remaining Members of the Bureau based on the recommendation of the Executive Committee;
- f) oversee the activities of the Union Commissions and Working Groups;
- g) perform such other duties as may be assigned by the Bureau.

16. The Secretary General shall:
- a) serve as Secretary of the General Assembly, the Council, the Executive Committee and the Bureau; arrange for meetings of these bodies; prepare and distribute promptly the agenda and the minutes of all their meetings;
 - b) manage the affairs of the Union, informed by the document ‘Guidelines on IUGG Administration’, attend to correspondence, preserve the records;
 - c) circulate all information related to the Union;
 - d) prepare reports on the Union's activities; at least three months before the General Assembly, forward to all the Member Countries a report on the administration of the Union since the last General Assembly, and present a summary of this to the General Assembly itself;
 - e) maintain a register of distinguished scientists who have been honoured by the Union as Fellows of IUGG, collectively designated as the College of Fellows.
 - f) perform such other duties as may be assigned by the Bureau.
17. To assist the Secretary General and the Treasurer in the performance of their duties, the Bureau may appoint one Assistant Secretary General (Executive Secretary) and one Assistant Treasurer who shall be assigned specific tasks by the Secretary General and the Treasurer, respectively, with the approval of the Bureau. The Assistants may attend meetings of the administrative bodies of the Union in an advisory capacity. The Bureau may authorize employment of additional administrative and secretariat personnel as may be required to ensure orderly administration.

III. FINANCE

- 18.
- a) The Adhering Bodies to the Union shall pay annually the number of units of contributions assigned to the category in which they adhere, according to the following table

Cate gory	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Units of Contribution	1	2	3	5	7	10	15	20	25	30	35	40	45	50

- b) Associates, in Category A, do not pay.
 - c) Affiliate members, in Category AF, do not pay.
19. The Finance Committee shall elect a Chair from among its members.
- The Finance Committee shall meet, at the call of its Chair, and at least once during its term of office.

The Treasurer may be invited by the Chairman to attend a meeting of the Finance Committee. No Member may be represented by any other person at a meeting of the Committee.

The Finance Committee shall:

- a) advise the Council on all financial matters of the Union;
- b) receive and review the audits of the accounts;
- c) report to the Council;
- d) advise the Treasurer on preparation of the budget;
- e) advise the Treasurer, the Bureau, and the Executive Committee on financial matters, including raising funds to support Union and Association activities, and reviewing the category of membership of National Members.

The Chair of the Finance Committee will normally be invited to meetings of the Bureau or Executive Committee when financial matters are on the agenda.

20. The Treasurer of the Union shall be responsible for the financial administration of the Union informed by the document 'Guidelines on IUGG Administration' and directions issued by the Bureau.

The Treasurer shall:

- a) in consultation with the Executive Committee and the Finance Committee, prepare a preliminary budget to be sent to the Adhering Bodies at least three months prior to the Assembly together with comments of the Finance Committee, then update it at the General Assembly and submit the budget to the Council for approval;
- b) arrange for an annual audit of the books;
- c) collect the funds of the Union and disburse them in accordance with the approved budget and instructions of the Council and of the Bureau;
- d) maintain records of all financial transactions of the Union and submit annual financial reports thereon to the Bureau and the Finance Committee;
- e) submit such other reports to the Finance Committee and to the Council as may be requested;
- f) assemble, at the end of the calendar year preceding a General Assembly, a report on the complete accounts of the Union (including those of the Associations and of all Union activities) for the previous period, for presentation to the Bureau and to the Finance Committee at least three months prior to the General Assembly, and at the General Assembly to the Council. The report shall be accompanied by statements concerning each account administered by the Union, its Associations, and other financially assisted bodies. Each account shall be audited by a qualified accountant;
- g) prepare a summary report of the Finances of the Union (including those of the Associations and of all Union activities) and arrange for the distribution of copies thereof to the Member Countries not later than three months prior to the General Assembly.

The President, the Treasurer and the Assistant Treasurer have the authority to draw from any bank accounts of the Union, but only as directed by the Bureau.

21. Travelling expenses and per diem subsistence may be paid by the Treasurer in accordance with rates established by the Bureau.

The following conditions must be satisfied:

- a) the meeting must be for specific Union business;
- b) those concerned must represent the Union and not Adhering Bodies;
- c) those concerned must be unable to obtain adequate allowances from sources in their own country.

IV. AWARDS

22. Fellowship of the International Union of Geodesy and Geophysics is a tribute, awarded by the IUGG Bureau, to individuals who have made exceptional contributions to international cooperation in Geodesy or Geophysics and attained eminence in the field of Earth and space sciences.

The nomination and selection procedures and detailed criteria for IUGG Fellowship shall be determined by the IUGG Bureau and published in the document 'Guidelines on IUGG Administration'.

V. CHANGES TO THE BY-LAWS

23. The Council has the power to adopt By-Laws within the framework of the Statutes of the Union. These By-Laws may be modified by a simple majority of votes cast at a Council meeting or by electronic voting. These By-Laws, or any further modification of them shall come into force at the close of the Council meeting at which they are adopted or, in the case of electronic voting, at the date on which they are adopted.

END OF STATUTES AND BY-LAWS

STATUTES AND BY-LAWS OF THE ASSOCIATIONS

STATUTES AND BY-LAWS OF THE INTERNATIONAL ASSOCIATION OF CRYOSPHERIC SCIENCES

Statutes of the International Association of Cryospheric Sciences

(Adopted July 2007, XXIV IUGG General Assembly, Perugia, Italy; revised July 2019, XXVII IUGG General Assembly, Montreal, Canada)

Denomination

The International Association of Cryospheric Sciences, hereinafter called "IACS", formed in 2007 is a constituent association of the International Union of Geodesy and Geophysics (hereinafter called "IUGG"), and is autonomous in its governance structure and processes, as defined below and without contradictions to the Statutes and By-Laws of IUGG.

Statute 1; Objectives of IACS

- 1 a. to promote studies of the cryosphere of Earth and other bodies of the Solar System and related physical processes
- 1 b. to encourage research on cryospheric sciences through collaboration and co-operation among individuals, institutions, and research programmes, both nationally and internationally
- 1 c. to provide opportunities for international discussion and collaboration on cryospheric sciences and research;
- 1 d. to promote education and public awareness about the cryosphere;
- 1 e. to facilitate the standardisation of measurements and the collection of cryospheric data and the analysis, archiving and publication of such data;
- 1 f. to promote the scientific activities of any permanent service which may fall under IACS responsibility and scientific supervision.
- 1 g. to promote and support diversity, inclusion and equality within the field of cryospheric science, within IACS as well as among its membership including but not limited to career stage, gender, racial and ethnic identities, and geographic origin.

Statute 2; Membership of IACS

- 2.1 There are three categories of membership in IACS: National Members, Individual Members, Honorary members
- 2.1 a. A National Member is a country admitted to IUGG and is represented by the IUGG Adhering Body of that nation. Each National Member may appoint at least one Correspondent to IACS.
- 2.1 b. Anyone engaging in scientific research on the cryosphere or otherwise contributing to the objectives of IACS may become an Individual Member.
- 2.1 c. Honorary membership is conferred upon an individual for outstanding service to IACS according to Statute 3.11.

Statute 3; Structure of IACS

- 3.1. IACS shall consist of a Bureau and other component bodies as specified in the By-laws of IACS.
- 3.2 Plenary Administrative Session
- 3.2 a. The work of IACS shall be directed by a Plenary Administrative Session which shall be convened at least once during each General Assembly of IACS, and attended by the Accredited Delegates appointed by National Members, and by Individual Members. One-third of the Accredited Delegates that are eligible to vote are required to validate a decision. Delegates not present may forward a vote on any specific question as described in Statute 3.4.
- 3.2 b. A Plenary Administrative Session may be convened at a Scientific Assembly of IACS between General Assemblies at the request of the President, and must be convened at the request of not less than one-third of

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IUGG Adhering Bodies eligible to vote. Such a request has to reach the Secretary General at least four months prior to the Scientific Assembly.

3.3. The work of IACS consists of matters that are scientific, administrative, and financial in character. Prior to a Plenary Administrative Session the President shall decide the character of each agenda item and whether the procedure of voting by correspondence applies.

3.3 a. On matters of scientific purpose, all Accredited Delegates and IACS Individual Members have a single vote but no person can have more than one vote.

3.3 b. On matters of administration, including election of officers, only Accredited Delegates from IUGG Adhering Bodies in regular IUGG member status (dues paid) may vote; each delegate has one vote and may represent only one Adhering Body.

3.3 c. On matters of finance, only Accredited Delegates from IUGG Adhering Bodies in regular IUGG member status (dues paid) may vote; each delegate has the number of votes corresponding to the Category of IUGG membership of the Adhering Body and may represent only one Adhering Body.

3.4. An IUGG Adhering Body eligible to vote that is not represented by a Delegate at a Plenary Administrative Session may vote by correspondence, including post, fax, or electronic mail, on any voting matter provided that:

- the matter has been clearly defined in the final agenda distributed in advance to the members in accordance with the By-laws,
- the substance of the matter has not been changed, and
- the vote has been received by the Secretary General prior to the meeting.

3.5. Decisions on any voting matter, except for the modification of the Statutes, shall be determined by a simple majority of the votes cast. Simple majority shall be determined by the proportion of affirmative votes to the sum of the affirmative and negative votes, including correspondence votes, and excluding abstentions. If a tie should occur, the decision shall rest with the President.

3.6. The Plenary Administrative Session has the power to adopt and modify By-laws that include specification of the scientific components of IACS (Divisions).

3.7. Electronic voting (e-voting) may be required in between Plenary Administrative Sessions on matters that are scientific, administrative, or financial in character. The matters must be communicated to the IACS Correspondents that are appointed by the IUGG Adhering Body National Committees and in case of scientific matters also to IACS Individual Members at least one month in advance of the voting date. IACS Correspondents from Adhering Bodies in regular IUGG member status (dues paid) are eligible to vote. Individual IACS Members may vote only on issues of scientific matter. The same number of votes per person applies as specified in Statute 3.3. The President nominates one Vice-President or the Secretary General to organize and oversee the ballot. The same quorum applies as for Sessions held at Assemblies.

3.8. The Bureau.

3.8 a. The Bureau shall consist of a President, the President-elect or immediate Past-President, three Vice-Presidents, the Secretary General, and the Heads of the Divisions. The immediate Past-President will remain a Bureau Member during the period between the end of his/her office of President and the election of a new President-Elect. In order to maintain continuity, the terms of office of the President, the President-Elect and the immediate Past-President are staggered. Thus, the four-year term of the President is split, with the first two years in office having the immediate Past-President on the Bureau and with the last two years having the President-Elect on the Bureau. The President-elect will become President at the IACS Scientific Assembly approximately mid-period between IUGG General Assemblies.

3.8 b. Except for the incumbent President, all members of the Bureau shall be elected by the Plenary Administrative Session during the General Assembly of IACS in accordance with the Statutes and By-laws.

3.8 c. In the event of any vacancy occurring in the membership of the Bureau, a person will be appointed to fill the vacancy by the remaining members of the Bureau until the next election. The eligibility for election of a person so appointed shall not be affected by such an appointment. If the vacancy is that of the President, the President-elect shall assume the office of President. If there is no President-Elect, then the Bureau shall appoint one of the three Vice-Presidents to act as President.

3.8 d. No elected officer of the IACS Bureau may hold more than one position within the Bureau at the same time.

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3.10 The Bureau may establish Standing Groups and Working Groups with specified terms of reference.

3.11 The Bureau may nominate persons to the Plenary Administrative Sessions for recognition as “Honorary Members of IACS.”

3.12 IACS may create joint bodies with other IUGG Associations and other intergovernmental and non-governmental international scientific organizations such as the International Science Council (ISC) and organizations affiliated with the United Nations, to deal with topics of mutual interest, and may appoint appropriate representatives to these organizations.

Statute 4; Assemblies of IACS

4.1 A General Assembly of IACS shall normally be held in conjunction with each General Assembly of IUGG.

4.2 The interval between the end of one General Assembly and the end of the next one is, for the purposes of the Statutes, termed one Period.

4.3 A Scientific Assembly of IACS may be held between General Assemblies of IACS.

4.4 Notice of the date and place of a General Assembly or a Scientific Assembly shall be sent by the Secretary General to the IACS Correspondents at least nine months prior to that Assembly.

4.5 Between Assemblies, responsibility for the direction of IACS shall rest with the Bureau, which shall administer the affairs of the IACS in accordance with these Statutes and By-laws and the decisions of the prior Plenary Administrative Session.

Statute 5; Dissolution of IACS

If IACS should be dissolved, its financial assets will revert to IUGG to be used for the continuation of scientific and educational activities.

Statute 6; Languages

The present Statutes have been prepared in the official languages of IUGG. The English text shall take precedence if there is a question of interpretation.

Statute 7; Adoption and Modification of the Statutes

7.1 The Statutes of IACS must be approved by the IUGG Council at a General Assembly of IUGG, and shall come into force at the close of the Council Meeting at that General Assembly.

7.2 A member of the IACS Bureau, an IACS Correspondent or a Delegate to the IACS Plenary Administrative Session from an IUGG Adhering Body may propose a change to these Statutes. Any such proposal must reach the Secretary General of IACS at least six months prior to the announced date of the IUGG General Assembly at which it is to be considered. The Secretary General shall notify all IACS Correspondents and Accredited Delegates of any proposed change at least two months prior to the announced date of the General Assembly.

7.3. For adoption, modifications must be agreed by at least a two-thirds' majority of the votes cast by Accredited Delegates at a Plenary Administrative Session held during a General Assembly, and further approved by the Council of the IUGG. A two-thirds majority shall be determined by the proportion of affirmative votes to the sum of the affirmative and negative votes, including correspondence votes, and excluding abstentions.

7.4 Modifications to these Statutes shall come into force at the close of the General Assembly at which they were adopted.

By-laws of the International Association of Cryospheric Sciences (IACS)

By-law 1: Divisions

The scientific components of IACS shall be separated into Divisions as follows:

Snow and Avalanches
Glaciers
Ice sheets
Sea Ice, Lake and River Ice
Cryosphere, Atmosphere and Climate
Planetary and other Ices of the Solar System

- The role of Divisions shall be to further the scientific objectives of IACS through co-ordination of appropriate scientific research, promotion and administration of IACS Working Groups, organization of scientific meetings, and promotion of the exchange of information and data.
- Each Division shall be responsible for its role, structure, and mode of operation.
- Each Division shall be represented on the IACS Bureau by a Division Head.
- The role and effectiveness of each Division shall be reviewed periodically by the Bureau.

By-law 2: IACS Administration

2.1 The Bureau shall meet at least twice at each IACS General Assembly, and must meet at least once more between such Assemblies.

2.2 The Bureau shall meet at the call of the President, who will set the agenda in consultation with the Secretary General.

2.3 The Bureau can meet in person, or via teleconference. All participating Bureau Members have equal voting rights.

2.4 The quorum for an IACS Bureau Meeting shall be a majority of the Bureau Members but must include: at least three of the President; President-Elect or Past-President; the Secretary General; and one of the Vice-presidents.

2.5 The President may invite representatives of scientific bodies or individuals to attend a Bureau Meeting in an advisory capacity.

2.6 Electronic voting (e-voting) may be required in between Bureau Meetings. E-voting is a two-stage process: a discussion phase where Bureau Members openly discuss the issue, followed by a voting phase that is secret. The Secretary General or, in case of conflict of interest, either the President or the President-Elect or Past-President, counts the votes. The same quorum applies as for Bureau Meetings (see By-law 2.4). The discussion period and voting time should be kept as short as possible (approximately one week each).

2.7 The President, the Secretary-General, and either the President-Elect or the immediate Past-President shall meet at the call of the President, in person, or via teleconference. As a subset of the full Bureau, they will handle the day-to-day IACS administration and perform tasks delegated by the Bureau.

By-law 3: Officers

3.1 President

3.1 a. The President shall be elected for one Period, and may not be re-elected to the same office. In accordance with Statute 3.8a, the term of office begins approximately mid-period between IUGG General Assemblies, usually at the time of an IACS Scientific Assembly.

3.1 b. The duties of the President are

- (i) to represent IACS in the IUGG Executive Committee and at other meetings, conferences, or functions where formal representation is requested or desirable;
- (ii) to convene Plenary Administrative Sessions and meetings of the Bureau and to preside over these meetings;
- (iii) to prepare and distribute the agenda of Bureau Meetings to Bureau Members in consultation with the Secretary General;
- (iv) to submit a report on the work of IACS to Plenary Administrative Sessions;

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(v) to appoint the Chair of Standing and Working Groups established according to Statute 3.10;
(vi) to appoint, on behalf of the Bureau, persons who maintain liaison between the Bureau and other scientific bodies and programmes according to specified terms of reference.

3.1 c. If the President is temporarily not available, the President-Elect shall act on behalf of the President in accordance with the Statutes and By-laws. If there is no President-Elect, then the Bureau shall appoint one of the Vice-Presidents, who shall be from a country represented by an IUGG Adhering Body in regular IUGG member status (dues paid), to act on behalf of the President in accordance with the IUGG Statutes and By-laws.

3.2 Vice-Presidents

3.2 a. The Vice-Presidents shall be elected for one period and may be re-elected for not more than one period which may or may not be consecutive.

3.2 b. The duties of the Vice-Presidents are:

- (i) to represent the interests of cryospheric scientists at-large;
- (ii) to advise the Bureau on IACS activities;
- (iii) to assist the President in furthering the objectives of IACS within IUGG and the International Scientific Community;
- (iv) to assist the President and Secretary General in administering IACS.

3.3 Secretary General

3.3 a. The Secretary General shall be elected for one period and may be re-elected for not more than two additional periods which may or may not be consecutive.

3.3 b. The duties of the Secretary General are

- (i) to assist the Bureau in the management of the administrative and scientific affairs of IACS, to attend to correspondence, and to maintain and preserve the records of IACS;
- (ii) to arrange meetings of the Bureau, to assist the President in the preparation of the agenda for Bureau Meetings, and to prepare and distribute the minutes of these meetings;
- (iii) to organize Assemblies according to the instructions of the Bureau, to prepare and arrange publication of the program of each Assembly,
- (iv) to request and receive the names of Accredited Delegates for each Plenary Administrative Session; to prepare and distribute the agenda; to prepare ballots and arrange for counting of votes; and to prepare and distribute the minutes of each Session;
- (v) to receive and take charge of the funds allocated by IUGG to IACS, or as may be received from any other source; to disburse such funds in accordance with the decisions of Plenary Administrative Sessions or with the instructions of the Bureau; to keep account of all receipts and disbursements and to submit such account, audited by a qualified accountant, for approval by the Bureau and submission to the Plenary Administrative Session;
- (vi) to maintain lists of IACS Members for purposes of communication, including IUGG, and Correspondents;
- (vii) to publish an internal IACS bulletin (such as IACS News) containing information of general interest to IACS;
- (viii) to perform such other duties as may be assigned by the President or the Bureau.

3.3 c. The Bureau may, at its discretion, appoint an Assistant Secretary General.

3.4 Heads of Divisions

3.4 a. The Heads of Divisions shall serve for one period but may be re-elected for two more periods which may or may not be consecutive.

3.4 b. The duties of the Heads of Divisions are:

- (i) to promote the interests of their respective divisions through participation in symposia, conferences, workshops and other activities, which receive the approbation of the Bureau;
- (ii) to oversee the activities of Working Groups within a Head's Division and serve as liaison between the Working Group and the Bureau;

(iii) to assist the Bureau in furthering the objectives of IACS in accordance with the Statutes and By-laws.

3.4 c. The Bureau may, upon request from the Head of a Division and at its discretion, appoint a Deputy Head of Division. The Division Head can temporarily delegate the right to vote on Bureau matters to the Deputy. No Division can have more than one vote.

3.5 No person who has served on the Bureau for four Periods shall be eligible for further election to any position on the IACS Bureau.

By-law 4: Nominations and Election of the Bureau

4.1 The Bureau shall establish a Nomination Panel consisting of a Chair and not less than two other members at least ten months before a General Assembly of IACS. The Panel will receive and consider suggestions and shall

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prepare a list of candidates for each office, seeking to achieve reasonable balance with respect to gender, career stage, cryospheric field, and geographical distribution. Members of the Bureau may not be appointed to the Nominating Panel.

4.2 At least nine months before an IACS General Assembly, the Secretary General shall solicit nominations for officers that must be received by the Chair of the Nomination Panel not later than six months before the IACS General Assembly. Nominees for the position of President-Elect, but not for the other positions, must be from countries represented by IUGG Adhering Bodies in regular IUGG member status (dues paid).

4.3 Each nomination for office must include a résumé of the candidate's qualifications relevant to the office for which the candidate is nominated. A signed statement of the candidate's willingness to stand for office must also be provided. The nomination shall not be considered without submission of the résumé and consent statement.

4.4 A person may be a candidate for more than one office, but once elected for one position cannot be elected for another for the same Period according to Statute 3.8d.

4.5 The list of candidates shall normally contain more than one name for each office. The Chair of the Nomination panel shall distribute the list to the accredited delegates to the Plenary Administrative Session at least three months before an IACS General Assembly. The list submitted for voting shall contain both the candidates proposed by the Nomination Panel and the names of all other nominees submitted.

4.6 Voting for the election of Bureau Officers by the Accredited Delegates shall be by secret ballot. The President shall select two electoral officers from among the participants at the Plenary Administrative Session to oversee and compile the votes. The electoral officers shall not be members of the Bureau or members of the Nominating Committee nor candidates for the election.

4.7 Candidates who obtain a simple majority of votes shall be elected. If no candidate receives a majority of votes for a specific office, the two candidates receiving the most votes shall be named and a second vote shall be held. In the case of a tie in the second round the current President shall decide.

By-law 5: Plenary Administrative Sessions

5.1 Attendance

5.1 a. Plenary Administrative Sessions shall be open to all scientific participants at IACS Assemblies and to the general public.

5.1 b. Participants who are either Accredited Delegates or IACS Individual Members have voice on any issue. Any other session attendee has voice only on scientific issues.

5.1 c. An Accredited Delegate may designate another participant from that country to be his or her representative at all or part of a Plenary Administrative Session provided that the Secretary General is informed in writing prior to the Plenary Administrative Session at which the designated representative is to act.

5.1 d. The President may, on his or her initiative or at the request of an Accredited Delegate, invite individuals such as representatives of relevant scientific bodies to attend a Plenary Administrative Session in an advisory capacity.

5.2 Agendas

5.2 a. A provisional agenda for a Plenary Administrative Session shall be prepared by the Secretary General and circulated to IACS Accredited Delegates and Correspondents at least two months prior to the opening of an Assembly.

5.2 b. The provisional agenda shall include all items submitted by IACS Accredited Delegates for discussion at the Plenary Administrative Session, together with questions placed on the provisional agenda by the Bureau. Additional agenda items, for which notice has not thus been given, may only be discussed with the consent of the voting members of the Plenary Administrative Session.

By-law 6: Modifications to the By-laws

The By-laws may be modified by a simple majority of votes cast at a Plenary Administrative Session.

Glossary: IACS Statutes and By-laws

Accredited Delegate:	the Delegate appointed to attend a Plenary Administrative Session of an IACS Assembly by an IUGG Adhering Body. The Accredited Delegate may, but does not need to be, the National Correspondent. An Accredited Delegate may vote on all IACS scientific matters and on IACS administrative and financial matters if the IUGG dues of the Adhering Body are paid.
Adhering Body:	As defined in IUGG Statute 4a, a single body in any country that represents the geodetic and geophysical activities of that country. Under extraordinary circumstances, there may be more than one Adhering Body for a country. Each Adhering Body forms a Committee for Geodesy and Geophysics hereafter known as an IUGG National Committee (IUGG By-law 4).
Assembly:	a General Assembly or a Scientific Assembly of IACS.
(The) Bureau:	the officers elected by a Plenary Administrative Session at an Assembly of IACS.
(The) By-laws:	the By-laws of IACS.
Correspondent:	the person named by an IUGG Adhering Body National Committee to serve as a liaison between the National Committee and IACS.
Divisions:	The primary scientific components of IACS, named in By-law 1.
IACS:	the International Association of Cryospheric Sciences.
(IACS) Individual Member:	a person registered with IACS as an individual member.
IUGG:	the International Union of Geodesy and Geophysics.
National Members (of IACS):	A country admitted to IUGG as voting or non-voting member as defined in Statute 2.1 a.
Nominating Panel:	the committee appointed by the Bureau to solicit candidates and provide nominations for the election of Bureau officers to the Plenary Administrative Assembly.
General Assembly (of IACS):	an Assembly of IACS held in conjunction with a General Assembly of IUGG (i.e., every 4 years). Consistent with IUGG General Assemblies it consists of three parts: (1) a Plenary Administrative Session, (ii) business meetings of IACS, and (iii) an open scientific assembly.
Period:	the interval between the end of one General Assembly of IACS and the end of the next General Assembly of IACS.
Plenary Administrative Session:	a formal meeting of Accredited Delegates, and IACS Individual Members. It is open to the public.
Scientific Assembly (of IACS):	an Assembly of IACS held between General Assemblies.
(The) Statutes:	the Statutes of IACS.

STATUTES AND BY-LAWS OF THE INTERNATIONAL ASSOCIATION OF GEODESY

(Adopted by the IAG Council at the XXVII IUGG General Assembly in Montréal, Canada, July 2019)

Statutes of the International Association of Geodesy

1. Definition of Terms

- (a) Geodesy is the discipline that deals with the measurement and representation (geometry, physics, and temporal variations) of the Earth and other celestial bodies.
- (b) IUGG is an acronym for the International Union of Geodesy and Geophysics.
- (c) IAG or Association is an acronym for the International Association of Geodesy.
- (d) Adhering Body and Council have the same meaning as in the Statutes of the IUGG.
- (e) IAG General Assembly refers to an assembly for scientific and/or administrative purposes of:
 - (i) scientists from geodesy and other Earth science disciplines;
 - (ii) the Council Delegates (or Alternative Delegates) appointed by the Adhering Bodies; and
 - (iii) individual members as defined by Statute 6(b).
- (f) IAG Scientific Assembly means an assembly for primarily scientific purposes and therefore it does not normally require the presence of the delegates appointed by the Adhering Bodies.
- (g) Council Delegate means the person appointed by the Adhering Body to be a member of the Council for one period (see 1(h)). Adhering Bodies may appoint an Alternative Delegate to an IAG Council meeting if the Council Delegate cannot attend the meeting.
- (h) Period means the interval of time between the closures of two successive IAG General Assemblies.

2. International Association of Geodesy

- (a) The International Association of Geodesy (IAG):
 - (i) is a constituent Association of the IUGG; and
 - (ii) is subject to the Statutes and Bylaws of the IUGG.
- (b) In the event of the dissolution of the IAG, its assets shall be ceded to the IUGG.

3. Mission

The Mission of the Association is the advancement of geodesy. The IAG implements its mission by furthering geodetic theory through research and teaching, by collecting, analyzing, modelling and interpreting observational data, by stimulating technological development and by providing a consistent representation of the figure, rotation, and gravity field of the Earth and planets, and their temporal variations.

4. Objectives

The IAG shall pursue the following objectives to achieve its mission:

- (a) Study, at the highest possible level of accuracy, all geodetic problems related to Earth observation and global change, including:
 - (i) Definition, establishment, and maintenance of global and regional reference systems for interdisciplinary use.
 - (ii) Rotation of the Earth and planets.
 - (iii) Positioning and deformation.
 - (iv) Gravity field.
 - (v) Ocean, ice and sea level.
 - (vi) Atmosphere and hydrosphere.
 - (vii) Time and frequency transfer.
- (b) Support the maintenance of geodetic reference systems and frames for continuous, long-term observations and archival of results.
- (c) Provide observational and processed data, standards, methodologies, and models in a form that ensures the broadest possible range of research and application.
- (d) Stimulate development and take advantage of emerging space and other technologies to increase the resolution and accuracy of geodetic data and products in order to advance geodetic and interdisciplinary research.
- (e) Initiate, coordinate, and promote international cooperation and knowledge exchange through symposia, workshops,

summer schools, training courses, publications, and other means of communication.

- (f) Foster the development of geodetic activities and infrastructure in all regions of the world, taking into consideration the specific situation of developing countries.
- (g) Collaborate with the international science and engineering community in supporting the application of geodetic theory and techniques and the interpretation of results.
- (h) Cooperate with national and international agencies in establishing research goals, missions, and projects.

5. Structure and Administration

- (a) The Association's structure shall comprise a small number of components: Commissions, Inter-commission Committees (ICC) (such as the ICC on Theory (ICCT)), the Services, the Global Geodetic Observing System (GGOS), and the Communication and Outreach Branch (COB).
- (b) Subcomponents, such as IAG Projects, Sub-commissions, Commission Projects, and Study and Working Groups, may be established as provided for in the Bylaws.
- (c) The administration of the IAG is carried out by the IAG General Assembly, the IAG Council, the IAG Bureau and the IAG Executive Committee. The COB is the office responsible for the promotional activities of the IAG and the communication with its members.

6. Membership

The membership of the IAG shall comprise:

- (a) Adhering Bodies; and
- (b) Individual members in accordance with the Bylaws.

7. IAG Council

- (a) The IAG Council is responsible for governance, strategic policy and direction.
- (b) The membership of the IAG Council consists of Delegates appointed by the Adhering Bodies.
- (c) Each Adhering Body may appoint one Delegate subject to the conditions in (d) and (e) below.
- (d) A Delegate may only represent one Adhering Body.

- (e) The IAG President, Vice President and Secretary General may not serve as Delegates.

8. IAG Bureau

- (a) The Bureau of the Association consists of the IAG President, the Vice President and the Secretary General.
- (b) The duties of the IAG Bureau shall be to administer the affairs of the Association in accordance with these Statutes and Bylaws and with the decisions of the IAG Council and the IAG Executive Committee.

9. IAG President

- (a) The IAG President shall be elected by the IAG Council.
- (b) The IAG President shall provide general leadership for the Association.
- (c) The IAG President presides over the meetings of the IAG General Assembly, the IAG Scientific Assembly, the IAG Council, the IAG Executive Committee, and the IAG Bureau. In the IAG Council meetings the President has no vote, except in the case of a tie as provided in 14(g).
- (d) The IAG President, on completion of their term of office of one period, shall serve for the next period in the position of Immediate Past President.

10. IAG Vice President

- (a) The IAG Vice President shall be elected by the IAG Council.
- (b) The IAG Vice President shall perform such tasks as may be assigned by the IAG President, the IAG Executive Committee or the IAG Council.
- (c) The IAG Vice President assumes the functions, duties and powers of the President when the latter is absent or otherwise unable to assume office.

11. IAG Secretary General

- (a) The IAG Secretary General shall be elected by the IAG Council.
- (b) The IAG Secretary General shall serve as secretary of the IAG General Assembly, the IAG Scientific Assembly, the IAG Council, the IAG Executive Committee, and the IAG Bureau and arrange for meetings of these bodies in accordance with the Bylaws.
- (c) The IAG Secretary General, on completion

of their term of office, shall serve for the next period in the position of Immediate Past Secretary General.

12. IAG Executive Committee

- (a) The IAG Executive Committee shall consist of the following voting members: each member of the IAG Bureau, the immediate Past President, the immediate Past Secretary General, the Presidents of the Commissions, the President of the ICCT, the President of GGOS, the President of the COB, the three representatives of the Services, and two Members-at-Large.
- (b) Presidents of the Inter-commission Committees other than the ICCT, Chairs of the IAG Projects, and the Assistant Secretaries shall attend any meeting of the IAG Executive Committee, with voice but without vote. The Past Presidents and past Secretaries General may attend any meeting of the IAG Executive Committee, with voice but without vote (except for the immediate Past President and the immediate Past Secretary General, who do have a vote in accordance with Statute 12(a) for one 4-year period).
- (c) The election of IAG Executive Committee members shall be in accordance with the Bylaws.
- (d) The responsibilities of the IAG Executive Committee shall be to further the objectives of the Association through effective coordination and through the formulation of general policies.
- (e) Decisions of the Executive Committee shall be taken by a simple majority. If a tie should occur in an Executive Committee vote, the IAG President shall cast the decisive vote.

13. Council Meetings

- (a) The IAG Council shall meet at the time of an IAG General Assembly.
- (b) The IAG Council may hold extraordinary meetings, either in person or electronically, at times other than an IAG General Assembly. Such meetings must be proposed by the IAG Executive Committee
- (c) The members of the IAG Executive Committee may attend meetings of the IAG Council, with voice but without vote, except for those who are also Delegates.

14. Voting in the Council

Voting in the IAG Council shall follow the following rules:

- (a) An Adhering Body which is not represented at an IAG Council meeting may vote by correspondence on any specific question, provided that the matter has been clearly defined on the final agenda distributed in advance, and that the discussion thereon has not produced any significant new considerations or change in its substance, and that the said vote has been received by the IAG President prior to the voting. In such a case the vote will be cast in accordance with 14(d)).
- (b) Quorum in IAG Council meetings is achieved when the number of Council Delegates (or Alternative Delegates) in attendance is at least one third of the delegates from countries eligible to vote.
- (c) On questions not involving matters of finance, each delegate from an Adhering Body, with its IUGG subscriptions paid up to the end of the calendar year preceding the voting, shall have one vote.
- (d) On questions involving finance, each delegate from an Adhering Body, which has paid its IUGG subscriptions up to the end of the calendar year preceding the voting, shall have the right to vote. The number of votes allotted to each delegate of an Adhering Body shall then be in accordance with its category of membership, as defined by the IUGG.
- (e) Prior to any vote in an IAG Council meeting, the IAG President shall decide whether or not the matter under consideration is financial in character and whether the procedure of voting by correspondence applies.
- (f) The IAG Council may also deliberate and decide matters at other times by correspondence and/or email ballot, provided that the issues have been communicated to IAG Council members at least one month in advance of the voting date.
- (g) Decisions of the IAG Council shall be taken by a simple majority, except as otherwise specified in these Statutes. If a tie should occur in an IAG Council vote, the IAG President shall cast the decisive vote. This procedure also applies if the vote is taken by email ballot. Simple and two-thirds majorities are determined by the proportion of affirmative votes to the sum of all votes

(affirmative, negative and abstention). Blank and invalid ballots and votes not cast by delegates present are counted as abstentions.

- (h) Elections for all for members of the IAG Executive Committee shall be by electronic ballot. For each post, the winner must receive an outright majority (number of votes being greater than the total combined votes of the other candidates). If there are three or more candidates for a position and no candidate has an outright majority after the first voting round, then the top two ranked candidates will be retained and a second round of votes conducted to elect the winner. Ties will be broken by a coin toss, drawing of lots, or equivalent random selection.
- (i) Except as otherwise provided in the Statutes or Bylaws, meetings of the IAG Council, as well as those of other IAG administrative bodies, shall be conducted according to the edition of Robert's Rules of Order currently recommended by the IUGG.

15. Decisions of the Council

- (a) Decisions of the IAG Council shall be reported to the individual membership in a meeting at the IAG General Assembly.
- (b) If the majority of those present at this meeting disagrees with the decisions of the IAG Council, the IAG Council shall reconsider the question, and make a decision, which shall be final.

16. Changes to Statutes and Bylaws

Changes in the Statutes and Bylaws shall be made as follows:

- (a) If deemed necessary, the Association may review the Statutes and Bylaws in each period, to ensure an up-to-date structure of its scientific and administrative organization. A Review Committee, known as the Cassinis Committee, will be appointed by the IAG Executive Committee to achieve this goal. Proposals for a substantive change of any article of these Statutes and Bylaws must reach the Secretary General at least two months before the announced date of the IAG Council meeting at which it is to be considered. The Secretary General shall notify all Adhering Bodies of any proposed changes at least one month before the announced date of the IAG Council meeting.
- (b) The Statutes may not be modified except a two-thirds majority of votes cast at an IAG Council meeting, and changes shall come into force at the close of that meeting.
- (c) The IAG Council shall have the power to adopt Bylaws within the framework of the Statutes.
- (d) The Bylaws may be modified by a simple majority of votes cast at an IAG Council meeting, and changes shall come into force at the close of the meeting.

By-Laws of the International Association of Geodesy

1. Definition of Terms

- (a) **Association component** or **components** refers to the Commissions, the Inter-commission Committee on Theory (ICCT), other Inter-commission Committees as they may be established, IAG Projects, the Services, the Global Geodetic Observing System (GGOS), and the Communication and Outreach Branch (COB).
- (b) **Commissions** represent major fields of activity in accordance with the IAG Statutes.
- (c) **Services** collect and analyze observations to generate products relevant to geodesy and other sciences and applications.
- (d) The **Global Geodetic Observing System** (GGOS) works with the IAG components in advancing our understanding of the dynamic Earth system by quantifying our planet's changes in space and time..
- (e) **Association subcomponent** or **subcomponents** are long-term or short-term structures created by the IAG or one or more of its components.
- (f) **Long-term subcomponents** comprise IAG Projects (broad in scope and of high interest for the entire field of geodesy), Sub-commissions and Commission Projects which are expected to operate for several periods.
- (g) **Short-term subcomponents** refer to Study Groups and Working Groups which are established for a maximum term of one period.
- (h) **Steering Committee** means a group of elected or appointed IAG officers who oversee the work of Commissions, Inter-commission Committees (see 17), IAG Projects (see 16), and the Communication and Outreach Branch (see 18).
- (i) **Period** means the interval of time between the closures of two successive IAG General Assemblies.

2. Responsibilities of Association Components

- (a) The scientific work of the IAG is performed by Commissions, Inter-commission Committees, IAG Projects, Services and the GGOS.
- (b) The responsibilities of the IAG Components are determined by the IAG Council on the recommendation of the IAG Executive Committee.

- (c) Components are expected to interact with each other where their activities are inter-related.
- (d) Each Component may set up subcomponents and is responsible for the activities of those subcomponents.

3. General Responsibilities of Component Presidents or Chairs, and Steering Committees

- (a) Each Component shall have a President or Chair who will lead a Steering Committee.
- (b) The Component President or Chair is responsible for the scientific development within the Component's field of interest. The Component's President or Chair shall:
 - (i) coordinate the work of the subcomponents;
 - (ii) keep the officers of the Component as well as the IAG Bureau and IAG Executive Committee informed of the Component's activities on an annual basis;
 - (iii) collect reports of the subcomponents two months before each IAG General and Scientific Assembly for publication in the "Travaux de l'Association Internationale de Géodésie";
 - (iv) receive suggestions for new subcomponents, and suggestions for continuation of existing ones; and
 - (v) recommend changes to subcomponents to the IAG Executive Committee for approval.
- (c) The Component's Steering Committee is expected to meet at least once per year and at least once during each IAG General Assembly.
- (d) The Component's Steering Committee shall review at one of its meetings (usually the IAG General Assembly, or the IAG Scientific Assembly):
 - (i) the activities of the subcomponents over the past period;
 - (ii) the structure of the subcomponents; and
 - (iii) the programs for the forthcoming period for those subcomponents that will be recommended for continuation.
- (e) The Component's Steering Committee shall inform the Secretary General about all relevant issues.
- (f) The Component's Steering Committee may organize scientific and organizational meetings

and workshops provided that they are readily distinguished as being of a more limited scope than IAG Scientific Symposia or IAG Sponsored Symposia as described in Bylaws 28 and 29.

4. Commission Responsibilities

Commissions shall promote the advancement of science, technology and international cooperation in their field. They establish the necessary links with sister disciplines and with the relevant Services. Commissions shall represent the Association in all scientific domains related to their field of geodesy.

5. Commission Steering Committee

- (a) The Commission Steering Committee shall be set up at each IAG General Assembly, following the election of the Association officers.
- (b) The Steering Committee shall have the following voting members:
 - (i) Commission President.
 - (ii) Commission Vice President.
 - (iii) Chairs of the Sub-commissions and Commission Projects.
 - (iv) Up to three representatives of the Services relevant to the work of the Commission.
 - (v) Up to two Members-at-Large to balance geographical and member country representation.

6. Appointment of Commission Officers

- (a) The Commission President shall be elected by the IAG Council for one period without reappointment, except where exceptional circumstances justify reappointment.
- (b) The Commission Vice President shall be appointed by the IAG Executive Committee for one period without reappointment, except where exceptional circumstances justify reappointment.
- (c) Chairs of the Sub-commissions and Commission Projects shall be nominated by the Commission President and Vice President within two months following the General Assembly.
- (d) The representatives of the Services shall be appointed by the Commission President and Vice President upon proposal of the Services.
- (e) The Members-at-Large shall be nominated by the Commission President and Vice President within two months following the IAG General Assembly.

- (f) The appointments of Members-at-Large and Chairs of Sub-commissions and Commission Projects take effect on approval of the nominations by the IAG Executive Committee.

7. Tasks of Commission Steering Committee

The Commission Steering Committee is subject to the general responsibilities of component Steering Committees in Bylaw 3(c), 3(d), 3(e), and 3(f). In particular, its tasks are to:

- (a) Review the Commission's field of interests and objectives.
- (b) Liaise with the other IAG Commissions, the Inter-commission Committees, and with similar organizations outside the IAG, as appropriate.
- (c) Foster active participation of early career geodesists and geodesists from under-represented countries.
- (d) Coordinate and review the work of its components and report at the time of the Scientific Assembly to the IAG Executive Committee on the progress and performance of the components.
- (e) Encourage and organize Commission and inter-disciplinary symposia and/or sessions at major geodesy related international meetings.
- (f) Maintain a Commission website and email service.
- (g) As requested, nominate editors for the Journal of Geodesy.

8. Current Commissions

On the approval of these Bylaws, there shall be four Commissions with areas of scientific responsibility as outlined below:

(1) Commission 1: Reference Frames

- (a) Establishment, maintenance, improvement of the geodetic reference frames.
- (b) Advanced terrestrial and space geodetic techniques for the above purposes.
- (c) International collaboration for the definition and deployment of networks of terrestrially-based space geodetic observatories.
- (d) Theory and coordination of astrometric observation for reference frame purposes.
- (e) Collaboration with space geodesy/reference frame related international services, agencies and organizations.

(2) Commission 2: Gravity Field

- (a) Terrestrial, marine, and airborne gravimetry.
- (b) Satellite gravity and altimetry observations.
- (c) Gravity field modelling.
- (d) Time-variable gravity field.
- (e) Geoid determination and height systems.
- (f) Satellite orbit modelling and determination.

(3) Commission 3: Earth Rotation and Geodynamics

- (a) Earth orientation (Earth rotation, polar motion, nutation and precession).
- (b) Earth tides.
- (c) Tectonics and crustal deformation.
- (d) Sea surface topography and sea level changes.
- (e) Planetary and lunar dynamics.
- (f) Effects of the Earth's fluid layers (e.g., post glacial rebound, loading).

(4) Commission 4: Positioning and Applications

- (a) Terrestrial and satellite-based positioning systems development, including sensor and information fusion.
- (b) Navigation and guidance of platforms.
- (c) Interferometric laser and radar applications.
- (d) Applications of geodetic positioning using geodetic networks, including monitoring of deformations.
- (e) Applications of geodesy to engineering.
- (f) Atmospheric investigations using space geodetic techniques.

9. Commission Subcomponents and Joint Subcomponents

- (a) Commission subcomponents are Sub-commissions, Commission Projects, Study Groups, and Working Groups, which all belong to one Commission.
- (b) If more than one component is involved in a subcomponent, the term “joint subcomponent” will be used, e.g. Joint Sub-commission, Joint Commission Project, Joint Study Group, Joint Working Group.

10. Sub-commissions and Joint Sub-commissions

- (a) A Sub-commission may be set up for topics where the Commission plays a leading or coordinating role.
- (b) Where a topic relates to the scientific responsibilities of more than one IAG component, a Joint Sub-commission shall be established under the lead of one Commission.
- (c) A Sub-commission is expected to be established for several periods.
- (d) Sub-commissions are established and terminated by the IAG Executive Committee upon recommendation from the Commission President.
- (e) A proposal to the IAG Executive Committee for a Joint Sub-commission requires the recommendation of the Presidents of all contributing components.

11. Commission Projects and Joint Projects

- (a) A Commission Project may be established when a new scientific method or a new technique is being developed, or when it seems appropriate to apply an existing technique to a specific geographic area where international collaboration is required.
- (b) Where a topic for a Commission Project relates to the scientific responsibilities of more than one Commission, or a Commission and a Service, a Joint Commission Project shall be established under the lead of one Commission.
- (c) A Commission Project is established for one period and may be extended for another period subject to a positive review.
- (d) Commission Projects are established, extended and terminated by the IAG Executive Committee upon recommendation from the Commission President.
- (e) A proposal to the IAG Executive Committee for a Joint Commission Project requires the recommendation of the Presidents of all contributing components.

12. Study Groups, Working Groups, Joint Study Groups and Joint Working Groups

- (a) A Study Group or Working Group may be established at any time to address clearly defined well-focused scientific topics of limited scope within the field of the Component. A Study Group is dealing with more theoretical

issues and a Working Group with more practical realizations.

- (b) Where a topic for a Study Group or Working Group relates to the scientific responsibilities of more than one Component, a Joint Study Group or a Joint Working Group shall be established.
- (c) A Study Group or Working Group is established for a maximum of one period.
- (d) Study Groups and Working Groups, including the position of the group chair, are established and terminated by the IAG Executive Committee upon recommendation of the Component President.
- (e) A proposal to the IAG Executive Committee for a Joint Study Group or Joint Working Group requires the recommendation of the Presidents of all contributing components.
- (f) The Chair of a Study Group or Working Group is responsible for initiating and directing its work and appointing its members.
- (g) Study Group and Working Group membership should be balanced so as to reflect international cooperation in its subject.
- (h) A Study Group or Working Group may have at most 20 full members and an unlimited number of correspondent members.
- (i) The Chair of each Study Group or Working Group shall issue a brief description of the work to be performed and a list of members, to be published in the Geodesist's Handbook after each IAG General Assembly.
- (j) The Chair of each Study Group or Working Group shall report annually to its members and the Commission Steering Committee, on results achieved and outstanding problems.

13. IAG Services

- (a) IAG Services (see Bylaw 14) generate products, using their own observations and/or observations of other services, relevant for geodesy and for other sciences and applications. Accuracy and robustness of products, quality control, timeliness, and state of the art quality are the essential aspects of the Services.
- (b) Each IAG Service shall define its Terms of Reference as appropriate to accomplish its mission and shall submit the Terms of Reference to the IAG Executive Committee for approval.
- (c) Each IAG Service shall have an IAG representative, appointed by the IAG Executive Committee, as a voting member of its directing or governing board.

- (d) IAG Services are linked to at least one of the Commissions and may be also linked to other scientific organizations, such as the World Data System (WDS) or the International Astronomical Union (IAU).
- (e) IAG Services should collaborate on a scientific basis with the Commissions, establish Joint Commission Projects and Joint Study Groups and help compile the Commissions' list of themes for Study Groups.
- (f) Three representatives shall be elected in accordance with Bylaw 39 to the IAG Executive Committee to serve the interests of all Services.
- (g) On any matter relating to the products of a Service, the Service shall represent the IAG.

14. Current IAG Services

There are twelve IAG Services at the time of adoption of these Bylaws:

- (a) International Centre for Global Earth Models (ICGEM)
- (b) International Digital Elevation Models Service (IDEMS)
- (c) International DORIS Service (IDS)
- (d) International Earth Rotation and Reference Systems Service (IERS)
- (e) International Geodynamics and Earth Tides Service (IGETS)
- (f) International GNSS Service (IGS)
- (g) International Gravimetric Bureau (BGI)
- (h) International Gravity Field Service (IGFS)
- (i) International Laser Ranging Service (ILRS)
- (j) International Service for the Geoid (ISG)
- (k) International VLBI Service for Geodesy and Astrometry (IVS)
- (l) Permanent Service for Mean Sea Level (PSMSL)

15. The Global Geodetic Observing System (GGOS)

- (a) The GGOS is IAG's observing system to monitor the geodetic and the global geodynamic properties of the Earth as a system.
- (b) The **Global Geodetic Observing System (GGOS)** works with the IAG Services to facilitate the production of geodetic products (including the geometric reference frames and the gravity field models) that are fundamental to science and society. In addition GGOS undertakes activities directed at improving the

geodetic infrastructure that underpins the geodetic products. Further, GGOS takes advice from the Commissions and the ICCT concerning new developments, and keeps the Commissions and ICCT informed of the work of GGOS.

- (c) GGOS operates under its own Terms of Reference, defined by the GGOS Coordinating Board and approved by the IAG Executive Committee. The GGOS procedures for the nomination and election of its Officers are specified in its Terms of Reference.
- (d) The GGOS President is elected by the IAG Executive Committee from a slate of nominations submitted by the GGOS Coordinating Board in consultation with the Executive Committee. The President is appointed for one period, which may be renewed once.

16. IAG Projects

- (a) IAG Projects are flagship long-term projects of broad scope and of significant interest for the entire field of geodesy.
- (b) The establishment of an IAG Project shall be carried out by a planning group appointed by the IAG Executive Committee.
- (c) The Project Steering Committee shall have the following voting members:
 - (i) The Project Chair appointed by the IAG Executive Committee.
 - (ii) One member from each Commission appointed by each Commission's Steering Committee.
 - (iii) Two Members-at-Large proposed by the members of the Project Steering Committee identified in clause (i) and (ii) above and approved by the IAG Executive Committee.
 - (iv) Chairs of the IAG Project Working Groups (if any).
 - (v) Representatives of other IAG components, as appropriate.
- (d) IAG Project subcomponents are known as Working Groups.

17. Inter-commission Committees (ICCs)

- (a) Inter-commission Committees shall be responsible for well-defined, important and permanent tasks involving all Commissions.
- (b) Each ICC shall have a Steering Committee, which shall include the following members:

- (i) President appointed by the IAG Executive Committee.
- (ii) Vice President appointed by the IAG Executive Committee on the recommendation of the President.
- (iii) One representative appointed by each Commission.
- (c) The Terms of Reference for each ICC shall be developed by a planning group appointed by the IAG Executive Committee, for approval by the Executive Committee.
- (d) ICCs will be established for at least two periods and shall be reviewed by the IAG Executive Committee every eight years.
- (e) The ICCs shall report to the IAG Executive Committee.

17.1 The Inter-commission Committee on Theory (ICCT)

The mission of the ICCT is to interact and collaborate with other IAG components, in particular the Commissions and GGOS, in order to further the objectives of ICCT:

- (i) to be the international focal point of theoretical geodesy;
- (ii) to encourage and initiate activities to further geodetic theory in all branches of geodesy; and
- (iii) to monitor research developments in geodetic modelling.

18. Communication and Outreach Branch (COB)

- (a) The function of the Communication and Outreach Branch (COB) is to provide the Association with communication, educational/public information and outreach links to the membership, to other scientific organizations and to the world as a whole.
- (b) The responsibilities of the COB shall include the following:
 - (i) Promote the recognition and usefulness of geodesy in general and the IAG in particular.
 - (ii) Publications (such as newsletters) and social media platforms.
 - (iii) Membership development.
 - (iv) General information service and outreach.
- (c) The COB shall also assist the IAG Secretary General in the following tasks as required:
 - (i) Maintenance of the IAG website.

- (ii) Setting up Association schools.
 - (iii) Organizing meetings and conferences.
 - (d) The IAG Executive Committee establishes the COB on a long-term basis by issuing a Call for Participation. The responding organization(s) and the IAG Executive Committee shall then negotiate the Terms of Reference and other conditions.
 - (e) The President of the COB shall be elected by the IAG Council after consideration of a COB proposal.
 - (f) Major decisions related to the operations of the COB shall be made by a Steering Committee consisting of the following voting members:
 - (i) COB President.
 - (ii) IAG Secretary General.
 - (iii) Editor-in-Chief of the Journal of Geodesy.
 - (iv) Editor-in-Chief of the IAG Symposia Series.
 - (v) Up to 5 other members appointed by the IAG Executive Committee on the recommendation of the President of the COB.
- the IAG Fund, IAG Awards and for the conduct of scientific meetings as well as relevant scientific information.
- (e) The IAG Symposia Series publishes peer-reviewed papers related to presentations made at IAG Symposia and/or IAG Sponsored Symposia, provided that sufficient number of papers are submitted and accepted for publication.
 - (f) After each IAG General Assembly, a collection of the reports by the Association components shall be published in the "Travaux de l'Association Internationale de Géodésie". This publication is supplied free of charge to the officers of the Association and to the adhering body of each member country.
 - (g) At every IAG General Assembly each member country is encouraged to submit a National Report on geodetic work done since the previous General Assembly to be placed on the IAG website.
 - (h) The IAG Newsletter is under the editorial responsibility of the Communication and Outreach Branch. It should be published on the IAG website and distributed to members electronically.

19. IAG Publications

- (a) The IAG publications include the Journal of Geodesy, the IAG Symposia Series, the Geodesist's Handbook, the "Travaux de l'Association Internationale de Géodésie," the IAG Newsletter, and IAG Special Publications.
- (b) The Association's journal is the Journal of Geodesy, hereinafter referred to as the Journal. The Journal is published monthly through an agreement between the Association and a publishing company, or by other arrangement approved by the IAG Executive Committee. The terms of any agreement for publication of the Journal shall be negotiated by the President of the Communications and Outreach Branch and ratified by the IAG Executive Committee.
- (c) The Journal publishes peer-reviewed papers, covering the whole range of geodesy, including geodetic applications.
- (d) After each IAG General Assembly, a special issue of the Journal shall be published under the name of "The Geodesist's Handbook". This issue provides the actual information on the Association, including the reports of the IAG President and Secretary General presented at the previous IAG General Assembly, the resolutions taken at that assembly, and the Association structure listing all components and subcomponents for the running period, rules for

20. Editor-in-Chief and Editorial Board

- (a) There shall be one Editor-in-Chief for the Journal of Geodesy, hereinafter referred to as the Journal Editor. An Assistant Editor-in-Chief may assist the Journal Editor. The Journal Editor shall be advised and assisted by an Editorial Board. To ensure broad expertise, each of the Commissions may nominate up to three members of the Editorial Board.
- (b) The Journal Editor shall be responsible for the scientific content of the Journal. The Journal Editor shall make the final decision on whether a refereed scientific manuscript is accepted for publication. The Journal Editor shall keep the IAG Executive Committee informed of the activities and status of operations of the Journal.
- (c) Three months before each IAG General Assembly, the Journal Editor, in consultation with the IAG Bureau, shall recommend a preliminary list of candidates for the new Editorial Board. This list shall be published on the IAG website at least two months in advance of the IAG General Assembly to solicit additional nominations for the Editorial Board from the IAG Components, Members, Fellows, Honorary Offices, and Council.
- (d) At the IAG General Assembly, the current Editorial Board shall appoint the members of the new Editorial Board from those

recommended. After taking office, the new Editorial Board shall nominate the new Journal Editor and the new Assistant Editor for the next period. After approval of these nominations by the IAG Executive Committee, the Journal Editor and the Assistant Editor will be considered as elected.

- (e) The Journal Editor, the Assistant Editor, and the members of the Editorial Board shall each hold office for one period, but are eligible to be re-elected for one further period.
- (f) There shall be one Editor-in-Chief for the IAG Symposia Series, hereinafter referred to as the Series Editor. He/she is appointed by the IAG Executive Committee for one period. An assistant Editor-in-Chief may also be appointed.
- (g) The Series Editor shall be responsible for the scientific content of the IAG Symposia Series. On the recommendation of the volume editor(s), the Series Editor shall make the final decision on whether a refereed scientific manuscript is accepted for publication. The Series Editor shall keep the IAG Executive Committee informed of the activities and status of the IAG Symposia Series.
- (h) Each volume of the IAG Symposia Series may have additional Volume Editors.

21. IAG Individual Membership

- (a) Individuals engaged in geodesy, can become individual members of the IAG on application and payment of the membership fee.
- (b) Applications for individual membership are submitted to the IAG Secretary General.
- (c) The decision on the membership application shall be made by the IAG Bureau.
- (d) Benefits of membership include:
 - (i) Reduction in the individual subscription rate to the Journal of Geodesy.
 - (ii) The right to participate in the IAG election process both as a nominator and a nominee.
 - (iii) Upon application, correspondent membership in a Sub-commission or Study Group of choice.
 - (iv) Reduction in the registration fee for IAG meetings as set under Bylaws 25(i), 26(d) and 27(c).
- (e) The membership fee per annum is set by the IAG Executive Committee.
- (f) In individual cases, the Secretary General may consider a discount or full remission of membership fees on application by the member.

- (g) Where a member provides a donation in excess of the membership fee, the excess shall be assigned to the IAG Fund.
- (h) Membership is terminated if the membership fee is not paid or if an application for discount or full remission has not been received one year after the fee was due.

22. Honorary Officers, Fellows

- (a) The IAG Executive Committee may appoint a merited past IAG President as Honorary President or a merited IAG Secretary General as Honorary Secretary General.
- (b) The IAG Executive Committee may appoint past officers of the IAG as Fellows.

23. IAG Fund

The IAG Executive Committee may establish an IAG Fund for supporting specific IAG activities as defined in the IAG Fund Rules, published in the Geodesist's Handbook. The Fund is under the direct responsibility of the President. The Fund's resources are administered by the Secretary General.

24. IAG Awards

The IAG Executive Committee may establish Awards for outstanding contributions to geodesy and distinguished service to the IAG. The rules for the awards are to be published in "The Geodesist's Handbook".

25. Administration of the IAG General Assemblies

- (a) The IAG General Assembly will be held at the same time and at the same place as the International Union of Geodesy and Geophysics (IUGG) General Assembly.
- (b) Before any IAG General Assembly, the IAG Bureau shall prepare detailed agendas for the IAG Council meetings, IAG Executive Committee meetings, and the opening and closing sessions.
- (c) The IAG Executive Committee shall draw up the agenda for the scientific program. Joint Symposia covering topics of interest to two or more IUGG Associations may be arranged.
- (d) The agendas developed according to (b) and (c) above are sent to the member countries and to all officers of the Association so as to reach them at least two months prior to the IAG General Assembly. In principle, only matters on the agenda may be considered during the sessions, unless a decision to do otherwise is

passed by a two-thirds majority of the IAG Council.

- (e) At each IAG General Assembly, the IAG President shall present a report on the scientific work of the Association during their tenure. The IAG Secretary General shall present a report on the administrative work and on the finances of the Association for the same period. The President and Secretary General should include in their reports proposals for work to be undertaken during the coming period, within the limits of expected resources. These reports shall be published in "The Geodesist's Handbook".
- (f) At each IAG General Assembly, the work of each Commission, each Inter-commission Committee, each Service, the Communication and Outreach Branch, and each IAG Project shall be reported on by its President or Chair. IAG Representatives to other scientific bodies shall report to the IAG Executive Committee.

26. Scientific Meetings

- (a) Scientific meetings of the IAG are:
 - (i) the Scientific Symposia held during an IAG General Assembly;
 - (ii) Scientific Assemblies, including IAG Scientific Symposia; and
 - (iii) IAG Sponsored Symposia.
- (b) The IAG Newsletter shall include a calendar of IAG Symposia and other scientific meetings organized or sponsored by the IAG or its components.
- (c) The IAG Executive Committee shall appoint an IAG Scientific Meeting Representative for each of the scientific meetings other than the General Assembly and the Scientific Assembly to be governed by these Bylaws. The representative is obliged to remind the organizers to adhere to the Bylaws for scientific meetings and to report back to the IAG Executive Committee.
- (d) A reduced registration fee shall be offered for individual members in accordance with Bylaw 21(d) (iv).

27. IAG Scientific Assemblies

- (a) IAG Scientific Assemblies are held mid-way during the period between two IAG General Assemblies and shall consist of a group of component meetings and/or a group of scientific symposia, held at the same time and place.
- (c) A reduced registration fee shall be offered for individual members in accordance with Bylaw 21(d)(iv).

28. IAG Scientific Symposia

- (a) Scientific symposia take place at the IAG General Assembly and the IAG Scientific Assembly. In general, they shall be organized by IAG components and subcomponents, and be led by their respective Presidents or Chairs.
- (b) The study of some questions may require joint meetings of several components under a chair, appointed by the IAG Executive Committee. A committee consisting of the component chairs shall decide on the agenda and on the inclusion of scientific presentations.
- (c) At each IUGG General Assembly Joint Scientific Symposia covering topics of interest to two or more Associations within the IUGG and/or other international scientific organizations may be convened. Though the IAG may be asked to act as convenor or co-convenor, these symposia shall follow the rules established by the IUGG. The IAG may participate also in joint symposia at any other time outside of the IAG General Assembly and governed by the same procedures.
- (d) The planning of a scientific symposium shall be subject to the usual approval procedure provided by "The Geodesist's Handbook".

29. IAG Sponsored Symposia

- (a) The IAG may sponsor a symposium covering broad parts of geodesy and having large attendance at any suitable time outside the IAG General Assemblies or IAG Scientific Assemblies, and shall call it an IAG Sponsored Symposium, provided the following conditions are fulfilled:
 - (i) One or more IAG component or subcomponent, or at least two Study Groups, shall sponsor it.
 - (ii) Host organization of the symposium shall accept an IAG representative in the Scientific Organizing Committee (SOC) appointed by the IAG Executive Committee.
 - (iii) The symposium shall be open to all bona-fide scientists in accordance with the International Science Council (ISC) rules.
- (b) The SOC appointed under Bylaw 29(a)(ii) shall be responsible for the quality of science of the symposium being at a high level. A Local Organizing Committee (LOC) shall be responsible for the organization and logistics.
- (c) Applications for approval of an IAG Symposium should be submitted to the Secretary General at least one year before the intended date of the meeting.

30. International Cooperation

- (a) The IAG may participate in joint bodies of the IUGG and other scientific organizations, especially those belonging to the ISC.
- (b) The IAG shall initiate international cooperation in scientific work of international and interdisciplinary character. This includes the adequate participation in international programs and projects and the representation at scientific congresses, symposia, etc., of organizations with related activities.
- (c) Representatives to international programs and projects shall be appointed by the IAG Executive Committee and shall inform the IAG Executive Committee on the activities, on a biannual basis. The representatives shall also prepare a report for presentation at the IAG General Assembly.
- (d) The IAG Components shall have close cooperation with inter-governmental organizations responsible for services and scientific products of particular interest to the Association (e.g. BIPM, ISO, UNOOSA/ ICG).

31. Responsibilities of the IAG Council

- (a) In addition to any other functions, powers and duties provided in other Statutes and Bylaws, the IAG Council shall:
 - (i) Examine questions of general scientific policy or administration, and propose actions deemed necessary.
 - (ii) Elect the voting members of the IAG Executive Committee, with the exception of the GGOS Chair (Bylaw 15(d)) and the ICC Presidents, (Bylaw 17(b(i))).
 - (iii) Receive reports from the Secretary General and consider for approval the decisions or actions taken by the IAG Bureau and the IAG Executive Committee since the last IAG Council meeting.
 - (iv) Set up and dissolve IAG components.
 - (v) Appoint the three members of the ad hoc (audit) committee created for examining the finances of the IAG, consider its recommendations and adopt the final budget.
 - (vi) Consider proposals for changes in the IAG Statutes and Bylaws.
 - (vii) Decide on the venue of the next IAG Scientific Assembly.
 - (viii) Approve the establishment of Inter-commission Committees and IAG Projects.

- (b) IAG Council meetings shall be convened by the IAG President, and shall meet at least once during each IAG General Assembly. The IAG Council may be convened at other times, normally coinciding with the IAG Scientific Assembly according to Statute 13(b).

32. Responsibilities of the IAG Executive Committee

- (a) In addition to any other functions, powers and duties provided in other Statutes and Bylaws, the IAG Executive Committee shall:
 - (i) Initiate actions and issue guidelines, as required, to guide the IAG towards the achievement of its scientific objectives.
 - (ii) Fill vacancies occurring between IAG General Assemblies, in accordance with the Statutes and Bylaws.
 - (iii) Approve the internal structure of IAG components.
 - (iv) Make recommendations to the IAG Council on matters of general policy of the IAG and on the implementation of its objectives.
 - (v) Appoint Honorary Officers and Fellows of the IAG, upon the recommendation of the IAG Bureau.
 - (vi) Appoint planning groups for Inter-commission Committees and IAG Projects.
 - (vii) Establish Inter-commission Committees and IAG Projects.
 - (viii) Appoint a Committee, known as the Cassinis Committee, for reviewing and updating the IAG Statutes and Bylaws when deemed necessary.
 - (ix) Confirm the Assistant Secretaries (if any) of the IAG.
 - (x) Confirm the links between Commissions and Services.
 - (xi) Approve the level of the membership fee.
 - (xii) Appoint the Vice President of each Commission, the President of GGOS, and the President of each ICC.
 - (xiii) Appoint representatives to external bodies.
- (b) IAG Executive Committee meetings shall be convened by the IAG President. It shall meet at IAG General Assemblies and its members are expected to attend the meetings of the IAG Council, with voice but without vote. It shall also meet normally at least once a year, especially one year before the IAG General

Assembly, in order to prepare the scientific agenda and timetable of the next IAG General Assembly.

- (c) At a meeting of the IAG Executive Committee, no member may be represented by any other person, except by the corresponding Vice Presidents or Vice Chairs of the IAG components represented in the Executive Committee. In order that the deliberations of the IAG Executive Committee shall be valid, a quorum of at least half of its members must be present or represented.
- (d) The agenda for each meeting of the IAG Executive Committee shall be prepared by the IAG Bureau and sent to the members at least two months prior to the meeting.

33. Responsibilities of the IAG Bureau

- (a) In addition to any other functions, powers and duties provided in other Statutes and Bylaws, the IAG Bureau shall:
 - (i) Draw up the agenda of the meetings of the IAG Council and IAG Executive Committee and send these to the members at least two months prior to the meeting.
 - (ii) Ensure the adequate administration of the IAG.
 - (iii) Receive applications for individual memberships and accept individuals as members of the IAG.
 - (iv) Recommend Honorary Officers and Fellows to the IAG Executive Committee.
- (b) The IAG Bureau shall normally meet before each meeting of the IAG Executive Committee.

34. Responsibilities of the President

In addition to any other functions, powers and duties provided in other IAG Statutes and Bylaws, the IAG President shall:

- (a) Provide general leadership for the IAG in all matters.
- (b) Convene and preside over the IAG General Assembly and over all meetings of the IAG Council, IAG Executive Committee and IAG Bureau.
- (c) Represent the IAG in IUGG meetings and forums.
- (c) Represent the IAG in its dealing with national or international organizations or institutions.
- (d) Submit a report to the IAG General Assembly on the scientific work of the IAG during their tenure.

35. Responsibilities of the Vice President

In addition to any other functions, powers and duties provided in other IAG Statutes and Bylaws, the IAG Vice President shall act on behalf of the IAG President whenever the IAG President is not present or is unable to perform any of the President's duties, and shall perform such tasks as may be assigned by the IAG President, the IAG Executive Committee or the IAG Council.

36. Responsibilities of the Secretary General

In addition to any other functions, powers and duties provided in other IAG Statutes and Bylaws, the IAG Secretary General shall:

- (a) Serve as secretary of the IAG General Assembly, the IAG Scientific Assembly, the IAG Council, the IAG Executive Committee and the IAG Bureau; and arrange for meetings of these bodies, distribute promptly the agenda and prepare and distribute the minutes of all their meetings.
- (b) Act as Director of the IAG Office.
- (c) Manage the affairs of the IAG, including finances as per Bylaw 42(b), attend to correspondence, and preserve the records.
- (d) Circulate all appropriate information related to the IAG.
- (e) Prepare the reports of the IAG's activities.
- (f) Coordinate with the COB.
- (g) Perform such other duties as may be assigned by the IAG Bureau.
- (h) The function of the Secretary General is unpaid and only expenses incurred in connection with the functions and duties may be reimbursed.

37. Assistant Secretaries

- (a) The IAG Secretary General may be assisted by one or more Assistant Secretaries.
- (b) The position(s) of Assistant Secretary is unpaid and only expenses incurred in connection with the functions and duties may be reimbursed.

38. IAG Office

To assist the IAG Secretary General, the IAG establishes the IAG Office in the country in which the Secretary General resides. The IAG Executive Committee negotiates logistical and financial support with the host country or institution.

39. Procedure for Nomination and Election of IAG Officers

- (a) Elections shall take place by electronic voting before each IAG General Assembly and should be completed at least two months before the assembly.
- (b) The IAG President, after taking advice from the IAG Executive Committee, shall appoint a Nominating Committee consisting of a Chair and three other members.
- (c) The Nominating Committee, after taking advice from the Delegates of the Adhering Bodies, the Officers, Fellows, and Members of the IAG, shall normally propose at least two candidates for each position to be filled by election of the IAG Council. Candidates shall be asked to signify their acceptance of nomination and to prepare a short resume, outlining their position, research interests and activities relating to the IAG.
- (d) The Adhering Bodies and the individual membership shall be informed of these nominations at least four months before the IAG General Assembly.
- (e) During the following month further nominations can be submitted by the Delegates of the Adhering Bodies. Such additional nominations shall be in writing, shall be supported by at least two members of the IAG Council, and shall be submitted with resumes to the Chair of the Nominating Committee.
- (f) Nominations shall be checked against the eligibility criteria in Bylaw 40 by the Nominating Committee. Ineligible nominations will not be accepted and the members of the IAG Council who supported the nomination will be advised of the reason for its rejection.
- (g) Delegates shall be informed of these further eligible nominations and resumes and of their supporters.
- (h) The Chair of the Nominating Committee shall write to all Services asking them for nominations from each Service for the Service representatives on the IAG Executive Committee. The Nominating Committee shall recommend a minimum of two nominees for each of the Services' three positions, considering appropriate scientific and geographic distribution. The procedure for seeking additional nominations in subclause (e) above does not apply to these positions.
- (i) If candidates have been nominated for more than one position, they will be asked prior to the election to make a decision for which position they will allow their name to stand.
- (j) Elections shall be by electronic ballot. The winner must receive an outright majority (number of votes being greater than the total combined votes of the other candidates). If there are three or more candidates for a position and no candidate has an outright majority, then the top two ranked candidates will be retained and a second round of votes conducted to elect the winner. Ties will be broken by the IAG President's vote.
- (k) The Members-at-Large shall be elected in a subsequent round after the other members of the IAG Executive Committee have been elected, in order to fulfil the condition of geographical, gender and organizational balance (see Statute 12a).

40. Eligibility & Terms of Office

- (a) No person may hold more than one of the following offices at the same time: IAG President, Vice President, Secretary General, IAG immediate Past President, President of a Commission, President of an Inter-commission Committee, Chair of a Service, President of GGOS, President of the COB, Executive Committee Member-at-Large, or Chair of an IAG Project.
- (b) A member of the IUGG Bureau or of the IUGG Finance Committee may not occupy the post of President, Vice President or Secretary General of the IAG.
- (c) The IAG President is elected for one period and may not be immediately re-elected to the same office.
- (d) The Vice President is elected for one period and may not be re-elected to the same office.
- (e) The Secretary General is elected for one period initially. He/she may be re-elected for up to two additional periods.

41. Extraordinary Vacancies

- (a) Should the position of IAG President become vacant during the period between two IAG General Assemblies, their duties and responsibilities devolve to the Vice President until the closure of the next IAG General Assembly.
- (b) Should the post of Secretary General become vacant, the IAG President shall arrange without delay for the IAG Executive Committee to propose a replacement and for the IAG Council to appoint a new Secretary General so as to ensure the continuity of the work of the IAG Office. This appointment has effect until the closure of the next IAG General Assembly and shall not be counted in the restriction of

eligibility for re-election of the Secretary General under Bylaw 40(e).

42. Finances

- (a) The Finances of the IAG derive from the following sources:
 - (i) Contributions of IUGG Adhering Bodies of which a portion, determined by the IUGG Council on recommendation of its Finance Committee, is paid to the IAG by the IUGG Treasurer.
 - (ii) Sale of publications.
 - (iii) IAG Fund collected from individual contributions for specific purposes.
 - (iv) Membership fees.
 - (v) A portion of the registration fee charged at IAG symposia.
 - (vi) Other sources, e.g. grants, interests, and funds remaining after a symposium.
- (b) The Secretary General is responsible to the IAG Bureau and to the IAG Council for managing the funds in accordance with the Statutes and Bylaws. The Secretary General alone shall be responsible for the day-to-day financial operations of the IAG.
- (c) At each IAG General Assembly the budget proposal for the next period shall be presented by the Secretary General and submitted for approval to the IAG Council. The budget as approved by the IAG Council shall be implemented by the Secretary General.
- (d) During each IAG General Assembly, the IAG Council shall examine all expenditures during the preceding period to ensure that they were in accordance with the approved budget. This examination shall be carried out by an ad hoc (audit) committee appointed by the IAG Council; see also Bylaw 31(a)(v).
- (e) In addition, the accounts shall be audited and shall then be reported to the IUGG Treasurer, as prescribed in Article 20 of the IUGG

STATUTES AND BY-LAWS OF THE INTERNATIONAL ASSOCIATION OF GEOMAGNETISM AND AERONOMY

(Revised August 2017, Joint IAPSO-IAMAS-IAGA Assembly in Cape Town, South Africa)

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GLOSSARY OF TERMS

Terms are defined formally in the Statutes; this glossary is included for convenience only and does not provide the formal definition of terms.

Assembly: a General Assembly, an extraordinary Assembly, or a Scientific Assembly of IAGA.

(The) Association: IAGA.

(The) By-Laws: the By-Laws of IAGA.

Chief Delegate: the Delegate appointed by an IAGA National Body for the purpose of casting that country's vote(s) on administrative and financial matters and who has communicated his or her accreditation to the Secretary-General.

Component Bodies of IAGA: the Divisions and Interdivisional Bodies of IAGA.

Conference of Delegates: a formal meeting of Delegates and Chief Delegates of Member Countries, open to the public.

Delegate: a scientist from a Member Country who is registered for an IAGA Assembly as a *bona-fide* scientific participant, or someone who has the agreement of the Secretary-General in consultation with the IAGA Executive Committee to attend and vote as a Delegate at a Conference of Delegates.

Early career Scientist - a scientist satisfying both of the following two criteria by 31 December of the year when an Assembly is held: 1) be in age 30 or younger; 2) be an undergraduate or postgraduate (Masters/PhD) student or have received her/his highest degree qualification (e.g., BSc, MSc, PhD) within the last two years (N.B. where applicable, up to one year of parental leave time may be added per child).

Executive Committee: the committee elected by a Conference of Delegates to be responsible for IAGA affairs between Conferences of Delegates.

Extraordinary Assembly: an Assembly of IAGA called by the President in accordance with *By-Law* 5.

Finance Committee: the committee appointed by the Executive Committee to examine the accounts and report to a Conference of Delegates.

General Assembly (of IAGA): a General Assembly of IAGA normally held in conjunction with a General Assembly of IUGG (i.e., every 4 years).

Honorary Member of IAGA: a person who has been voted the status of honorary member of the Association in recognition of outstanding contributions to the work of IAGA.

IAGA: the International Association of Geomagnetism and Aeronomy.

IAGA National Body: the body in a Member Country that is established by the body that adheres to IUGG to represent that country in IAGA activities.

ICSU: the International Council for Science (previously called the International Council of Scientific Unions).

IUGG: the International Union of Geodesy and Geophysics.

Member Country: a country that adheres to IUGG and may, therefore, participate in IAGA activities. Paying Member Countries of IUGG, as defined in the IUGG statutes, are Member Countries of IAGA.

Nominating Committee: the committee appointed by the Executive Committee to provide to a conference of Delegates nominations for the Executive Committee (Chief Delegates may also make nominations).

Officers (of IAGA): members of the Executive Committee and chairs of Divisions and Interdivisional Bodies

Period: The interval between the end of one ordinary General Assembly and the end of the next one.

Scientific Assembly (of IAGA): an Assembly of IAGA normally held between General Assemblies.

(The) Statutes: the Statutes of IAGA.

STATUTES OF IAGA

I. OBJECTIVES, STRUCTURE, AND MEMBERSHIP OF THE ASSOCIATION

Statute 1. Objectives of IAGA

The objectives of the International Association of Geomagnetism and Aeronomy (henceforth IAGA) are:

- (a) to promote studies of the geomagnetism and aeronomy of the Earth and other bodies of the solar system and of the interplanetary medium and its interaction with these bodies ;
- (b) to promote and encourage research in the above subjects by individual countries, institutions or persons and to facilitate international co-ordination of such research;
- (c) to provide an opportunity on an international basis for presentation, discussion and publication of the results of the research indicated above;
- (d) to promote appropriate standardisations of observational programmes, data acquisition systems, data analysis, modelling, and publications;
- (e) to promote understanding and appreciation of geomagnetism and aeronomy by the general public through, but not limited to, public lectures, media events, media publication packages, etc.

Statute 2. Establishment of Component Bodies

To achieve its objectives, IAGA may establish Component Bodies both within the Association and jointly with other Associations of the International Union of Geodesy and Geophysics (IUGG), components of other Bodies of the International Council for Science (ICSU) or other internationally recognised scientific bodies.

Statute 3. A Member Country of IAGA

Fully accredited Member Countries of IUGG, as defined in *IUGG Statute 4*, are Member Countries of IAGA. Countries in Observer status or having Associate Membership of IUGG, as defined in *IUGG Statute 4*, have the same status in IAGA as in IUGG.

Statute 4. An IAGA National Body

Each Member Country shall be represented by a single body, henceforth referred to as the IAGA National Body, established in that country by the body that adheres to IUGG.

II. ADMINISTRATION

Statute 5. Assemblies of IAGA

- 5.1 A General Assembly of IAGA shall normally be held in conjunction with each General Assembly of IUGG.

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- 5.2 A Scientific Assembly of IAGA shall be held between General Assemblies of IAGA, in accordance with *IUGG By-Law 9*.
- 5.3 An extraordinary General Assembly or an extraordinary Scientific Assembly of IAGA may be convened by the President in accordance with *By-Law 5*.

Statute 6. Delegates and Conferences of Delegates

- 6.1 The work of the Association shall be directed by Conferences of Delegates held at Assemblies of IAGA.
- 6.2 A Delegate is a scientist from a Member Country who is registered for an Assembly as a *bona-fide* scientific participant, or someone who has the agreement of the Secretary-General in consultation with the IAGA Executive Committee to attend and vote as a Delegate at a Conference of Delegates.
- 6.3 Among the Delegates from each Member Country, one shall be identified by the respective IAGA National Body as Chief Delegate for the purpose of casting that country's votes on administrative and financial matters as stipulated in *Statutes 12, 13 and 14*. A Chief Delegate may be represented in voting matters by another Delegate appointed in accordance with the By-Laws.
- 6.4 A Delegate may represent only one Member Country. A member of the Executive Committee (see *Statute 7*) may not be a Chief Delegate, except when that member is the only person in attendance from the country in question.
- 6.5 A Conference of Delegates shall be convened at least once during each Assembly of IAGA.

Statute 7. The Executive Committee

- 7.1 Responsibility for the direction of IAGA affairs between Conferences of Delegates shall rest with an Executive Committee of the Association, elected at a Conference of Delegates.
- 7.2 Decisions of the Executive Committee must be reported to a Conference of Delegates. Any decision or recommendation failing to receive simple majority support from a Conference of Delegates shall be referred to the Executive Committee for further study.
- 7.3 The duties of the Executive Committee shall be to administer the affairs of the Association in accordance with these Statutes and By-Laws and the decisions of a Conference of Delegates.
- 7.4 The Executive Committee may appoint appropriate leaders and IAGA representatives to Joint Bodies established with other IUGG Associations, components of other ICSU Bodies, or other internationally recognised scientific bodies.
- 7.5 In its dealings with non-IUGG Bodies, the Executive Committee shall not commit the name of IUGG, or act on behalf of IUGG, unless prior approval has been secured from either the President or the Secretary-General of the IUGG, acting on behalf of the IUGG Executive Committee.
- 7.6 The Executive Committee shall meet at least twice at each Assembly, and must meet at least once more between Assemblies. Any such meeting between Assemblies can be conducted electronically, via audio and/or video links.

Statute 8. Membership of the Executive Committee

- o The Executive Committee shall be chaired by the President of IAGA and shall consist of the President, two Vice-Presidents, the Secretary General, the Treasurer, the Early Career Scientist representative, and six additional Members. Two members of the Executive Committee shall come from developing countries. All members of the Executive Committee shall be elected by a Conference of Delegates as an administrative matter with voting as stipulated in *Statutes 13 and 14*.
- 8.2 The President shall be elected for one Period, and may not be re-elected to the same office.

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- 8.3 The retiring President (ex-officio) shall be entitled to attend Executive Committee meetings and participate in Committee business, but shall not vote or draw on IAGA funds to attend such meetings.
- 8.4 The two Vice-Presidents shall be elected for one Period, and may not be re-elected to the same office.
- 8.5 The Secretary General shall be elected for two periods and may be re-elected in extraordinary circumstances for up to two successive further periods.
- 8.6 The Treasurer shall be elected for two periods and may be re-elected in extraordinary circumstances for up to two successive further periods.
- 8.7 The Early Career Scientist Representative shall be elected for one Period, and may not be re-elected to the same office.
- 8.8 No person, other than the Secretary General and the Treasurer may serve in the same position for more than two Periods. A person who has already served for the maximum allowed number of Periods is not eligible for a lower position.
- 8.9 The election of the Executive Committee shall normally take place at a Conference of Delegates held at a General Assembly, with the exception of that of the Secretary-General who shall normally be elected at a Conference of Delegates held at a Scientific Assembly.
- 8.10 In the event of any vacancy occurring in the membership of the Executive Committee during a Period, the Executive Committee shall appoint a person to fill the vacancy until the next election. The eligibility for election of a person so appointed shall not be affected by such an appointment. If the vacancy is that of the Presidency, one of the Vice-Presidents shall act as President

Statute 9. Duties of Component Bodies

- 9.1 The duties of the Component Bodies within IAGA (see *Statute 2*) shall be to further the scientific objectives of IAGA through:
 - (a) co-ordination of appropriate scientific research;
 - (b) organisation of scientific meetings and business meetings on the matter
 - (c) promotion of the exchange of information and data; and
 - (d) provision of advice to the Executive Committee on the formulation of policies to guide the scientific work of the Association.
- 9.2 The duties of the Component Bodies established jointly with other Associations of IUGG, other ICSU Bodies or other internationally recognised scientific bodies (see *Statute 2*) shall be to deal with and co-ordinate those scientific programmes and/or meetings that cover topics of mutual interest, to promote the exchange of information, data and products derived from them, to undertake and promote educational and outreach activities, and to formulate policies and provide advice on topics of mutual interest.

III. FINANCE

Statute 10. Adoption of the budget

The Treasurer shall prepare a budget estimate of receipts and expenditures for each half-Period and present this budget before the Executive Committee and a Conference of Delegates at the time of an Assembly. On receiving the approval of both the Executive Committee and a Conference of Delegates, the Treasurer shall proceed with the disbursement of funds in accordance with that approved budget.

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Statute 11. Finance Committee

- 11.1 A Finance Committee shall be appointed by the Executive Committee within six months after the opening of each General Assembly and shall normally serve for one Period.
- 11.2 No serving Executive Committee Member may be a member of the Finance Committee.
- 11.3 The Finance Committee shall examine the accounts and report the results of their examination for approval to the Executive Committee and to a Conference of Delegates at the time of an Assembly

IV. VOTING

Statute 12. Categories of Voting Matters

- 12.1 Prior to a vote by a conference of Delegates, the President, on the advice of the Secretary General, shall decide whether the matter under consideration is scientific, administrative, or financial.
- 12.2 Matters that are partly scientific and partly administrative and do not involve matters of finance shall be classified as administrative matters.
- 12.3 The President's ruling may be challenged only by the Chief Delegate of a Member Country. In the event of a challenge, the President's ruling can be changed in accordance with a vote passed at the Conference of Delegates by a two-thirds majority of those entitled to vote.

Statute 13. Voting Rules

- 13.1 When a vote is taken on a scientific matter, each Delegate present at a conference of Delegates shall have one vote.
- 13.2 When a vote is taken on an administrative matter, voting shall be by fully accredited Member Countries, each fully accredited Member Country having one vote cast by its Chief Delegate, or that person's representative appointed in accordance with the By-Laws.
- 13.3 When a vote is taken on a financial matter, voting shall be by fully accredited Member Countries, each fully accredited Member Country having a number of votes equal to the number of its category of membership in IUGG. Such votes shall be cast by the Chief Delegate of each fully accredited Member Country, or that person's representative.

Statute 14. Voting at Conferences of Delegates

- 14.1 Decisions taken by a vote at a Conference of Delegates shall be valid only if at least half of the Chief Delegates of fully accredited Member Countries attending the Assembly are present or represented in accordance with the By-Laws.
- 14.2 Decisions of a Conference of Delegates shall be taken by a simple majority of the votes cast, except as otherwise specified in the Statutes. If a tie should occur, the decision shall rest with the President.

V. GENERAL

Statute 15. Modification of the Statutes

- 15.1 Modifications to these Statutes shall normally come into force at the close first General Assembly following the Assembly at which the modifications are adopted. Where a modification of the Statutes is approved at a General Assembly the changes shall normally come into force at the end of that same General Assembly.
- 15.2 These Statutes may only be modified with the approval of at least a two-thirds majority of Chief Delegates of fully accredited Member Countries present at a Conference of Delegates held during an Assembly, in accordance with *Statutes 6, 13, and 14*.
- 15.3 Only the IAGA National Body of a Member Country may propose a change to these Statutes. Any such proposal must reach the Secretary General at least six weeks prior to the announced date of the Assembly at which it is to be considered. The Secretary General shall notify all IAGA National Bodies of any proposed change at least four weeks prior to the announced date of the Assembly.

Statute 16. Modification of the By-Laws

A Conference of Delegates shall have the power to adopt By-Laws within the framework of the Statutes of the Association. These By-Laws may be adopted or modified by a simple majority vote of Chief Delegates of fully accredited Member Countries present at an Assembly, in accordance with *Statutes 6, 13, and 14*. Any modification of the By-Laws shall normally come into force at the close of the first General Assembly following the Assembly at which they are approved. Where a modification of the By-Laws is approved at a General Assembly the changes shall normally come into force at the end of that same General Assembly.

Statute 17. Languages

The present Statutes have been prepared in the official languages of the IUGG. The English text shall take precedence if there is a question of interpretation.

BY-LAWS OF IAGA

I. COMPOSITION

By-Law 1. Component Bodies of IAGA

The Component Bodies of IAGA shall be called Divisions and Interdivisional Bodies as follows:

Division I: Internal Magnetic Fields

Division II: Aeronomic Phenomena

Division III: Magnetospheric Phenomena

Division IV: Solar Wind and Interplanetary Magnetic Field

Division V: Observatories, Instruments, Surveys, and Analyses

Division VI: Electromagnetic Induction in the Earth and Planetary Bodies

Interdivisional Commission: History

Interdivisional Commission: Developing Countries

Interdivisional Commission: Education and Outreach

Interdivisional Commission: Space Weather

By-Law 2. Role and Structure of a Component Body

- 2.1 Each Division or Interdivisional Body shall propose to the Executive Committee its own role, structure, and mode of operation, which must be approved by the Executive Committee.
- 2.2 The role and the effectiveness of each Division and Interdivisional Body shall be reviewed by the Executive Committee at each General Assembly.

By-Law 3. Appointment of Leaders of Component Bodies

- 3.1 The names of candidates to fill the positions of leaders of each Division and Interdivisional Bodies shall be proposed by the President, representing the wishes of the Executive Committee, at the Conference of Delegates during a General Assembly. Alternates may be proposed by a Chief Delegate (or his/her representative appointed in accordance with *By-Law 9*) of a fully accredited Member Country, and, if seconded by another Chief Delegate (or his/her representative), then voting occurs of all Chief Delegates (or their representatives) at the Conference of Delegates.
- 3.2 In order that their appointments shall become effective, Division and Interdivisional Body leaders must express in writing or electronically to the President their willingness to serve. For leaders proposed by the President, this must be prior to the Conference of Delegates; for alternates approved at the Conference of Delegates, this must be no later than four weeks after the Conference of Delegates.
- 3.3 If no structure exists within subdivisions for appointment of leaders of such subdivisions, then the leaders of the relevant Divisions and Interdivisional Bodies may appoint, for each Period, Reporters, Working Group leaders, and the leaders of other possible subdivisions.

- 3.4 While it is recognized that the prime criteria for the appointment of leaders should be the scientific and administrative competence of the candidates, the Executive Committee and Division and Interdivisional Body leaders shall ensure that, wherever possible, these appointments achieve a diversified geographical and gender representation.

By-Law 4. Honorary Membership of IAGA

- 4.1 A person who has given outstanding service to IAGA may be elected by a Conference of Delegates as an "Honorary Member of IAGA". Proposals for Honorary Members must reach the Secretary General no later than 31st December of the year before an Assembly. The Executive Committee shall select persons for this category and shall present their names to a Conference of Delegates for approval.
- 4.2 The names of Honorary Members of IAGA shall be listed in publications where the structure of IAGA is shown.

II. ADMINISTRATION

By-Law 5. Extraordinary Assemblies

- 5.1 The President may at any time, with the approval of the Executive Committee, call an Extraordinary Assembly.
- 5.2 The President must call an Extraordinary Assembly at the request of not less than one-third of the number of IAGA Member Countries.
- 5.3 Such an Extraordinary Assembly must be held no later than nine months after the request.
- 5.4 An Extraordinary Assembly shall have the same powers and be subject to the same rules as a General Assembly.

By-Law 6. Notice of an Assembly

Notice of the date and place of a General Assembly or a Scientific Assembly shall be announced on the IAGA web site and through electronic distribution to the IAGA emailing list maintained by the Secretary General.

By-Law 7. The Agenda for a Conference of Delegates

- 7.1 A provisional agenda for a Conference of Delegates shall be prepared by the Secretary General and sent electronically to IAGA National Bodies at least four weeks prior to the opening of an Assembly.

- 7.2 The provisional agenda shall include all items submitted by IAGA National Bodies for discussion at the Conference of Delegates, together with questions placed on the provisional agenda by the Executive Committee. Additional agenda items, for which notice has not thus been given, may only be discussed with the consent of the Conference of Delegates by simple majority of all Delegates present.

By-Law 8. Attendance at a Conference of Delegates

- 8.1 A Conferences of Delegates shall be open to the public. Any non-delegate shall be heard in a discussion provided that person has the consent of the President to speak on the matter.
- 8.2 The President may, on his or her own initiative or at the request of a National Body, invite representatives of scientific bodies or individuals to attend a Conference of Delegates in an advisory capacity.

By-Law 9. Representation on behalf of a Chief Delegate

A Chief Delegate of a Member Country may designate another Delegate from that country to be his or her representative at all or part of a Conference of Delegates. If the Chief Delegate is unable to do this, the accredited Delegates from that Member Country may designate one of their members to represent the Chief Delegate. In either case, the Secretary General shall be informed of the designation electronically prior to the Conference of Delegates at which the representative of the Chief Delegate is to act.

By-Law 10. Nominations and Election of the Executive Committee

- 10.1 At least six months prior to the opening of a General Assembly, the President, in consultation with the Executive Committee, shall appoint a Nominating Committee consisting of a Chair and four members. Members of the Executive Committee may not be appointed to the Nominating Committee.
- 10.2 The Nominating Committee shall nominate at least one candidate for each position on the Executive Committee and notify the Secretary General so that these nominations are circulated to all IAGA National Bodies at least six weeks prior to the election. Those nominated must have advised the Nominating Committee in writing or electronically beforehand of their willingness to serve.
- 10.3 The IAGA National Body of any Member Country may make other nominations in writing to the Chair of the Nominating Committee at least four weeks prior to the election. To qualify for candidacy, each individual nomination must be supported by at least three Member Countries and must be accompanied by the written or electronic agreement of the nominee to stand. The combined list of candidates must be made publicly viewable and distributed electronically at least one day prior to the election.
- 10.4 The composition of the Executive Committee should reflect diversified geographical and scientific disciplinary representation, and favour short rather than long intervals of service in

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order to increase opportunities for new members to serve. At least two members of the Executive Committee should come from developing countries.

- 10.5 Members of the Executive Committee shall be elected by secret ballot. The President shall select two scrutineers for the election from among the Delegates present. The scrutineers shall not be members of the Executive Committee nor of the Nominating Committee nor candidates for the election.
- 10.6 Only scientists from Member Countries of IUGG (as defined in *IUGG Statute 4*) are eligible to hold elected positions in IAGA.

By-Law 11. Meetings of the Executive Committee

- 11.1 Executive Committee meetings shall be convened by the President, or by one of the Vice-Presidents when the President is not available. At a meeting of the Executive Committee, whether a physical or virtual meeting, no member can be represented by another person. Decisions of the Executive Committee shall be valid only if at least half plus one of its members are present. All decisions of the Executive Committee shall be taken by simple majority of the total number of voting members present. In the case of a tie, the decision shall rest with the President.
- 11.2 When the importance and urgency of a decision warrant it, a vote by electronic correspondence may be organized by the Secretary General at the request of the President. Voting rules stipulated in these Statutes and By-Laws shall apply.
- 11.3 The President may, on his or her own initiative or at the request of another member of the Executive Committee or of an IAGA National Body, invite representatives of scientific bodies or individuals to attend an Executive Committee meeting in an advisory capacity.
- 11.4 Proposals concerning the agenda for meetings of the Executive Committee may be submitted by members of that Committee, by Division or Interdivisional Body leaders, or by IAGA National Bodies; they must be notified to the Secretary General at least two weeks prior to the meeting. The final agenda, after its approval by the President, shall be distributed to the members of the Executive Committee at least one week prior to the meeting.

By-Law 12. Duties of the Executive Committee

In addition to the duties specified in *Statutes 7* and *8* and *By-Laws 2, 3, 4, 5, 7, 10, and 11*, and subject to directives of a Conference of Delegates, the Executive Committee shall have the power to:

- (a) act as the organizing committee for all IAGA Assemblies, Symposia, and Meetings, or delegate such responsibility to other persons by making the necessary appointments;
- (b) entrust to special commissions or to particular individuals the preparation of reports on subjects within the province of the Association;

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- (c) invite or appoint persons or institutions belonging to countries that are not members of the Association to be local correspondents to the Association.

By-Law 13. Duties of the President

The duties of the President of IAGA are:

- (a) to promote geomagnetism and aeronomy within scientific communities and also to the public;
- (b) to represent IAGA in the IUGG Executive Committee;
- (c) to represent IAGA in its dealings with IAGA National Bodies, other IUGG Associations, other ICSU Bodies, and other international scientific bodies;
- (d) to represent or to appoint a person to represent IAGA at meetings, conferences, or functions where formal representation is requested or desirable;
- (e) to convene Conferences of Delegates and meetings of the Executive Committee and to preside over these meetings;
- (f) to submit a report on the scientific work of the Association to a Conference of Delegates at each Assembly.

By-Law 14. Representation on behalf of the President

If the President is not available, one of the Vice-Presidents, delegated by the President, shall preside at a Conferences of Delegates or an Executive Committee meeting, and the Vice-President or the Secretary General shall represent the President at an IUGG Executive Committee Meeting in accordance with IUGG By-Laws. The President may designate one of the Vice-Presidents, the Secretary General or any other EC member to act on his or her behalf in any other function, meeting, or conference in which formal representation of IAGA is requested or desirable.

By-Law 15. Duties of the Secretary General

The duties of the Secretary General are:

- (a) to serve as secretary of IAGA, to organize Assemblies according to the instructions of the Executive Committee, to arrange meetings of the Executive Committee, and to prepare and distribute promptly the agenda and minutes of Conferences of Delegates and meetings of the Executive Committee;
- (b) to manage the administrative and scientific affairs of the Association, to attend to correspondence, and to maintain and preserve the records of the Association;
- (c) to inform members of the Executive Committee during the interval between its meetings about any important matter concerning the Association;
- (d) to advise the President during the meetings of the IUGG Executive Committee;
- (e) to prepare and arrange publication of the Programme of each Assembly, and a report on the outcomes;
- (f) to publish an internal Association bulletin (such as IAGA News) containing information of general interest to the Association;
- (g) to prepare for each Assembly the list of Chief Delegates;

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- (h) to ensure that the website of the Association is maintained;
- (i) to perform such other duties as may be assigned by the President or by the Executive Committee.

By-Law 16. Duties of the Treasurer

The duties of the Treasurer are:

- (a) to receive and take charge of such funds as may be allocated by IUGG to the Association, or as may be received from any other source;
- (b) to disburse such funds in accordance with the decisions of Conferences of Delegates or with the instructions of the Executive Committee;
- (c) to keep account of all receipts and disbursements and to submit such account, audited by a qualified accountant (before each General Assembly), for examination by the Finance Committee appointed according to *Statute 11*;

III. FINANCE

By-Law 17. Allocation of Funds

In the estimation of expenditures by the Treasurer and approval thereof by the Executive Committee, as mentioned in *Statute 10*, provision may be made to allocate the expected funds to:

- operation of the Secretariat of the Association;
- administrative arrangements in preparation for Assemblies and Executive Committee meetings;
- publication and distribution electronically of IAGA News or special publications;
- assistance for the President to attend IUGG Committee meetings and for IAGA officers to attend functions as the representative of IAGA when such officers have expressed in writing or electronically that they are unable to obtain the necessary support from other sources;
- assistance for officers of IAGA, to attend official administrative meetings or IAGA-sponsored scientific meetings when participation by such persons is judged by the Executive Committee to be essential for the success of the meeting and those persons have expressed in writing or electronically that they are unable to obtain the necessary support from other sources;
- minor administrative expenses requested by leaders of Divisions, Joint Bodies, and Interdivisional Bodies who have expressed in writing or electronically that they are unable to obtain the necessary support from other sources,
- any item not mentioned above for which support will contribute to achieving the objectives of the Association.

STATUTES AND BY-LAWS OF THE INTERNATIONAL ASSOCIATION OF HYDROLOGICAL SCIENCES

(Revised July 2011, XXV IUGG General Assembly, Melbourne, Australia)

STATUTES

1. THE OBJECTIVES OF THE ASSOCIATION

1.1. To promote the study of Hydrology as an aspect of the earth sciences and of water resources;

_ to study the hydrological cycle on the Earth and the waters of the continents; the surface and groundwaters, snow and ice, including their physical, chemical and biological processes, their relation to climate and to other physical and geographical factors as well as the interrelations between them;

_ to study erosion and sedimentation and their relation to the hydrological cycle;

_ to examine the hydrological aspects of the use and management of water resources and their change under the influence of man's activities;

_ to provide a firm scientific basis for the optimal utilization of water resources systems, including the transfer of knowledge on planning, engineering, management and economic aspects of applied hydrology.

1.2. To provide for discussion, comparison, and publication of research results.

1.3. To initiate, facilitate, and coordinate research into, and investigation of, those hydrological problems which require international cooperation.

2. The Association is a constituent body of the International Union of Geodesy and Geophysics (IUGG). The Association is subject to those Articles of the Statutes and Bye-laws of the Union that apply to associations and also to these Statutes.

3. Any country adhering to the Union also adheres to the Association, and is entitled to send delegates and otherwise to participate in its work. All scientific meetings of the Association or of its components are open to such delegates.

4. The Association performs its activities in the framework of the International Council for Science (ICSU) and IUGG, in cooperation with the United Nations and its specialized agencies and through direct contacts with other international organizations.

5. The Association shall comprise: the Plenary Session, the Bureau of the Association, the Scientific Commissions, the Panels and Working Groups and the International Association of Hydrological Sciences Limited. The Association shall maintain contact with the several adhering countries through their National Representatives or National Committees (often subcommittees or sections of the IUGG National Committees) and Regional Committees.

Scientific Commissions: Units of the Association having defined scientific responsibilities in specific hydrological fields or subjects. Divisions are corresponding units of the Scientific Commissions.

Panels or Working Groups: Ad hoc units to report on specific problems, either scientific or administrative.

National Committees: National Committees of IAHS are administrative bodies for maintaining contacts with the Association. They may include representatives to the Scientific Commissions of IAHS.

National Representatives: Each member country of IUGG shall appoint a National IAHS Representative who is responsible for maintaining contact with the Association, taking part in the work of the National Committee of IAHS, if one such is established.

Regional Committees: Regional Committees are administrative bodies which examine subjects of particular concern within specific regions.

The International Association of Hydrological Sciences Limited: This is a UK Registered Charity having as part of its Memorandum and Articles of Association objects which are identical to those of this Association and coming within the framework of ICSU and IUGG.

Individual Members: Even though membership of IAHS is by country, individuals may request to be registered for so-called individual membership. To qualify for such membership an individual must work in one or more fields of hydrology and endeavour to participate in IAHS activities. The individual members are not permitted to vote on administrative matters.

PLENARY SESSION

6. A Plenary Session of the Association shall be convened in accordance with the Bye-laws of the Union. At least one Plenary Session of the Association shall be held during a General Assembly of the IUGG and during a Scientific Assembly of the Association. Each adhering country may be represented by one or more delegates to the Plenary Session.

6.1. The Plenary Session has final authority on questions of a scientific character.

6.2. The Plenary Session shall consider the state of hydrological sciences, the trends in their development, and questions relating to the organization of symposia on important programmes, taking into consideration the appropriate programmes of other international organizations.

6.3. Each participant present at the Plenary Session shall have one vote on scientific matters.

7. The final authority of the Association in all matters of administration and finance shall be vested in the Plenary Administrative Session of the Association.

7.1. The Plenary Administrative Session shall consist of the President, the President-Elect or immediate Past-President, the Vice-Presidents, the Secretary General, the Treasurer, the Editor, the President or other designee of each Scientific Commission in existence at the time, the Chairman of IAHS Limited and one voting delegate from each adhering country, appointed by that country to vote in the Plenary Administrative Session.

A quorum shall consist of the President (or Vice-President acting as President), the Secretary General, or his deputy, and voting delegates from at least 10 countries.

7.2. Voting in the Plenary Administrative Session shall be by countries, each country having one vote, with the provision that it has voting rights in IUGG at that time. This voting may also be by mail but if the vote has been by mail then the country cannot vote at the Plenary Session again. Only those officers of the Association and its Scientific Commissions who are also voting delegates of their countries may vote.

7.3. The Plenary Administrative Session, during the General Assembly of the IUGG, shall elect for the Association, in accordance with the Bye-laws, the President-Elect, three Vice-Presidents, the Secretary General, the Treasurer, and such other elective officers as may be deemed necessary.

The election shall be held during the IUGG General Assembly, in accordance with Articles 7.1, 7.2 and 7.6.

The period of office for all Association officers except the President, shall be the interval between elections at two successive IUGG General Assemblies.

The President-Elect shall become President, and the President shall become immediate Past-President, two years after the elections at the IUGG General Assembly.

If a Scientific Assembly is held during the second year after the elections, the President-Elect shall become President at the beginning of the Scientific Assembly.

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The term of immediate Past-President shall be from the time the new President takes office to the next election of a President-Elect. At any time there shall be in the Bureau either a President and President-Elect or a President and a Past-President.

The President and Vice-Presidents may not be elected to two successive terms of the same office.

The Secretary General shall be eligible for re-election, but not for more than two additional terms.

The Treasurer shall be appointed by the Bureau, and shall be eligible for re-appointment without limit.

The Editor shall be appointed by the Bureau, and shall be eligible for re-appointment without limit.

The President-Elect shall assume the office of President if this office becomes vacant. If there is no President-Elect the Bureau shall appoint one of the Vice-Presidents to be President.

If the office of the Secretary General or that of the Treasurer or that of the Editor shall become vacant between IUGG General Assemblies, acting officers shall be appointed by the President to serve the remainder part of the term.

7.4. The Plenary Administrative Session has the power to form and discontinue Scientific Commissions. Their terms of reference shall be included in the Bye-laws of the Association.

The Plenary Administrative Session during the IUGG Assembly shall be informed of the President-Elect, three Vice-Presidents and Secretary elected during the Plenary Administrative Session of each of the Scientific Commissions.

The office of President-Elect of each Scientific Commission shall be established under the same terms as outlined in Article 7.3 for the Association.

The Presidents of the Scientific Commissions may not be re-elected to two successive terms of the same office. The Vice-Presidents and the Secretary shall be eligible for re-election but for not more than one additional term.

The Scientific Commissions have the power to fill vacancies that may occur between elections.

7.5. The Plenary Administrative Session has the power to form and discontinue Regional Committees, which may be formed on the initiative of several National Committees or National Representatives. Their Officers shall be elected by those National Committees, or National Representatives. Regional Committees shall examine hydrological subjects of particular concern to a specific region, and may conduct regional meetings on such subjects. Regional meetings shall be open to all adhering countries, and the Scientific Commissions may designate a representative to appear on their behalf at these meetings. Each Regional Committee may propose a set of regulations for its organization and governance for approval by the Plenary Administrative Session of the Association.

7.6. The Plenary Administrative Session may elect an Honorary President, who shall serve life or until such time as he/she resigns from this office. The Honorary President may participate as a non-voting member in any Association meeting, including those of the Bureau, and may be requested by the Bureau to undertake specific tasks in support of the Objectives of the Association.

7.7. In questions involving finance, voting in the Plenary Administrative Session shall be as in Article 7.2, except that upon the request of two voting delegates, the number of votes for each country shall be one greater than the number of its category of membership in the Union as defined in the Statutes of the Union.

7.8. An adhering country not represented at a Plenary Administrative Session may forward its vote on any pertinent item on the agenda, including elections of Association officers, by mail.

7.9. Voting by post on administrative matters between Plenary Sessions of the Association can be authorized by the Bureau.

THE BUREAU

8. The Bureau of the Association shall consist of the President, the President-Elect or immediate Past-President, three Vice-Presidents, the Secretary General, the Treasurer, the Editor and Presidents of the Scientific Commissions in existence at the time and the Chairman of the International Association of Hydrological Sciences Limited. The immediate Past-President shall remain a Bureau member during the period between the end of his/her office and the election of a new President-Elect. The President shall convene the Bureau at least every other year to guide the affairs of the Association.

PRESIDENT, SECRETARY GENERAL, TREASURER AND EDITOR

9. The President shall be the executive officer of the Association and shall direct its affairs in accordance with the decisions of the Plenary Session of the Association. The President shall be assisted by the Vice-Presidents.

10. The Secretary General, in consultation with the President, shall manage the business of the Association, conduct the correspondence, preserve the official documents and administrative records. The Bureau may authorize the Secretary General to employ administrative and secretarial personnel to assist him/her in the performance of his/her duties to the Association. The Secretary General shall also take any action necessary to ensure that the Objectives of the Association are fulfilled in a manner which complies with the relevant Law governing administration, taxation, Contract and Tort or their equivalent in any country where the Association is operational including the appointment of a person or corporation if required to protect and represent the Association in any such matters and he/she shall be indemnified by the Association in respect of the costs of any such action.

11. The Treasurer, or acting Treasurer, shall collect the funds of the Association and disburse them in accordance with the decisions of the Plenary Session of the Association and the Bureau. He shall maintain records of all financial transactions of the Association and submit annual reports thereon to the Bureau as required by the Statutes and Bye-laws of IUGG. In agreement with the Secretary General he shall arrange for the subscriptions, sales, and storage of the publications of the Association.

11.1. The funds of the Association shall be invested in accounts of the Association. They shall be at the disposal of the Treasurer and the Secretary General as may be deemed necessary and as specified in Article 11, but provisions shall be made to enable the President to transfer the funds or part of them to an acting Treasurer appointed according to Article 7.3.

12. The Editor shall prepare for publication by the Association original papers, reviews and other material in a form in accordance with the decisions of the Plenary Session and the Bureau.

COMMISSIONS

13. The following provisions shall govern Scientific Commissions that are created under Article 7.4.

13.1. The Scientific Commissions shall keep abreast of their fields of hydrology and determine the trends in research on the most urgent problems of hydrology that are of common interest to many countries. The Scientific Commissions shall study the questions voted by their Plenary Session.

13.2. The Scientific Commissions shall participate actively in the preparation of symposia on appropriate scientific problems.

13.3. The Scientific Commissions shall be styled "International Commission on ...".

13.4. The National Committee (or National Representative) for IAHS of each adhering country may designate one representative on each Scientific Commission and on each Regional Committee with which it desires to affiliate. Such representatives may vote on all administrative and scientific matters before the Scientific Commission or Regional Committee and may correspond directly with the Officers of a Commission or such Committee on all matters of concern to that Commission or such Committee. All participants present at a meeting of a Commission or such Committee may vote on scientific matters.

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13.5. While the regulations for all scientific commissions should be as similar as possible, each Scientific Commission may propose a set of regulations for its organization and governance for approval by the Plenary Administrative Session of the Association.

13.6 The Scientific Commissions may establish Divisions and ad hoc working groups to report on specific problems.

PANELS, WORKING GROUPS AND RAPPORTEURS

14. The Plenary Session or the Bureau may create panels or working groups and appoint rapporteurs to undertake either:

- (a) ad hoc scientific programmes; or
- (b) activities of a pro tempore regional nature; or
- (c) specific administrative or organizational tasks.

The Chairman and members of all such groups shall be appointed by the President, to whom they shall report. Such groups shall exist only during the term between two successive IUGG General Assemblies.

IAHS LIMITED

15. The International Association of Hydrological Sciences Limited.

15.1. The International Association of Hydrological Sciences Limited shall deal with those matters set out in its Memorandum and Articles of Association (a copy of which shall be held by the Secretary General) and is a registered Charity in the United Kingdom.

15.2. Membership of the Limited Company is restricted to Individual Members of the Association. The Limited Company will deal inter alia with the IAHS publishing programme including the arrangements for the Hydrological Sciences Journal.

15.3. The International Association of Hydrological Sciences Limited shall have as its Board the Secretary General and those persons appointed by the President. The Chairman of the Limited Company will report to the President. Because of requirements under English Law, at least half the Board of the Limited Company, who shall also be Directors, must be ordinarily resident in the United Kingdom.

15.4. For the purpose of continuity of administration of the Limited Company, the President shall have absolute discretion regarding the appointment of the Chairman and the Board.

BY-LAWS: AMENDMENTS

16. Within the framework of these Statutes, the Plenary Administrative Session of the Association shall have the power to adopt or amend Bye-laws by a simple majority.

17. Proposals by adhering countries for a change of any Article of the Statutes must reach the Secretary General at least six months before the date of the meeting at which they are considered by the Plenary Administrative Session of the Association. The Secretary General shall notify all adhering countries of any proposed changes at least four months before the named date.

18. The Articles of these Statutes may be changed only by a majority of two-thirds of the votes cast at a meeting of the Plenary Administrative Session of the Association by voting members who are present or who vote by post, provided that the total number of favourable votes is not less than one-half the number of the members of the Plenary Administrative Session of the Association eligible to vote.

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19. The Statutes are prepared in English and French, and the English text shall be considered the authoritative text. Questions of interpretation as between the texts shall be decided by the President.

BY-LAWS

1. The following Scientific Commissions have been established in accord with Article 7.4 of the Statutes:

International Commission on Surface Water;

International Commission on Groundwater;

International Commission on Continental Erosion;

International Commission on Snow and Ice Hydrology;

International Commission on Water Quality;

International Commission on Water Resources Systems;

International Commission on Remote Sensing;

International Commission on the Coupled Land-Atmosphere System;

International Commission on Tracers.

International Commission on Statistical Hydrology.

The Commissions shall follow the Regulations of the Scientific Commissions. Commission-specific modifications of these regulations are subject to approval by the Plenary Administrative Session of the Association and shall become part of the Bye-laws.

All Commissions will be concerned with natural processes and these processes as modified by human activities or with processes, technologies and applications. Relations to the environment will be considered as appropriate.

Whenever Scientific Commissions are referred to in the Bye-laws, it implies "International Commissions".

2. The several Scientific Commissions shall prepare scientific reviews of the state of research in their respective fields of hydrology, noting achievements and trends, with particular emphasis on significant problems for attack. The reports should be submitted in English or in French and include a summary in the other language. The report shall reach the Secretary General at least four months before the Plenary Session of the Association, for distribution among the officers of the Association including those of the several Scientific Commissions and among the National Committees, and for publication in the reports of the Plenary Session of the Association. The President of the Association shall introduce these reviews in his address to the Plenary Session of the Association, together with his recommendations as to the course of research.

3. The Scientific Commissions shall meet at the IUGG General Assemblies and Scientific Assemblies of the Association unless authorized otherwise by the Bureau. A Scientific Commission may also schedule other meetings under the regulations it adopts according to Statutes Article 13.6.

4. The Scientific Commissions may invite advisors from non-adhering countries to participate in the work of the Scientific Commissions. These advisors may not vote.

5. Each Scientific Commission shall show on its stationery or other formal documents its identification with the International Association of Hydrological Sciences.

NOMINATIONS AND VOTING FOR OFFICE

6. The Bureau shall establish a Nomination Panel of not less than three members at least 10 months before an IUGG General Assembly to receive and consider suggestions and prepare nominations for the President-Elect, the three Vice-Presidents and the Secretary General.

At least nine months before an IUGG General Assembly the Secretary General shall inform all National Committees of the membership of the Nomination Panel, asking them to send their nominations to its Chairman not later than six months before the General Assembly in order to be considered by the Panel. On the basis of available nominations from the National Committees, the IAHS Bureau and from the Scientific Commissions, the Panel shall prepare a list of candidates, seeking to achieve a reasonable balance in their geographical and professional distribution.

Each nomination for office must include a résumé of the candidate's qualifications relevant to the office for which the candidate is nominated. A signed statement of the candidate's willingness to stand for office must also be provided. The nomination shall not be considered without submission of the résumé and consent form.

A person may be a candidate for more than one office except the candidate for President-Elect who may not be a candidate for any other office of the Association. No one may hold more than one office at the same time.

The list submitted for voting shall contain the candidates proposed by the Nomination Panel and mention the names of all other nominees submitted.

The voting on the list shall be by the Plenary Administrative Session of the Association or by mail according to Article 7.2 of the Statutes.

6.1. Each of the Scientific Commissions shall establish a Nomination Group of not less than three members at least 10 months before an IUGG General Assembly to prepare nominations of Commission officers. At least nine months before an IUGG General Assembly the Secretary General shall inform all National Committees of the membership of these groups, asking them to send nominations to the Chairman of the Nomination Panel not later than six months before the General Assembly. The Chairman of the Panel shall furnish each Nomination Group with the names of candidates appropriate to each Scientific Commission. On the basis of available nominations from the National Committees and respective Scientific Commissions each Nomination Group shall then prepare a list of candidates for Scientific Commission officers. The preparation of the list shall be done in consultation with the Panel Chairman.

The nominations for Commission officers shall follow the same procedure as that for the Bureau officers (Article 6) except that the nominee for President-Elect may be a candidate for more than one office.

The voting on this list shall be by the Plenary Administrative Session of the Scientific Commissions or by mail according to Article 7.2 of the Statutes. The results shall be given to the Chairman of the Nomination Panel who shall draw up a list of Scientific Commission Officers to be announced at a Plenary Session of the Association in Administrative Session.

6.2. The list of candidates for Association and Commission Officers shall normally contain more than one name for each office. The Chairman of the Nomination Panel shall distribute the list to the National Committees at least three months before an IUGG General Assembly.

The list submitted for voting shall include both the candidates proposed and the names of all the other nominees submitted.

6.3. Voting on the list of candidates for both Association and Scientific Commission officers shall be done by secret ballot. To be elected, each candidate must obtain a simple majority of votes. For those offices not filled in the first round of voting, a second round shall be held on the two highest ranking candidates of the first round. In the case of a draw in the second round, the President shall decide

NATIONAL COMMITTEES

7. The National Committees or the National Representatives shall disseminate information on the Association within their countries and shall solicit papers for symposia or for publication in the Hydrological Sciences Journal.

8. National Committees shall be invited to present their views on hydrological and water resources research and on matters relating to the management of the Association to the Bureau and the Plenary Sessions, as a contribution to the discussion on future activities of the Association.

9. Where the National Committee for IAHS has not appointed or designated a person or persons to cast its vote as specified by the Statutes in the Plenary Session or at a meeting of a Scientific Commission or other committee, the delegates present are invited to select one of their number for this purpose.

10. The Association should encourage the formation of National Committees for hydrology in all countries that adhere to the Union. Where such National Committees do not exist, de facto or de jure delegates who have attended General Assemblies and symposia of IAHS are invited to petition the National Committee for IUGG to form a national group for discussion of questions before IAHS or its Scientific Commissions or to designate delegations to a General Assembly.

11. National Committees shall designate a delegate to the Plenary Sessions of the Association and each of the Scientific Commissions. The names of such delegates should be given to the Secretary of the pertinent body at least one day in advance of any Administrative Session.

AGENDA, SYMPOSIA AND PUBLICATIONS

12. The Bureau of the Association shall organize the agenda for the Plenary Sessions of the Association.

13. Suggestions for the agenda of the Plenary Session of the Association must reach the Secretary General at least three months before the date of the meeting. However, a question which has not been placed on the agenda may be discussed if a proposal to that effect be approved by two-thirds of the votes of the delegates to the Plenary Session.

14. A Scientific Assembly may be held once during the four-year period between the General Assemblies of IUGG.

Guidelines for organizing symposia

15. Symposia for which the Association has primary responsibility (referred to as IAHS symposia in this By-law) should meet the following conditions and be accepted by the Bureau:

- (i) a subject having an important role in the development of hydrology;
- (ii) proposed by a National Committee or by officers of the Association or of its Scientific Commissions;
- (iii) a member country expressing readiness to serve as host and presenting evidence of adequate support.

15.1. IAHS symposia (with subject outline) should be announced by the Secretary General not later than 18 months before the date of the symposium, by post to each National Committee and published in the Journal of the Association.

15.2. IAHS symposia are organized jointly with a relevant organization of the host country and may be supported by or organized in collaboration with other international organizations. Preference shall be given to those symposia where there is evidence of adequate national support.

15.3. The Association may support or take partial responsibility in symposia of other international organizations according to arrangements formulated through exchange of correspondence and approved by the Bureau.

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16. The Editor is authorized to arrange for the publication of a periodic Journal to provide a line of communication with the National Committees and with the world hydrological community.

GENERAL

17. Scientific Commissions, Panels, Working Groups and the International Association of Hydrological Sciences Limited shall account to the Treasurer in January of each year on all funds received from the Association and from other sources for their activities and disbursed by them during the preceding year.

18. Corporate Subscribers: The Bureau of the Association is authorized to accept institutions with an interest in hydrology as Corporate Subscribers who, for an annual fee established by the Bureau, shall be entitled to receive a copy of each Journal published by the Association, a 20% discount on any IAHS publication other than the Journal, copies of all notices and information circulars, and to a listing in the Journal.

19. The President may invite representatives of the UN specialized agencies or other observers, advisors or consultants to attend Plenary Sessions or meetings of the Bureau, with voice but without vote.

20. The legal domicile of the Association shall be established by the Bureau.

21. The Secretary General shall publish the Statutes and Bye-laws at least once in each period between General Assemblies of the IUGG.

22. The Secretary General keeps a list of hydrologists who are willing and qualified to participate actively in the work of the Association. These hydrologists are designated as Individual Members of IAHS. The Secretary General will notify the Secretaries of the Scientific Commissions of the Individual Members interested in their respective Commission.

STATUTES AND BY-LAWS OF THE INTERNATIONAL ASSOCIATION OF METEOROLOGY AND ATMOSPHERIC SCIENCES

(Revised August 2019)

PREAMBLE

The International Association of Meteorology and Atmospheric Sciences is one of the constituent associations of the International Union of Geodesy and Geophysics, and carries out its activities subject to those of its Statutes and By-Laws that apply to associations. Both the International Association of Meteorology and Atmospheric Sciences and the International Union of Geodesy and Geophysics operate within the framework of the International Council Science (ISC) and the policies and principles it upholds guiding the conduct of international scientific activities.

STATUTES

Statute I - Objectives of the Association

1. The objectives of the International Association of Meteorology and Atmospheric Sciences (IAMAS), hereafter the Association, are:

- 1.1. To promote study of the sciences of the atmospheres of the Earth and other celestial bodies, and of the interactions of the Earth's atmosphere with society and with other components of the Earth system.
- 1.2. To initiate, encourage, facilitate, and coordinate international cooperation in scientific research.
- 1.3. To stimulate discussion, presentation and publication of scientific results.
- 1.4. To facilitate the education, development, and participation of early career scientists and atmospheric scientists from countries with low per-capita GDP (hereafter referred to as resource-limited countries) in international scientific assemblies and conferences.
- 1.5. To recognize leading scientific accomplishments and scientists.
- 1.6. To promote communication about the atmospheric sciences within and across the international scientific community.
- 1.7. To convey the collective views of the atmospheric science community to other organizations.
- 1.8. To promote public education and awareness of the role and importance of the atmosphere and atmospheric sciences.

In pursuit of all of its activities, the aim of the Association is to further the advancement of atmospheric sciences in a strictly non-partisan and non-profit manner.

Statute II - Membership in the Association

2. Membership in the Association is of three forms: (1) National Members, (2) Individual Members, and Affiliate Members.

2.1. National (or Adhering) Members of the Association are the Member Countries of the International Union of Geodesy and Geophysics (IUGG), hereafter referred to as the Union. All countries that adhere to the Union are National (Adhering) Members of the Association and are qualified to appoint delegates to the Association's General Assemblies.

2.1.1. Consistent with the Statutes of the Union, a nation's Adhering Body may be either its principal scientific Academy, its National Research Council, or any other institution or

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association of institutions, whether non-governmental or governmental, that can represent the geodetic and geophysical activities of the adhering country.

- 2.1.2. Both Adhering (or Member) Countries of the Union and Countries in Associate status with the Union (i.e., countries not participating financially with the Union) are qualified to appoint delegates to the General Assemblies (see Statute IV) of the Association. However, consistent with Union, National Members in Associate status with the Union have restricted rights of participation in some of the Association's activities (e.g., see Statute XI, Article 26.1, and By-Law I, Paragraph 2).
 - 2.1.3. National Members of the Association may participate in the governance and activities of the Association through a number of mechanisms, including directly through their National Committee for the Union, through a National Committee (or Sub-Committee) for the Association, or by appointing a National Delegate to (or National Correspondent with) the Association.
 - 2.1.4. The general duties and responsibilities of the National Members include: selection of a Delegate to represent their nation at General Assemblies of the Association; participation in the nomination and election of capable and effective officers of the Association; oversight and promotion of the interests and success of the Association; approval of the financing of the Association; and, along with the officers and members of the Association and its Commissions, promotion of the advancement of meteorology and atmospheric sciences in their country and throughout the world.
 - 2.1.5. National Members have the opportunity and responsibility to present proposals to host General and Scientific Assemblies and other meetings associated with the Association and its Commissions.
 - 2.1.6. The Secretary General (see Statute IX) shall be the primary contact point with the Association's National Members, including communicating with them about the upcoming meetings and activities of the Association, and responding to their requests and queries.
- 2.2. Scientific Members of the Association are individual scientists with primary interests in meteorology and atmospheric sciences who are or have been an officer of the Association, a National Delegate attending a General Assembly of the Association, an officer or member of a Scientific Commission or other scientific entity sponsored by IAMAS, awarded honorary membership, or whose application to the Secretary General to be included as a Scientific Member of IAMAS has been approved by the Bureau of the Association.
- 2.2.1. Applications for admission as Scientific Members should include a brief summary of the applicant's education, scientific research, and publications in the field of atmospheric sciences and a statement indicating the interest in and efforts to promote the objectives of the Association. Approval should be granted based on an indication that the applicant is of the caliber of those who would be approved to present a paper at a Scientific Assembly of the Association.
 - 2.2.2. The Secretary General shall keep a listing of the Scientific Members of the Association. The initial list of members shall be created from the listing of past officers of the Association, of the officers and members of the Scientific Commissions, and National Delegates that have attended the General Assemblies of the Association.
 - 2.2.3. There is no fee for being a Scientific Member of the Association. Membership shall be for life unless a resignation from the Scientific Member is received or membership is revoked by a two-thirds vote of those present at a regular meeting of the Executive Committee or of all Executive Committee members if the vote is taken by electronic means.
 - 2.2.4. Scientific Members are able to participate in the Association through a number of mechanisms, including participation in the Scientific Assemblies (see Statute V), serving as officers of the Association (see Statute VI), serving as members and officers of the Scientific Commissions and Joint Scientific Committees, voting on resolutions of the Association

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dealing with scientific matters, submitting nominations for officers of the Association, and otherwise contributing to the objectives of the Association.

2.2.5. Scientific Members of the Association and activities in which they participate may be recognized by the Association for their contributions and accomplishments, as provided for in By-Law IV.

2.3. Affiliate Members are other scientific or professional organizations at the international, regional, or national level that are involved in study of the atmosphere, helping to educate the public about the atmosphere, or otherwise promoting the objectives of IAMAS, and that have been admitted to Affiliate membership by the General Assembly of the Association.

2.3.1. Affiliate Members are not permitted to vote on administrative or scientific matters coming before the Association, but may join with the Association in activities to promote the objectives of the Association and may be invited to make presentations before bodies of the Association, including the General Assembly.

Statute III - Time Schedule of the Association

3. The fundamental time interval for the Association is a 'period,' which is defined as the interval elapsing between the conclusion of the final Plenary Session of the Association at one Ordinary General Assembly (see Statute IV) and the conclusion of the final Plenary Session of the Association at the succeeding Ordinary General Assembly. This interval is generally four years.

Statute IV - General Assemblies of the Association

4. Representatives of the National Members of the Association will meet regularly to conduct the business of the Association in Ordinary General Assembly. The Association's Ordinary General Assembly will normally be at the time and place of the Ordinary General Assembly of the Union.

4.1. The General Assembly of the Association will be composed of Delegates appointed by the National Committees of the National Member countries (see Statute II). These appointments will be brought to the notice of the Bureau officially before the opening of the first Plenary Session of the General Assembly. The National Committees will designate the particular National Delegate who, in case of voting by countries, will hold the right to vote for their country. A quorum shall be considered present with the attendance, in person or by proxy, of at least three of the elected officers and Delegates from a minimum of at least 10% of the Member Countries of the Union (excluding members in Associate status).

4.2. The agenda of a Plenary Session of a General Assembly of the Association will be determined by the Bureau (see Statute VIII), which will have previously invited the National Committees of the IUGG Adhering Countries to submit proposed topics for consideration. This agenda will be communicated to the Committees at least four months before the opening of the General Assembly. Questions not contained in the agenda may be considered during the sessions only with the agreement of at least half of the countries represented, or of the Delegates present at the General Assembly, accordingly, as the question is administrative (including financial) or scientific.

4.3. The Bureau will have the responsibility for preparing the schedule of business for the General Assembly. In general, an opening Plenary Session will be held near the start of the General Assembly to cover business matters of the Association including: to hear the reports of the President and Secretary General, to consider for approval the decisions and actions of the officers and committees of the Association, to receive nominations for Officers and Members of the Executive Committee, to agree on appointment of appropriate committees to function during the General Assembly, to hear proposals from Delegates of Member Countries to host upcoming Scientific Assemblies (see Statute V), and to hear presentations of reports from at least some of the Scientific Commissions, as may be appropriate at the first plenary. A second plenary session will be held towards the close of the General Assembly, during which financial reports will be made, remaining reports of the Scientific Commissions will be heard, resolutions or recommendations will be decided (see By-Law V for the procedure for considering and approving resolutions), elections will be held, and other appropriate business conducted.

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- 4.4. The General Assembly is responsible for hearing a report from the Executive Committee on the status of the Scientific Commissions, and for, if necessary, amending and/or acting on any recommendations, including changes in the objectives and continuation, establishment, or termination of any of the Scientific Commissions. The General Assembly will also consider the establishment, continuation and termination of any Joint Scientific Committees that have been established.
 - 4.5. By vote of the National Delegates, the General Assembly may, at its discretion, propose, enact, modify, and/or amend By-Laws defining Association procedures. This responsibility includes consideration of any amendments or new By-Laws proposed or approved on an interim basis by the Executive Committee over the preceding period.
 - 4.6. At the General Assembly, both National Delegates and Individual Members that are present will have the right to vote on resolutions and issues of scientific interest. Voting is expected to be on the basis of each individual's scientific knowledge and understanding.
 - 4.7. In the election of Officers of the Association and on administration matters without financial implications, voting by National Delegates at the General Assembly will be by country and each country will have one vote, subject to the condition that the country will have paid its subscription to the Union up to the end of the year preceding the voting.
 - 4.8. On financial questions, and particularly with respect to the budget of the Association for the period from the January 1 following the General Assembly to the December 31 following the next General Assembly, voting at the General Assembly will be by country, provided that the country will have paid its subscription up to the end of the year preceding the voting. The number of votes assigned to each country will be one greater than the number of its category of membership in the Union. In case of doubt as to which class a question belongs, and in all cases of equality of votes on a question, the decision will rest with the President or Presiding Officer.
 - 4.9. In the event that a designated National Delegate from a country cannot be present for voting, the National Delegate from that nation may in writing designate a Delegate from another country to cast the vote(s) on behalf of the country of the aforementioned National Delegate. No designated Delegate may represent more than two countries in addition to their own.
 - 4.10. A National Member country not represented by a National Delegate may, by post or in a printable electronic form, forward its vote on any specific agenda question that has been distributed in advance. The postal or electronically provided ballot must be received by the Bureau in advance of the Plenary Session in which the voting takes place.
 - 4.11. The decision on all voting matters will be by simple majority of those Delegates or those countries present, including votes received by post or in a printable electronic form, counting for the purpose of determining a majority only those votes cast for or against a particular matter. In case of a tie vote, that of the President or Presiding Officer will decide.
 - 4.12. Except as indicated in the Statutes and By-Laws, conduct of IAMAS meetings shall be conducted according to Robert's Rules of Order, Newly Revised.
5. If the need should arise, the President of the Association, with the concurrence of the Executive Committee, may convene an Extraordinary General Assembly of the Association, during the interval between two Ordinary General Assemblies of the Union. Delegates to an Extraordinary General Assembly will have the same powers and be subject to the same rules as the Ordinary General Assemblies.
- 5.1. An Extraordinary General Assembly must also be convened by the President upon the request of at least half of the National Members.
 - 5.2. If the date and place of such an Extraordinary General Assembly have not been agreed upon during the preceding Extraordinary or Ordinary General Assembly, that will be determined by the Executive Committee of the Association and communicated to the National Member countries at least six months in advance. The date and time will at the same time be communicated to the bureaus of the Union and its constituent Associations.

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6. Ordinary and Extraordinary General Assemblies will be open to the public. All interested scientists may participate in the discussions, and may take the floor after being recognized by the President or Presiding Officer, whether those scientists be formally accredited Delegates or not, and whether they are from National Member countries or not. However, voting will be conducted according to the procedures outlined in Article 4 above.

Statute V - Scientific Assemblies of the Association

7. The Association may, upon decision taken at an Ordinary or Extraordinary General Assembly, organize and conduct Scientific Assemblies.

- 7.1. The Association will organize Scientific Assemblies in cooperation with other associations of the Union to coincide with the Ordinary General Assemblies of the Union and the Association.
- 7.2. The Association may organize and conduct Scientific Assemblies at times other than the General Assemblies of the Union. These Scientific Assemblies may be arranged by the Association alone, or they may be held jointly with other Associations of the Union, with other bodies of the ISC, or in cooperation with international organizations or research programmes.
- 7.3. Plans for such Scientific Assemblies will be communicated to the National and Scientific Members of the Association and to the bureaus of the Union and its constituent Associations at least six months in advance.
- 7.4. Proposals of National Members to host a Scientific Assembly will normally be made to the Executive Committee at least four years prior to the intended Assembly, where a proposal may receive preliminary approval. Formal approval to hold a Scientific Assembly separate from the Union's General Assembly would normally be at the Ordinary General Assembly prior to the Scientific Assembly.
- 7.5. Financial responsibility for Scientific Assemblies held separately from the Union General Assembly must be accepted by the proposing National Member Country. The host country has responsibility for preparing the budget for the Scientific Assembly, the solicitation of supporting funds, and for any shortfall or surplus resulting from the conduct of the Scientific Assembly. The host Country also has authority to set the registration fee for the Assembly (including provisions for reduced rates for students or other special categories), subject to approval of the Bureau and the addition of any IAMAS fee (e.g., head tax).
- 7.6. IAMAS will participate in overall support for the Assembly by contributing to the costs for travel, lodging, and/or registration for selected early career scientists and atmospheric scientists from resource-limited countries who have applied for support by the announced procedure to the Association. The Association may also advance funds to cover organizing and preparatory costs for the Scientific Assembly, with reimbursement made following the Scientific Assembly. In the event that the Scientific Assembly generates a surplus, any contribution to the Association (e.g., by rebating all or part of the contribution to the support for participation of qualifying scientists) will be used to augment support for qualifying scientists to participate in following Scientific Assemblies.
- 7.7. Preparation of the scientific programme is the responsibility of the Executive Committee, assisted by a representative of the host country (see Statute X).
- 7.8. The Association may set a fee (head tax) for participation of scientists at Scientific Assemblies. The funds collected are to be deposited in the general bank account of the Association and used in support of the conduct of the Assembly, including especially the enhancement of participation by scientists from resource-limited countries.

Statute VI – Officers of the Association

8. The Officers of the Association will include a President, two Vice-Presidents, a Secretary General, and five Members-at-Large. By the Statutes of the Union, the elected Officers of the Association must be from National Member countries (i.e., Adhering Countries that are up-to-date on their dues). Officers of the Association will be

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chosen, as far as is possible, on the basis of competence, experience, scientific specialty, gender, and geographical coverage. No elected officer of IAMAS may simultaneously serve as an officer of the Scientific Commissions.

- 8.1. The President will be elected at the final Plenary Session of each Ordinary General Assembly (see Statute IV). The term of office for the position of President will be for one period (see Statute III), and the individual serving will not be eligible for re-election.
 - 8.1.1. If the office of the President becomes vacant between two Ordinary General Assemblies, the senior Vice-President will become President. In the event that the two Vice-Presidents are equal in seniority (i.e., each having been elected for the first time at the same Ordinary General Assembly), the Executive Committee will decide which Vice-President will become President.
- 8.2. Two Vice-Presidents will be elected at the final Plenary Session of each Ordinary General Assembly. Their terms of office will be for one period. They will be eligible for immediate re-election, but only for one additional period.
 - 8.2.1. If one or both offices of the Vice President become vacant between two Ordinary General Assemblies, the Executive Committee may decide to elevate a Member-at-Large to the Office of Vice President.
- 8.3. The Secretary General, who also serves as the Treasurer, will be elected at the final Plenary Session of each Ordinary General Assembly for one period and may be re-elected for not more than one additional consecutive period.
 - 8.3.1. If the office of the Secretary General becomes vacant between two Ordinary General Assemblies, a Secretary General will be nominated by the President to occupy the office until the next Ordinary or Extra-ordinary General Assembly.
 - 8.3.2. At the conclusion of the service of a Secretary General, the Bureau may appoint the individual for a term of no more than nine months as a special Deputy Secretary General in order to assist the incoming Secretary General in completing the financial matters pertaining to: (a) the General and Scientific Assemblies at which the term of the Secretary General ended, (b) the full calendar year of the assemblies, and (c) transfer of the location of the Secretariat.
- 8.4. Five Members-at-Large, each from a different National Member country (see By-Law I for an interpretation of this provision), will also be elected as officers of the Association. Their term of office will be for two periods, with their terms of office staggered so that at least two positions are up for election at the final Plenary Session of each Ordinary General Assembly. Members-at-Large will not be eligible for immediate re-election.
 - 8.4.1. If a vacancy occurs among the Members-at-Large, a replacement will be chosen by the General Assembly in the course of the next appropriate Plenary Session, for a period which will expire at the time when the member Member-at-Large so replaced would have terminated his/her office.

Statute VII - Components of the Association

9. The internal organization of the Association shall consist of the following organs, each defined in succeeding Statutes:

- 9.1. The Bureau (see Statute VIII).
- 9.2. The Secretariat and Seat of the Association (see Statute IX).
- 9.3. The Executive Committee (see Statute X).
- 9.4. The Scientific Commissions (see Statute XI).
- 9.5. The Joint Scientific Committees (see Statute XII).

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10. All officers and members of the Bureau, the Secretariat, the Executive Committee, the Scientific Commissions, and the Joint Scientific Committees serve on a voluntary basis without receiving a salary or honorarium from the Association.

Statute VIII - The Bureau

11. The Bureau is chaired by the President, and also includes the two Vice-Presidents and the Secretary General. The Bureau of the Association will, on a continuing basis and as necessary, direct and coordinate all scientific and related activities of the Association in the interval between Ordinary General Assemblies. Critical responsibilities include:

- 11.1. Preparation of the agendas for General Assemblies of the Association, as indicated in Article 4.2.
- 11.2. Promoting understanding of meteorology and atmospheric sciences in accord with the objectives of the Association.
- 11.3. Promoting the development of the theme and the scientific programme of the Scientific Assemblies convened by the Association.
- 11.4. Encouraging the development of proposals for the convening of future Scientific Assemblies.
- 11.5. Promoting the recognition of leading scientists and leading scientific accomplishments within the scope of the Association's activities. Awards and other recognitions may be made pursuant to the procedures described in By-Law IV.
- 11.6. In the event of significant disagreements or of concerns about possible malfeasance in the conduct of the Association's affairs among members of the Bureau, the matters shall be referred to the Executive Committee, which shall have authority for determining appropriate actions, up to and including reassigning responsibilities for the financial and other actions of the Association and referral to the General Assembly of a recommendation for removal of any of the officers of the Association.

12. The President, with input from and, as necessary, assisted by the other members of the Bureau, has responsibility for the following:

- 12.1. Presiding at General Assemblies of the Association.
- 12.2. Serving as Chair of the Executive Committee.
- 12.3. Serving as the IAMAS representative on the Executive Committee of the Union.
- 12.4. With concurrence of the Executive Committee, appointing atmospheric scientists to serve as the scientific liaisons from IAMAS to Joint Scientific Committees and appropriate international scientific and governmental organizations. Normally those appointed will be members of the Executive Committee or the Scientific Commissions. Organizations to which IAMAS officers and Scientific Members currently make appointments are listed in By-Law VI.
- 12.5. Working with the Secretary General to expedite the activities and operations of the Association.

13. The Vice-Presidents of the Association, with input from and, as necessary, assisted by other officers of the Association and Scientific Commissions, have lead responsibility for:

- 13.1. The Vice Presidents, in priority senior to junior in terms of date of election, shall act in place of the President whenever the President is not present or is unable to perform the duties of the President.
- 13.2. The Vice Presidents, consistent with their capabilities and interests, shall carry out activities assigned to them by the President and the Bureau. Among those meriting their specific participation, as appropriate with other members of the Bureau, are:

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- 13.2.1. Development, organization, and implementation of education and outreach activities of the Association.
- 13.2.2. Monitoring and reporting to the Bureau on the activities of the Scientific Commissions and Joint Scientific Committees.
- 13.3.3. Annual or more frequent reviews of the finances of the Association.
- 13.3.4. Other activities as assigned by the President, Bureau, or Executive Committee.

Statute IX – Secretariat and Seat of the Organization

14. The Secretary General establishes the Secretariat and the legal seat of the Association, which shall normally coincide with the location of employment and/or residence of the Secretary General.

14.1. To the extent possible, support for the direct and indirect costs of the Secretary General and of the office for the Secretariat are expected to be covered by the hosting nation.

15. The Secretary General is responsible for expediting the current business of the Association in cooperation with the President of the Association. The Secretary General has primary responsibility for:

- 15.1. Management of the affairs of the Association, including responsibility for the official communications of the Association with the Union, with Members of the Association, and with other scientific bodies.
- 15.2. Management of the financial resources of the Association in accord with best practices for non-profit organizations. Management of the financial resources will be understood to include:
 - 15.2.1. The right to open both checking and savings accounts in the name of the Association. Both the President and Secretary General shall have individual signing authority.
 - 15.2.2. Subject to the Association's budget, the authority to accept and disperse funds in the conduct of the Association's business.
 - 15.2.3. Based on decisions of the Association, the responsibility for awarding funding for expenses (but not salaries or other personal remuneration) to the Scientific Commissions and Joint Scientific Committees and monitoring their expenditures based on procedures recommended by the Secretary General and approved by the Executive Committee.
 - 15.2.4. The costs of operating the office, including consumables, costs of publications, purchase and maintenance of office equipment, expenses of correspondence, postage and shipping, incidental expenses, and, with the approval of the Bureau, costs of necessary computational and office equipment and, with approval of the Executive Committee, rental for the office of the Secretariat if not provided by the host organization or nation. Borrowing, purchase, and disposal of Association equipment should be carried through for the benefit of the Association.
 - 15.2.5. The responsibility for sustaining a Contingency Fund to be used to ensure the continuity of IAMAS through at least one period at a restricted funding level in the event of high-consequence financial contingencies that might arise and seriously impact the income of the Association. The amount to maintain shall be approved as a component of the draft budget, and the distribution of a contingency expenditure should be considered by the Executive Committee upon recommendation of the Bureau.
 - 15.2.6. Responsibility for soliciting applications and making awards for travel, lodging, and/or registration to Scientific Assemblies of the Association to deserving early career scientists and atmospheric scientists from resource-limited countries.
 - 15.2.7. To the extent not covered by their home countries or other organizations and within the limits of the approved budget, authority to cover the travel, lodging, meal, and communication expenses that are necessary for the President and the Secretary General to conduct the official business of the Association. Travel and lodging costs for other members of the Executive Committee may be paid provided that: (a) participation is in connection with meetings or other events on specific Association business; (b) when those concerned represent the Association and not National Member countries or other organizations; and (c) in special cases where those concerned cannot draw proper allocations from their own national sources

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and it is especially important for the Association to be represented. Such payments may cover traveling costs and a reasonable contribution to other expenses.

- 15.2.8. The responsibility to report on the income, expenses, and financial condition of the Association to the Ordinary General Assembly of the Association and the Union, comprising in particular, a statement of receipts, expenditures assets, and liabilities of the Association for the period from the first of the January prior to the preceding Ordinary General Assembly, to the thirty-first of the December prior to the current General Assembly (i.e., the financial year being from January 1 through December 31).
 - 15.2.9. Preparation of a draft budget (estimate of expected income and expenses) for the Association for the financial years up to that of the next Ordinary General Assembly.
 - 15.2.10. To seek approval of the Bureau and Members-at-Large for any expenditure that would lead to a significant exceedance (i.e., by more than 20% or \$5000, whichever is less) of the approved budget of the Association. On the initiative of any two of the members of the Bureau and the Members-at-Large, the decision may be appealed to the Executive Committee.
- 15.3. Administrative, financial, and logistical support of the General and Scientific Assemblies of the Association, including maintaining the roster of National, Scientific, and Affiliate Members of the Association, and acceptance of and action on letters of application to become Scientific and Affiliate Members of the Association.
 - 15.4. Administrative, financial and logistical support and arrangements for General and Scientific Assemblies, including fulfillment of the decisions of the Association at General Assemblies. In addition, the Secretary General, in support of the Executive Committee, shall coordinate organization of the scientific programme for the Scientific Assemblies (see Statute V).
 - 15.5. Administrative, financial, and logistical support, as necessary, for the Bureau, the Commissions, and the Joint Scientific Committees.
 - 15.6. Preparation, printing, and distribution of publications of the Association, including newsletters, reports and other documentation.
 - 15.7 Maintenance of the presence of the Association on the Web and other electronic media.
 - 15.8. Maintaining the financial and historical records of the Association.
 - 15.9. Undertaking other activities in support of the objectives of the Association as they may be assigned by the Bureau or Executive Committee and that are within the budget of the Association.
16. The Bureau together with the Members-at-Large may, at their discretion, appoint a Deputy Secretary General, who would be assigned specific functions of the Secretariat and also share duties with the Secretary General. The term of the appointment would be for the same interval as for the Secretary General. The Deputy Secretary General would report to the Secretary General and be an ex officio member of the Bureau. Normally the Deputy Secretary General will be from an area of science complementary to that of the Secretary General.
17. The Secretary General may, with the approval of the Bureau, appoint an Assistant Secretary General, normally resident in the same general geographical area as the Secretary General. The period of the appointment would be at the discretion of the Secretary General, but not to exceed the term of the Secretary General. The Assistant Secretary General would be expected to:
- 17.1. Become familiar with the routine operations of the Secretariat.
 - 17.2. Have signing authority (together with the President and Secretary General) for cheques on the Association bank account, only to be used on written instruction from the President or Secretary General.
 - 17.3. Assist the Secretary General as appropriate.

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Statute X – Executive Committee

18. The Executive Committee will be composed of the members of the Bureau, the five elected Members-at-Large, the Presidents of the Commissions, and the Past President of the Association.

18.1. The Executive Committee will be chaired by the President of the Association.

19. The President of a Commission may delegate to the Vice President or the Secretary of that Commission the right to participate in a meeting of the Executive Committee if the President cannot do so.

20. The Executive Committee will normally meet at General Assemblies. Meetings of the Executive Committee may also be convened by the Bureau in the interval between two General Assemblies (particularly at Scientific and Extraordinary Assemblies).

20.1. The Executive Committee is responsible for reviewing the objectives of the Scientific Commissions every four years, and making recommendations to the General Assembly for determination of adjustments and status of the Scientific Commissions.

20.2. The Executive Committee may develop, enact, and, without contravening specific changes of the General Assembly, amend or add to the By-Laws establishing procedures of the Association. New and modified By-Laws will come into effect immediately or as provided in their approval; they will also be explicitly considered by the National Members at the succeeding General Assembly.

20.3. The Executive Committee may appoint subcommittees to prepare materials for consideration by the full Executive Committee.

21. The Executive Committee will be consulted by the Bureau, by postal or electronic correspondence, on questions of importance, administrative or scientific, that arise between General Assemblies. With one week's notice by electronic means, meetings of the Executive Committee may be convened between assemblies by electronic means.

22. The Executive Committee has responsibility for appointing a Nominating Committee. The governing procedures for the Nominating Committee are presented in By-Law I.

23. With the organizing support and overall coordination of the Secretary General, the Executive Committee, working also with representatives of the host Country of the Scientific Assembly, is responsible for development of the scientific programme, including IAMAS symposia led by its Scientific Commissions and, as appropriate, joint symposia held with other Associations and Union symposia held in conjunction with General Assemblies of the Union.

24. All decisions of the Executive Committee will be taken by a simple majority vote of those voting. If the votes are equally divided, that of the President will decide.

Statute XI – Scientific Commissions

25. Scientific Commissions for the study of particular aspects of meteorology and atmospheric sciences may be constituted by the General Assembly. The list of approved Scientific Commissions and their scientific scope is maintained in By-Law II.

25.1 The scopes of the Scientific Commissions approved by the General Assembly will be reviewed every four years by the Executive Committee. Recommendations, as appropriate, for changes in the scope or status of a Scientific Commission will be presented at a Plenary Session of each Ordinary General Assembly, which will decide on the continuation of the research and works of each Scientific Commission or on its termination.

25.2 To better fulfill their scope and objectives, each Scientific Commission may formulate and approve their own set of Statutes and/or By-Laws and control their own administration and finances, all subject to the provisions provided in the Statutes, By-Laws, and positions of the Association, and as appropriate, of the Union and ISC. Review of proposed changes by the Bureau of the Association is encouraged.

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26. The members of the Scientific Commissions will be scientists with expertise in or closely related to the subject area of the Commission (i.e., Scientific Members of the Association).

26.1 The Scientific Commissions may elect new members by a simple majority vote of the members voting in the election. These members must be from IUGG (i.e., National Member) Adhering Countries. Members may also be appointed from IUGG non-Adhering Countries by the President of a Commission, after consultation with members of the Commission. Due regard should be paid to geographical representation in the composition of the Commissions. The terms of Commission members will normally be for two full periods. The results of membership elections and appointments will be promptly reported to the Secretary General, who will convey the results to the General Assembly.

27. Each Commission will elect a President and a Secretary from among their membership. A Vice President may also be elected if the Commission desires. Their terms of office will normally be for one four year term. They will be eligible for re-election for one additional term. Officers will be from National Member countries, except IUGG Associate Countries.

28. When a new Scientific Commission is constituted, the first President will be appointed by the Executive Committee. The Commission President will invite appropriate scientists to be on the Commission. These appointments will be voted upon by the Commission at its first meeting.

29. The Scientific Commissions should, in general, conduct their elections of officers and members at the times of the Ordinary General Assemblies of the Association. In this case these elections should be held prior to the final Plenary Session of the General Assembly so that the results, along with other business conducted by the Commissions, may be reported to the General Assembly. Alternatively, Commissions may decide to elect their officers at a Commission meeting/symposium that is independent of the Ordinary General Assembly, or by postal or electronic correspondence. The General Assembly will have the right to comment on the work of the Commissions, which the Commissions may wish to consider at subsequent business sessions.

30. The Scientific Commissions may meet, organize conferences, and have symposia when convened by their President outside the meetings of the General and Scientific Assemblies of the Association. Such activities may be arranged jointly between interested Commissions, or jointly with other appropriate bodies of the IUGG or ISC, or with other relevant organizations (e.g., the World Meteorological Organization).

31. A Scientific Commission may, at the discretion of its President and, as appropriate, in cooperation with other scientific bodies, appoint Sub-Commissions, Committees, Working Groups, Scientific Steering Committees or other similar panels to undertake planning and conduct of research activities or programmes designed to enhance scientific understanding of relevant aspects of meteorology and atmospheric and related sciences. The members of such sub-bodies need not be members of the Commission. They should be appointed by the President of the Commission, after due consultation with members of the Commission. Findings or recommendations of such sub-bodies must be approved by the parent Commission or an equivalent independent body or process before promulgation. In addition to reporting on their own activities, Commissions have an obligation to periodically report to the Association on the arrangements and findings from cooperative activities with other organizations.

32. All decisions of Commissions will be taken by a simple majority of votes of the members voting (individual votes). In case of equal votes for and against, that of the President will decide.

33. Each Scientific Commission should have an officer responsible for its financial affairs. The Association may make financial awards to Scientific Commissions in support of their activities and symposia. In accepting funds from the Association or any other source, the Scientific Commissions agree to provide financial statements to the Association no less often than every two years, at the direction of the Secretary General. In addition, the Scientific Commissions agree that, by vote of the Executive Committee, they will cooperate with the Secretary General or an individual or committee appointed by the Secretary General in review and examination of their finances.

33.1. In the event of the termination of a Scientific Commission, any assets and balances in its account(s) will be turned over to the Association.

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Statute XII – Joint Scientific Committees

34. Joint Scientific Committees (which also include entities that may be named Joint or Inter-Association Commissions or Working Groups, etc.) between the Association and other Associations on scientific questions of mutual interest may be constituted by the Associations concerned, acting directly in cooperation with the other Associations or through the Union. In the case of IAMAS, formal approval of Joint Scientific Committees or similarly named entities will be confirmed by a General Assembly, although approval in principle may be granted at an earlier date by the Executive Committee. The list of approved Joint Scientific Committees and their scientific scope is maintained in By-Law III.

34.1. With the concurrence of the Executive Committee, adjustments in the policies and rules governing the operation of Joint Scientific Committees may be made to ensure concurrence with the policies and rules of other organizations that are co-sponsoring the Joint Scientific Committee.

35. The members of Joint Scientific Committees will be expert scientists nominated by the respective Associations, each of which will normally nominate the same number of members.

36. The Joint Scientific Committees may propose new members whose nomination must be ratified by the respective Associations at the occasion of their General Assembly. The term of office of members will be for one period. They will be eligible for re-appointment.

37. Each Joint Scientific Committee will elect a President and Secretary who will not both have been appointed by the same Association, and whose term of office will be for one period. They will be eligible for re-election for one additional period.

38. The Joint Scientific Committees will formulate their programme of work and will organize their meetings, insofar as possible, during the course of the sessions of the General Assembly of the Union. The proceedings of the Joint Scientific Committees will be appended to the minutes of the Associations concerned.

38.1. The Joint Scientific Committees may meet when convened by their President outside the meetings of the General or Scientific Assemblies, on condition that the bureaus of the respective Associations are advised beforehand. They may meet at the same time as related Commissions or Joint Scientific Committees constituted by other Associations of the Union or by other Unions, in order to study and resolve together problems which interest more than one Association of the Union or more than one Union.

39. Requests from a Joint Scientific Committee for financial support must be presented and supported by the Associations concerned.

40. Every Joint Scientific Committee may refer in a consultative capacity to experts who are not members of the Joint Scientific Committee.

41. All decisions of Joint Scientific Committees will be taken by a simple majority of votes of the members present (individual votes). In case of equal votes for and against, that of the President will decide.

42. The IAMAS Executive Committee will review the continued participation of IAMAS in each Joint Scientific Committee at each Ordinary General Assembly.

Statute XIII – Financial Arrangements

43. The Secretary General is responsible for the financial operations of the Association (see Statute IX, Article 15.2).

43.1 The financial year of the Association is the calendar year, and the budget period is four calendar years.

44. At least two months prior to the General Assembly, the President shall appoint a Finance Committee consisting of up to three members, not more than one of which is on the Executive Committee and at least one of which will be a Delegate from a National Member country. Prior to the first Plenary Session of the upcoming General Assembly, the Finance Committee, with the cooperation of the Secretary General, shall examine the budget and

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the accounts for the years since the prior General Assembly (including a provisional estimate of income and expenditures for the current year). The Committee will also examine and offer comments on the draft financial summaries and the draft budget for the ensuing period that the Secretary General is called upon to prepare for consideration at the General Assembly. At the first plenary session General Assembly, the Finance Committee will offer its findings and recommendations. The General Assembly and/or the Finance Committee may request that further examination of the accounts be conducted and/or that the accounts be audited by a qualified accountant, with follow-up to be carried through by the Executive Committee.

45. The Association will draw its resources from several sources, including that part of the subscriptions of the National Member countries that is allotted to the Association by the Union. To this income may be added other receipts from, for example, the sale of publications, interest on bank accounts, contributions made by other interested organizations to support symposia or other meetings, and a share of the registration fees at Assemblies (e.g., head tax).

46. The income will be assigned in the first place for the payment of the expenses of the Secretariat, the maintenance of the Contingency Fund, and support for the conduct of scientific meetings, as enumerated in Article 15.2.

47. Upon application to the Secretariat and approval of the Bureau, the balance of receipts will be devoted primarily to grants to support the success of scientific symposia or special meetings. As far as possible, funds are expected to be used to contribute to the participation of early career scientists and atmospheric scientists from resource-limited countries who cannot obtain adequate travel allocations from other sources and who desire to come to General or Scientific Assemblies of the Association and/or its Scientific Commissions and Joint Scientific Committees. In general, it will be expected that such participants will obtain partial support from the Association's funds with the balance coming from national or other sources.

48. Unless provided for specifically by the General Assembly, Association resources are not to be used to fund honoraria for speakers at symposia and other events.

Statute XIV – Voting

49. Voting by the Executive Committee and by the National Delegates can be conducted at a meeting of these bodies or electronically. Electronic voting is voting using electronic systems (e.g., Internet, E-mail, Fax) and organized by the Secretary General. Electronic voting shall normally be suspended in the 6 months preceding a meeting of these bodies.

Statute XV – Dissolution of the Association

50. If the Association should be dissolved, its financial assets will fully revert to a non-profit association for the atmospheric sciences (e.g., a national meteorological society) or the appropriate national adhering body of the Union of the country where the current Secretary General resides. The receiving national association shall pass the financial assets on to the Union to be used exclusively for the continuation of scientific and educational activities, such as the organization of scientific meetings and symposia, the dissemination of scientific information, and the coordination of international research activities.

Statute XVI – Changes in the Statutes of the Association

51. Only National Member countries, members of the Executive Committee, including ex officio members, and officers of the Scientific Commissions may propose changes to any article in these Statutes and By-Laws. These changes must reach the Secretary General at least six months before the announced date of the General Assembly at which it is to be considered. The Secretary General will notify National Member countries and Executive Committee members of proposed changes at least four months before the General Assembly meeting. Adjustments to the proposed amendments may be announced at the General Assembly before the voting.

52. The Statutes and By-Laws can be modified by a two-thirds vote of the National Delegates present or represented by designation (see Article 4.9) or proxy (see Article 4.10) at a Plenary Session of the General Assembly. Such changes will come into effect at the close of the General Assembly at which they are approved.

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Statute XVII – Official Languages of the Association

53. The Association will observe the official languages recognized by the Union, namely English and French. Documents, reports, and abstracts of presentations may be submitted for presentation or publication in either of these languages.

54. For the interpretation of the Statutes, the English text shall be considered authoritative.

Record of Latest Amendment of the Statutes:

These Statutes, approved at the General Assembly in supersede those last amended by the IAMAS General Assembly in Perugia in July 2007 and Melbourne on 4 July 2011. This version of the IAMAS Statutes and By-Laws was compiled by a Statute Committee, chaired by the president of IAMAS, John Turner, between the IAMAS 2017 assembly in Cape Town and the regular General Assembly of IUGG 2019 in Montréal. The IUGG Statutes and By-Laws Committee found no conflict with the IUGG statutes in the drafted version. On 11 August 2019 the IAMAS General Assembly unanimously adopted the present version. After circulation by email to all national representatives it is now in force.

BY-LAWS

By-Law I – Governing Procedures of the Nominating Committee

1. The Executive Committee will appoint a Nominating Committee at the Scientific Assembly two years before a General Assembly. This committee will be responsible for nominating candidates for President, two Vice Presidents, elected members of the Executive Committee, and a Secretary General, when required. The Nominating Committee will consist of a chairperson (the Past-President, if available) and at least two other members plus the President as an ex-officio member, each of whom should be Individual Members of the Association.
2. The Nominating Committee will contact the adhering body of the National Member countries of the Association and the Executive Committee at least six months before the General Assembly and request nominations for the positions indicated above to reach them at least four months before the General Assembly. Individual Members of the Association will also be invited through a Web site posting that they may also submit nominations; any such nomination should be seconded by two additional Individual Members.
3. The Nominating Committee will consider nominees from National Member countries, from Commissions and from Individual Members and may also consider nominations from other sources. The Nominating Committee will prepare a list of nominations for consideration at the General Assembly, and may propose a single slate of candidates. The nominees must be from National Member countries, except Associate Countries (see paragraph 4 for interpretation of this provision). The slate of candidates for office will be communicated to National Member countries and the Executive Committee at least two months before the General Assembly.
4. Recognizing the internationalization of science and the intent of the Statutes to encourage widespread participation in the governance of the Association, this By-Law is included to provide guidelines for the interpretation of the first sentence of Statute 8.4, which states that “Five Members-at-Large, each from a different National Member country, will also be elected as officers of the Association” and Paragraph 3 of By-law I:
 - 4.1. The nation of affiliation of a scientist shall be defined as the nation where the scientist has been and is expected to be primarily based for the greatest number of years over the period from 5 years before the election to 5 years after the election, assuming that a scientist’s affiliation will remain the same unless a prior arrangement is in place.
 - 4.2. In the event that paragraph 4.1 leads to a scientist being affiliated with a nation that is not an Adhering Member of the IUGG in paying status, the basis for national affiliation may be determined by considering the years spent in a member nation where the scientist has held a formal appointment in the 20 years prior to the present appointment.
 - 4.3. In the event that a scientist’s primary affiliation is with an international organization or program office other than in the nation of the scientist’s citizenship or previous research position, the national affiliation may be either the nation where the position is or has been located or the nation of citizenship.
 - 4.4. To the extent possible, not more than two of the members-at-large shall be from the same continent, excluding any scientist primarily affiliated with an international organization.
 - 4.5. In considering the national affiliations of the President, Past President, Secretary General, two Vice-Presidents, and five Members-at-Large, the Nominating Committee should endeavor to ensure that at least four of the world’s continents are represented.
5. Any nominations for President or Secretary General should be accompanied by an indication of available resources for the operation of the respective offices.
6. At the first Plenary Session of the General Assembly the Nominating Committee will, if one is prepared, formally table its slate of candidates. Nominations from the floor for all positions except Secretary General can be made at that time. All nominations require the agreement of the individual to serve if elected. The election will take place during the final Plenary Session of the General Assembly.

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By-Law II -- Approved Scientific Commissions

1. The General Assembly approves Scientific Commissions to carry through the Objectives of the Association in specific scientific areas. As described in Statute XI, the continuation and scope of each of these Commissions is to be reviewed at each General Assembly.

2. The following Scientific Commissions have been either accepted (in the case that their formation predates formation of the Association) or established by the General Assembly:

2.1. The International Radiation Commission (IRC). The scope of the IRC encompasses atmospheric radiation and related disciplines. The IRC was founded in 1896 and accepted into IAMAS in 1948.

2.2. The International Ozone Commission (IOC). The scope of the IOC encompasses the amounts, characteristics and processes of ozone in the atmosphere. IOC was originally approved in 1948.

2.3. The International Commission on Clouds and Precipitation (ICCP). The scientific scope of ICCP encompasses the characteristics and processes governing clouds and precipitation in the atmosphere. ICCP was originally approved in 1956.

2.3.1. The Committee on Nucleation and Atmospheric Aerosols is a subcommittee of the ICCP formed in 1966 to bring together scientists covering the following subject areas: nucleation theory and experiment, tropospheric and stratospheric aerosols, cloud drop and ice nucleation, and aerosol-climate interactions.

2.4. The International Commission on Atmospheric Chemistry and Global Pollution (ICACGP). The scientific scope of ICACGP encompasses the chemistry and composition of the atmosphere, especially aspects that contribute to solving the basic societal issues of water supply, food production and human/ecosystem health. ICACGP was originally approved in 1957 as the International Commission on Atmospheric Chemistry and Radioactivity, and renamed in 1971.

2.5. The International Commission on Dynamical Meteorology (ICDM). The scope of the ICDM encompasses dynamical meteorology. ICDM was originally approved in 1967.

2.6. The International Commission on Climate (ICCL). The scientific scope of ICCL encompasses the characteristics, fluctuations, and changes of climate on all time scales, covering the past, present and future. ICCL was originally approved in 1977.

2.7. The International Commission on Planetary Atmospheres and their Evolution (ICPAE). The scope of ICPAE encompasses planetary, cometary and satellite atmospheres and their evolution (including the Earth, when considered as a member of the Solar System). The ICPAE was originally approved in 1977.

2.8. The International Commission on the Middle Atmosphere (ICMA). The scientific scope of ICMA encompasses the middle atmosphere, defined loosely as stretching from the tropopause into the lower thermosphere. The ICMA was originally approved as the International Commission on Meteorology of the Upper in Atmosphere in 1979, and renamed in 1987.

2.9. The International Commission on Atmospheric Electricity (ICAE). The scientific scope of ICAE encompasses electrical phenomena in the atmosphere. ICAE was originally approved in 1989.

2.10. The International Commission on Polar Meteorology (ICPM). The scope of the ICPM encompasses the meteorology and climatology of the Arctic and Antarctic. The ICPM was originally approved in 1963.

By-Law III -- Approved Joint Scientific Committees

1. IAMAS approves Joint Scientific Committees to carry through the Objectives of IAMAS in cooperation with other Associations. As described in Statute XII, the continuation and scope of each of these Committees is to be reviewed at each General Assembly.

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2. Participation in the following Joint Scientific Committees (names of which can vary based on IUGG conventions) has been concurred in by the Executive Committee and, if so indicated, approved by the IAMAS General Assembly:

- 2.1. The Committee on Mathematical Geophysics (CMG). The CMG is formally an IUGG Union Commission. The aims of CMG are to encourage exchange of ideas and information in all areas of geophysics, with 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. CMG was formed as a Working Group in 1964 and reconstituted as the CMG in 1971.
- 2.2. The Union Commission on Geophysical Risk and Sustainability (GeoRisk). The scope of GeoRisk encompasses the interaction between hazards, their likelihood and their wider social consequences as a result of the vulnerability of societies. GeoRisk was formed by IUGG in 2000 and approved by IAMAS in 2003.
- 2.3. The Union Commission for Data and Information (UCDI). The scope of UCDI is to provide a focused and sustainable organizational structure that supports and strengthens IUGG science through integrated scientific information activities. UCDI was established by IUGG in 2008 with Executive Committee concurrence in 2009 (formal IAMAS General Assembly approval pending).

3. The President, with the approval of the Executive Committee, is responsible (as indicated in Statute 12.5) for appointment of members of Joint Scientific Committees who serve on behalf of IAMAS to represent its objectives.

By-Law IV -- Procedures for the Recognition of
Scientific Expertise and Accomplishments

1. The General Assembly has established the following types of recognition of individual scientists (i.e., Scientific Members) and scientific accomplishments. Implementation of these types of awards, including protocols and criteria, is assigned to the Executive Committee, upon recommendation by the Bureau:

- 1.1. Recognition of an individual scientist whose career has contributed to the advancement of international research in meteorology and atmospheric sciences through appointment as an honorary member, which will be recognized by a suitable memorial the Association.
- 1.2. Recognition of an individual scientist for significant scientific accomplishments over a career or prolonged research programme through a suitable memorial and passage of a resolution of the Association calling special attention to the accomplishment.
- 1.3. Recognition of one or more early career scientists at a Scientific Assembly through award of a certificate or other suitable reward.
- 1.4. Other awards or recognition as determined by the Executive Committee or General Assembly.

2. The Executive Committee may choose to implement this By-Law at its discretion, choosing to offer or not offer any of the recognitions at any of the General or Scientific Assemblies.

By-Law V -- Procedures for Proposing and Approving Resolutions

1. Resolutions expressing the views of IAMAS must be approved by the General Assembly. Between General Assemblies, the Executive Committee may express its views in the form of a resolution of that body.

2. Resolutions of IAMAS will normally be addressed to scientific bodies, to organizations responsible for the conduct and governing of scientific research, and/or to the public. Through the president, IAMAS may join with IUGG or other Associations in resolutions that reflect the views as expressed by the IAMAS General Assembly and/or Executive Committee.

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3. The content of resolutions must be in furtherance of the objectives of the Association and not for partisan purpose. The General Assembly or Executive Committee may amend or modify a draft of the resolution before considering it for final approval. When developing joint resolutions with other bodies, the President and/or Secretary General or their designees may revise draft resolutions in the interests of IAMAS.
4. For consideration at the final Plenary Session of a General Assembly of the Association, a draft of the resolution must be provided to the Secretary General in time for consideration by the IAMAS General Assembly by the close of its first Plenary Session.
5. The Secretary General is responsible for the official transmittal of resolutions of the Association to those to the entities to whom the resolution is addressed.
6. The Secretary General shall maintain a cumulative record of the resolutions of the Association and of the resolutions made in partnership with other Associations and the IUGG.

By-Law VI -- Liaison Appointments of the Association

1. As a constituent association of the Union, officers of the Association and its Scientific Commissions, upon nomination and approval of the Union, serve as the Union's liaison to and/or ex officio members of the following scientific organizations:
 - 1.1. Executive Committee of ISC's Scientific Committee on Oceanic Research (SCOR).
 - 1.2. The World Meteorological Organization (WMO).
 - 1.3. The Joint Scientific Committee of the World Climate Research Programme (WCRP).
2. Acting in partnership with other IUGG associations, IAMAS makes appointments to Joint Scientific Committees, Inter-Association Commissions, Union Commissions, and Working Groups. These presently include:
 - 2.1. The Committee on Mathematical Geophysics (CMG).
 - 2.2. The Union Commission on Geophysical Risk and Sustainability (GeoRisk).
 - 2.3. The Union Commission for Data and Information (UCDI).
3. In representing the interests of the Association in other international bodies, the Association may, in cooperation with the relevant Scientific Commission, make additional liaison appointments.

STATUTES AND BY-LAWS OF THE INTERNATIONAL ASSOCIATION FOR THE PHYSICAL SCIENCES OF THE OCEANS

STATUTES

(Adopted October 1967, Berne, Switzerland, revised December 1979, Canberra, Australia, revised by mail ballot 1998, revised July 2007, Perugia, Italy, and revised July 2019; Montréal, Canada)

I. Objects, Composition and Membership of the Association

- 1) The International Association for the Physical Sciences of the Oceans (IAPSO) hereafter referred to as the Association is a constituent of the International Union of Geodesy and Geophysics hereafter referred to as the Union. The Association is subject to those articles of the Statutes and By-Laws of the Union which apply to Associations, and also to these Statutes.
- 2) The objects of the Association are:
 - (a) to promote the study of scientific problems relating to the ocean and interactions taking place at its boundaries, chiefly insofar as such study may be carried out by the aid of mathematics, physics and chemistry;
 - (b) to initiate, facilitate and coordinate research into and investigations of those problems of the ocean which require international cooperation;
 - (c) to provide for discussion, comparison and publications; and
 - (d) to organize Assemblies, which include symposia on the most interesting and up-to-date problems of physical and chemical oceanography.
- 3) Those Adhering Bodies that adhere to the Union are Members of the Association, and are hereafter referred to as "Members".

By resolution of an Association Assembly, other international organizations that are concerned with the study of physical sciences of the oceans may be admitted to Membership, with the status of guests.

II. Administration

- 4) The Authority of the Association shall be vested in the Members, and exercised collectively by their accredited delegates. The Association will hold a meeting of delegates at General Assemblies of the Union and at Association Assemblies occurring during interim periods between General Assemblies.
- 5) The Association shall convene scientific symposia and/or workshops and hold business meetings of the Members' delegates at the General Assemblies of the Union, to be held normally once every four years. The Association may recommend to the Executive Committee of the Union, at a General Assembly of the Union, arrangement of joint sessions of two or more Associations or of joint meetings of two or more Committees or Commissions for the discussion of topics of an interdisciplinary character. With the concurrence of the Executive Committee of the Union, the Association may arrange General Assemblies and other meetings of its own in the interval between the General Assemblies of the Union, either singly to deal with topics of specific interest, or jointly with another Association or other Associations.
 - (a) Meetings of Members' delegates are restricted to the delegates, members of the Association Executive Committee, and persons invited by the Association President when their attendance is deemed necessary to make reports or presentations to the delegates.
 - (b) Meetings of the Association Executive Committee are restricted to members of the Executive Committee and persons invited by the Association President when their attendance is deemed necessary to make reports or presentations to the Executive Committee.

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- 6) The President, the two Vice Presidents, the Secretary General, and the Treasurer of the Association shall be elected by delegates to the Association in accordance with Section III.
- 7) The Bureau of the Association shall consist of the President, Past President, the Secretary General and the Treasurer. Its duties shall be to conduct the affairs of the Association in accordance with the decisions of the foregoing meetings of the delegates. It shall prepare the Agenda for meetings of delegates. With the advice of the Association Executive Committee, it shall prepare the scientific program for Assemblies.
- 8) In accordance with Section III, the delegates from countries having Members shall elect six persons who, together with the President, immediate Past President, Vice Presidents, Secretary General, and Treasurer, shall constitute the Executive Committee of the Association.
- 9) The Executive Committee may establish Association Commissions, Working Groups or Services to address particular scientific areas of oceanography, and may abolish such Commissions, Working Groups and Services by a majority vote of the Executive Committee members. The Executive Committee may also approve Association participation in joint Commissions, Working Groups and Services with other Associations or scientific bodies, and may withdraw Association participation by a majority vote of the Association Executive Committee members.
- 10) A Nominations Committee of four persons from countries having Members will be appointed by the Executive Committee. The Nominations Committee will normally include the immediate Past President as its Chairperson. Its function will be to scrutinize nominations received for positions on the Executive Committee which become vacant, to seek additional nominations where appropriate, to ensure disciplinary and geographical distribution, and to prepare a final slate of candidates for election at the General Assembly.
- 11) The Executive Committee of the Association may establish medals and awards to recognize individuals for their accomplishments in advancing the knowledge of the physical and chemical sciences of the oceans.

III. Voting

- 12) Voting is held (a) at meetings during the Association Assembly or (b) electronically. Electronic voting is voting using electronic systems (e.g., Internet, E-mail, Fax) and organized by the IAPSO Secretary General. Electronic votes shall be open for one calendar month from the date of announcement. Electronic voting shall normally be suspended in the 6 months preceding an Association Assembly.
- 13) In questions of scientific nature, or of administrative nature, or of a character partly administrative and partly scientific not involving matters of finance, voting shall be by Members, each Member having one vote with the provision that its subscription shall have been paid up to the end of the year preceding the voting.
- 14) In questions involving finance, voting shall be by Member delegates, with the same provision as for administrative questions. The number of votes for each Member delegate shall be equal to the number of its category of membership to the Union.
- 15) Before a vote either during an Association Assembly, or through an electronic vote, the President shall decide whether the matter under consideration is scientific, administrative or financial in character and whether voting by correspondence is applicable.
- 16) A delegate shall represent only one Member. In the case of voting held during an Association Assembly, an adhering Member not represented by a delegate may submit by post its vote on any specific question of an agenda.
- 17) Guests will not vote.

IV. General

- 18) These Statutes shall be changed only by a majority of two thirds of the votes cast by delegates at an Association Assembly or electronically in accordance with Section III. Any modification to the Statutes shall come into force at the close of the Association Assembly at which they are adopted, or in the case of electronic voting on the date at which they are adopted.

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- 19) The Association may make By-Laws which may be changed by a simple majority of the votes cast by delegates at an Association Assembly, or electronically in accordance with Section III. Any modification to the By-Laws shall come into force at the close of the Association Assembly at which they are adopted, or in the case of electronic voting on the date at which they are adopted.
- 20) This English text shall be the authoritative text of the Statutes of the Association.

BY-LAWS

(Adopted October 1967, Berne, Switzerland, modified December 1979, Canberra, Australia, modified August 1995, Honolulu, USA, modified 1998, and modified July 2007, XXIV IUGG General Assembly, Perugia.)

I. Membership of the Association

- 1) It is recommended that each adhering Member shall form a National Sub-Committee for the Physical Sciences of the Oceans, to which correspondence may be addressed.
- 2) Each adhering Member and each international member may contribute to the Agenda of Association Assemblies.

II. Administration

- 3)
 - (a) The President and the Vice Presidents shall be elected for one four-year term. Their terms shall be the interval between the ends of two successive General Assemblies of the Union. A Vice President may be elected for one additional four-year term.
 - (b) The term of the immediate Past President shall run from the end of the General Assembly at which the new President is elected until the end of the next General Assembly.
 - (c) The Secretary General and the Treasurer shall be elected for two periods, and may be re-elected for the subsequent single period.
- 4) The President shall:
 - (a) provide general leadership for the Association in all matters;
 - (b) represent the Association on the Union Executive Committee;
 - (c) serve as chairperson of those meetings of Members' delegates and the Association Executive Committee held at Association Assemblies;
 - (d) represent the Association in communications with the International Association for Biological Oceanography (IABO) either directly or through scientific committees of the International Council for Science (ICSU);
 - (e) appoint qualified ocean scientists to serve as liaisons between the Association and other scientific organizations as appropriate; and
 - (f) prepare Association responses on inquiries of a scientific nature received from other organizations.
- 5) The Vice Presidents shall:
 - (a) perform such tasks as may be assigned by the President or the Association Executive Committee; and
 - (b) act as the President whenever the President is not present or is unable to perform any of the President's duties. The acting President shall perform such tasks as required by the President.
- 6) The Secretary General shall:

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- (a) serve as Secretary of the Association Assemblies, the Member meetings, the Executive Committee and the Bureau; arrange for meetings of these Bodies; prepare and distribute promptly the agenda and the minutes of all their meetings;
 - (b) manage the affairs of the Association, attend to correspondence, preserve the records;
 - (c) maintain an Association web page on the World Wide Web, either as part of or linked to the Union web page. The web page shall include all general details of the Association; its activities; abstract books of Association Assemblies when available; and other information of use to Members and associated scientists;
 - (d) at least three months before the General Assembly of the Union, forward to all the Members a report on the administration of the Association since the last General Assembly, and present a summary of this to the delegates meeting at General Assembly itself; and
 - (e) perform such other duties as may be assigned by the Association Bureau.
- 7) The Treasurer of the Association shall be responsible for the financial administration of the Association in accordance with directions issued by the Association Bureau. The Treasurer shall:
- (a) prepare the yearly budget of the Association and distribute to the Association Bureau for approval;
 - (b) collect the funds of the Association and disburse them in accordance with the approved budget;
 - (c) maintain records of all the financial transactions of the Association and submit annual financial reports thereon to the Association Bureau and to the Treasurer of the Union;
 - (d) assemble, at the end of the calendar year preceding a General Assembly, the complete accounts of the Association for the past period for presentation to the Association Bureau and the Treasurer of the Union at least three months prior to the General Assembly and at the Member meeting at the Assembly; and
 - (e) pay traveling expenses and per diem subsistence to members of the Executive Committee attending Association Assemblies and meetings with Association support, where those concerned cannot draw proper allocations from their national sources (see By-Law 18).
- 8) Of the six persons referred to in Article 8 of the Statutes, not more than three may be elected to an additional term.
- 9) The Executive Committee shall:
- (a) prepare for the Executive Committee of the Union recommendations concerning the arrangement, at a General Assembly of the Union, of scientific meetings to be confined to joint sessions of two or more Associations or of Joint meetings of two or more Committees or Commissions, for the discussion of topics of an interdisciplinary character;
 - (b) at its meetings during an Assembly, select the themes of Association symposia for the next Assembly, and recommend conveners for the symposia;
 - (c) seek for the concurrence of the Executive Committee of the Union for the arrangement of General Assemblies and other meetings of the Association in the intervals between the General Assemblies of the Union, either singly to deal with topics of specific interest, or jointly with another Association or other Associations;
 - (d) fill any vacancy which may occur among the officers of the Association between General Assemblies. Such appointments shall be subject to the subsequent approval of the next General Assembly. Tenure of office for part of a period shall not be counted as a period for the purpose of these By-Laws;
 - (e) consider matters of general administration and finance, and report thereon to the General Assembly;
 - (f) make recommendations on matters of policy;

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- (g) frame the budget for the ensuing period and report to the General Assembly of the Association and to the Secretary General of the Union. The budget period of the Association coincides with the budget period of the Union;
 - (h) advise upon the distribution of funds; and
 - (i) consider proposals for changes in the Statutes and By-Laws, and report thereon to the General Assembly.
- 10) Officers designated by these By-Laws for special duties or for special committees may appoint substitutes in their stead. Notice of the intention to do so must be sent in writing to the President or Secretary General. No substitute shall represent more than one officer.
- 11) Decisions and actions of the Officers and Committees of the Association, taken during and between Association Assemblies, shall be reported to the delegates' business meeting at the Assembly.
- 12) Proposals for the Agenda of the meeting of delegates at General Assemblies of the Union and Association Assemblies shall reach the Secretary General six months before the meetings. The Secretary General shall send the Agenda to the Members and their accredited delegates, through the National Sub-Committees where such exist, at least four months before the meeting. No question not previously placed on the Agenda shall be discussed unless approved by two thirds of the votes of the Members represented at the Assembly.
- 13) Medals and Awards
- (a) The Executive Committee shall establish protocols for awarding medals or other awards established by the Association.
 - (b) The Prince Albert I Medal shall be awarded at each Association Assembly to a distinguished ocean scientist for career achievements in advancing the knowledge of the physical and/or chemical sciences of the oceans.
 - (c) The Eugene LaFond Medal will be awarded at Association Assemblies to a student or scientist from a developing country in recognition of the student's or scientist's presentation of an outstanding paper. Not more than one Medal will be awarded at any Assembly. The Executive Committee may decline to present the Medal at a particular Assembly.
- 14) Nominations Committee
- (a) The terms of members of the Nominations Committee referred to in Article 10 of the Statutes will expire at the end of the General Assembly following their appointment.
 - (b) A call for nominations for candidates for positions on the Executive Committee will be issued by the Secretary General of the Association at least six months prior to a General Assembly where an election is to take place.
 - (c) Nominations must be accompanied by a brief Curriculum Vitae, and will not be accepted later than three months prior to the General Assembly, except for additional candidates identified by the Nominations Committee in accordance with Article 10 of the Statutes.
 - (d) The Nominations Committee will prepare a slate of candidates one month prior to the General Assembly, and will confirm that the members of this slate are prepared to serve if elected.
 - (e) In the event of a vacancy occurring on the Executive Committee during its term of office as a result of the resignation or demise of a member, the Nominations Committee will assist the Executive Committee in finding a suitable replacement.

III. Finance

- 15) The President and Treasurer shall individually have power to sign documents on behalf of the Association.
- 16) All disbursements of Association funds shall be made by the Treasurer in consultation with the Association Bureau.

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- 17) The Treasurer shall receive the allocation of funds from the Union, maintain financial accounts, obtain receipts for disbursement of funds and maintain financial records.
- 18) Traveling expenses may be paid by the Treasurer, but only
 - (a) in connection with meetings on specific Association or Union business; when the travelers represent the Association and not the Members or other organizations; and where those concerned cannot draw proper allocations from their national sources; and
 - (b) to cover the traveling costs of a person receiving an award from the Association.
 - (c) Such payments may cover traveling costs at economy rates and a reasonable contribution to other expenses when attending such meetings.

STATUTES AND BY-LAWS OF THE INTERNATIONAL ASSOCIATION OF SEISMOLOGY AND PHYSICS OF THE EARTH'S INTERIOR

(Adopted 1975, Grenoble, France, amended in July 2011, XXV IUGG General Assembly, Melbourne, Australia, in June 2015, XXVI IUGG General Assembly, Prague, Czech Republic, and 2017 at the Scientific Assembly in Kobe, Japan)

Statutes

I. Objectives of the Association

1. The International Association of Seismology and Physics of the Earth's Interior (IASPEI) is a non-governmental and non-profit organization with the purposes:
 - a. To facilitate research on theoretical, observational and applied seismology, such as the propagation of seismic waves, the discussion, design and adoption of standards for observatory practice and data storage, and generally all matters related to seismology.
 - b. To promote multidisciplinary research related to earthquake science, internal structure, properties and processes of the Earth.
 - c. To initiate and co-ordinate the conduct and communication of related research which depends on co-operation between different countries.
 - d. To organize and support international conferences and meetings focusing on the above-mentioned topics and to support, including financially if the budget allows, the participation in such meetings of young researchers and of scientists from developing countries.

II. Members of the Association

1. Each country having adhered to the International Union of Geodesy and Geophysics (IUGG) is a member.
2. Each scientist participating in IASPEI activities and in the Scientific Assemblies is an individual IASPEI member. Any member attending the General Assemblies or participating in other activities of the Association at least once in the past ten years is considered to be an active individual member.

III. National Committees

1. Each National Committee for the IUGG (or national organisation adhering to IUGG) where possible should nominate a section, or sub-committee, for Seismology and Physics of the Earth's Interior. The functions of this section or sub-committee are to facilitate and co-ordinate in their respective countries the study and practice of Seismology and Physics of the Earth's Interior, in accordance with the objects of the Association. Each National Committee and the Section or Sub-Committee shall be empowered to refer to the Association matters for discussion falling within the competence of the Association.
2. The National Committee (or adhering organization) names in each country a correspondent (hereafter National Correspondent), whose duty is to provide liaison between IASPEI and the Section in each country.
3. The National Committee, on the recommendation of the Section or Sub-Committee, nominates the delegate or delegates who shall represent it at the General Meeting of the Association. One of these delegates shall be designated as the principal delegate of the country and shall cast the vote of that country whenever a "national vote" is required (refer section VIII.2). If a National Committee does not formally appoint a delegate, the (older in age in case of two) National Correspondent(s) present at the General Meeting is the principal delegate.
4. Official communications sent by the International Association of Seismology and Physics of the Earth's Interior to an adhering country shall be addressed to that country's IASPEI National Correspondent or, in default, to its National Committee for the IUGG.

IV. Administration of the Association

1. The work of the Association shall be directed by the Association Plenary Meeting of the delegates of the Member countries of IUGG, and of the individual IASPEI members.
2. The Plenary Meeting of the Association shall elect the following: a President, a First and Second Vice-President, a Secretary General, a Treasurer and four additional persons. These, plus the immediate past President shall constitute the voting members of the Executive Committee of the Association.
3. A single person may, with the approval of the Executive Committee, be elected both Secretary General and Treasurer.
4. The President, the Vice-Presidents, the Secretary General and the Treasurer shall constitute the Bureau of the Association.
5. Elections shall be held at an Association Plenary Meeting held in conjunction with the quadrennial General Assembly of the IUGG. The President may not be re-elected to the same office, and no person may hold any one office for more than 12 consecutive years.
6. Should a vacancy occur among the elected offices, the Bureau shall fill the position provisionally by nomination, and an election shall be held for this office at the next General Meeting of the Association.
7. The transfer of duties takes place at the close of the Association Plenary Meeting at which the election occurs. The interval between successive elections (normally 4 years) is called a period.
8. The President, in consultation with the Executive Committee, may appoint individuals to committees as may be needed, and may approve the terms of reference of such committees.
9. Urgent matters arising in the interval between Association Assemblies shall be referred by the Bureau to the Executive Committee.
10. The Executive Committee may appoint an Associate Secretary who will be an ex-officio member of the Executive Committee, but without vote.
11. The Executive Committee may appoint an Association Webmaster who will be responsible for maintaining the website of the Association.

V. Secretariat

A Secretariat placed under the direction of the Secretary General shall conduct the correspondence, preserve the administrative archives, maintain a register of the National Correspondents, delegates and active membership, arrange the Association Assemblies and other meetings, and ensure the records of the Assemblies and Commission reports are preserved in an accessible web location.

VI. Budget and Finance

1. The financial resources of the Association are derived from: The allocation by the IUGG; The sales of publications, subscriptions, advertisements, etc.; A quota of the registration to the Association Assemblies; Grants; Contracts; Donations.
2. The Treasurer shall administer and disburse these resources under the direction of the Executive Committee. The administration of resources shall include the permanent delegation of authority to manage any bank accounts or investments held in the name of the Association.
3. The Treasurer shall alone retain responsibility toward the Association for all banking operations. As a precaution, however, the right to sign as an authorized agent for any account opened in the name of the Association shall be extended to at least one other Member of the Executive Committee.
4. The Treasurer shall provide annual financial reports as required by IUGG.
5. The Treasurer shall arrange for independent external audit of, and prepare and submit to the Association Plenary, the Accounts of Receipts and Expenditures for the preceding period, together with an estimated budget for the following financial year.

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6. An audit committee, authorised by the Plenary Meeting shall examine the accounts prepared by the Treasurer and submitted to the Plenary Meeting for the preceding period, and give discharge to the Treasurer for those accounts.
7. In the event of the dissolution of the Association, its assets shall be ceded to the IUGG.

VII. General Meetings of the Association

1. Scientific Assemblies of the Association shall be held in conjunction with General Assemblies of the IUGG, and normally at least once between successive IUGG meetings. At least one Plenary Meeting of the Association shall be held at each Scientific Assembly.
2. In the intervals between the Scientific Assemblies the Association may, either separately or jointly with other Associations, hold or sponsor additional scientific meetings.
3. The Bureau of the Association, on the request of the majority of the members of the Executive Committee may conduct an extraordinary meeting of the National Correspondents using e-mail or web-based tools, in order to resolve an urgent question. National Correspondents shall have at least one week notice of any resolution that requires a national vote.
4. The agenda to be transacted at an Association Plenary Meeting held in conjunction with a Scientific Assembly is to be prepared by the Bureau and posted at least two working days before the Plenary Meeting.
5. The agenda may only be modified with the consent of the majority of the IASPEI members present at the Plenary Meeting.
6. The Executive Committee approves a Local Organising Committee for the Scientific Assemblies conducted between the General Assemblies of IUGG, on the basis of a proposal submitted by the approved hosting country.
7. The Scientific Programme for a Scientific Assembly is the responsibility of the Secretary General, who will approve symposia and appoint convenors, in consultation with the Executive Committee and the Commission chairs.
8. Registration and abstract submission to the Scientific Assembly are open to all members of the international scientific community.

VIII. Voting

1. In a Plenary Meeting of the Association, two types of resolution may be put to the meeting: A. Procedural, and B. Scientific
2. Elections of the President and Procedural resolutions shall be decided on the basis of one vote per country present at the Association Plenary. That vote is to be exercised by the principal delegate of each country (refer paragraph III.2) or his proxy and is referred to here as a "national vote". In any vote a delegate may represent only one country.
3. A country that is not represented at the Association Plenary Meeting may appoint a proxy, or forward its vote, by notifying the Secretary General in writing before the election.
4. Scientific resolutions and the election of the members of the Bureau and Executive Committee, apart from the President, shall be decided by a majority of the votes cast by all IASPEI members present at the Association Plenary.
5. The Resolutions Committee will decide which category any specific resolution falls into, before it is presented to the Association Plenary. If any principal national delegate objects to that classification, the delegate may request that a national vote be used to decide which category a specific resolution falls into, before the resolution is voted on.
6. When there is an equal division of votes, the President shall have a deciding vote.
7. The election of the President will be conducted by open ballot and requires the approval by the majority of the principal national delegates or their proxies present at the Plenary Meeting. If requested by one principal national delegate the election has to be conducted by written ballot.

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8. The election of all other Association Offices and of the Executive Committee members will be conducted by open ballot and requires the approval by the majority of the IASPEI members present at the Plenary Meeting.

IX. Validity of Statutes

1. These statutes may be revised by a two-thirds majority vote of the member countries represented by principal national delegates at an Association Plenary Meeting.
2. The proposed revision must be posted at least one month in advance of the vote.
3. The English text shall be used exclusively in interpreting these statutes.

X. Commissions and Working Groups

1. The Association, on the recommendation of the Executive Committee, may establish Commissions to study scientific topics and to stimulate and coordinate research on specific topics or research related to a specific region.
2. The Association may also establish joint Commissions or Working Groups with other organizations.
3. Commission chairs (or co-chairs) will be nominated by the President.
4. Working Groups may be established or disbanded by the Commission chair, who will appoint the chair of the Working Group.
5. Commission and Working Group members will be invited to participate by the respective chair.
6. Commission or Working Group chairs shall not hold the same office for more than two periods.
7. Commission chairs will provide annual reports to the Secretary General (including reports on their Working Groups) prior to the Annual Bureau Meeting.
8. A Commission may be disbanded by decision of the Executive Committee if in the view of that Committee the Commission is no longer needed.

By-Laws

The following by-laws are established in order to provide for continuing guidance in conducting the affairs of the Association. The by-laws may be amended by majority decision of the Executive Committee.

XI. Definitions

In the context of the Statutes and By-laws, the term "posted" will be taken to indicate an e-mail sent to a prepared list of the Association National Correspondents and posted on the IASPEI web site. The term "mail" will be taken to include e-mail. The term "period" indicates the period between elections of the Association Officers, normally four years.

XII. Resolutions

1. Before the General Assembly, the President shall appoint a Resolutions Committee consisting of one officer of the Association and two other persons.
2. All resolutions to be presented at the Plenary Meeting of the Association must be transmitted in writing to the Resolutions Committee at least the day before the said meeting. It is the responsibility of the Resolutions Committee to word the resolutions consistently with the terminology of the Association and of the IUGG.

XIII. Nominations

1. At least two years before an election, the President shall appoint a Nominating Committee whose charge is to bring before the Plenary Meeting of the Association at the quadrennial General Assembly a slate of candidates for election to the Association Offices and the Executive Committee. The candidates for election shall be announced at least four days in advance of the Plenary Meeting.
2. The Nominating Committee should keep in mind the need for persons of executive ability, comprehensive scientific interests, and broad geographical representation and should consult, where possible, with former Presidents of the Association.
3. At the Plenary Meeting, additional nominations for each office may be made from the floor but they should reflect the same criteria that the Nominating Committee has to abide, in particular, the broad geographical representation.

XIV. Meetings of the Bureau and of the Executive Committee

1. The Bureau of the Association should meet at least every year. The Executive Committee should meet as often as necessary and at least once during each Association Assembly. If necessary and practicable, such meetings may be held using web-based communications, recognising that face-to-face meetings are preferable for most purposes.
2. The Association will normally cover Bureau travel expenses incurred for such meetings.

XV. Conduct of Meetings

Except if otherwise provided in the Statutes and By-laws, meetings shall be conducted according to Robert's Rules of Order.

STATUTES AND BY-LAWS OF THE INTERNATIONAL ASSOCIATION OF VOLCANOLOGY AND CHEMISTRY OF THE EARTH'S INTERIOR

(Revised July 2011, XXV IUGG General Assembly, Melbourne, Australia, and June 2015, XXVI IUGG General Assembly, Prague, Czech Republic)

STATUTES

I. Objectives of IAVCEI

- a) To promote the study of volcanoes, volcanic processes and their deposits, past and present, and of the chemistry of the Earth's interior;
- b) To encourage, initiate, and coordinate research and to promote international cooperation in these studies;
- c) To arrange for the dissemination and discussion of research results and policy matters on volcanology at major conferences (IAVCEI General Assemblies, IAVCEI Scientific Assemblies, Cities on Volcanoes Conferences), and Research Commission Workshops and Field Workshops;
- d) To arrange for the publication of the results of scientific research on volcanology and on the chemistry of the Earth's interior through its dedicated journal, *Bulletin of Volcanology*, and book series;
- e) To encourage volcanologists to alert appropriate authorities to the importance of adequate surveillance of active and potentially active volcanoes and of volcanic risk assessment;
- f) To be the international reference body for advice on scientific policies relating to volcanic processes, hazards and risks;
- g) To provide guidelines to professional volcanologists on protocols and principles in the conduct of their work, and to help them understand their responsibilities, the expectations and consequences of their actions, in their countries of employment and service

II. Relationship of IAVCEI to IUGG

2. IAVCEI is a constituent association of the International Union of Geodesy and Geophysics (IUGG), but is autonomous in its governance structure and processes, as defined below.
3. IAVCEI will contribute to IUGG through the IUGG Bureau, Executive Committee and Council through nomination of office bearers for the Bureau, participation of its President, and by invitation, Secretary General, in IUGG Executive Committee meetings, and their attendance at IUGG Council meetings when invited, to contribute the views of IAVCEI and its members, to the business of IUGG.
4. IAVCEI will receive from IUGG an annual capitation fee, based on the number of IAVCEI delegates who register and attend IUGG General Assembly conferences as IAVCEI members.

III. Membership of IAVCEI

5. In accordance with the Principle of Freedom of Participation in Learned Societies (see Appendix), anyone who has interests in volcanology or geochemistry can become a member of IAVCEI, irrespective of country of origin, and participate in the governance of IAVCEI.
6. Those wishing to become members of IAVCEI must apply on-line for membership through the IAVCEI website, and must pay the annual fee to maintain membership.

IV. Administration of IAVCEI

7. IAVCEI will be managed by a democratically elected Executive Committee, that is elected every 4 years, immediately prior to the IAVCEI General Assembly.
8. The Executive Committee will consider business brought to it by members of the Committee, individual members of IAVCEI and the IUGG Bureau and Executive Committee.

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9. The IAVCEI Executive Committee will conduct its business progressively during its 4-year term through meetings of the Committee at IAVCEI Scientific and General Assemblies, and in the interim as e-business and video conferences.
10. The IAVCEI Executive Committee is empowered to make policy decisions on behalf of IAVCEI and its members, but major policy decisions should be ratified by members through an on-line plebiscite, or at meetings of members during IAVCEI General and Scientific Assemblies.
11. The Executive Committee of the Association shall consist of 11 members. Candidates for the following 9 positions are democratically nominated by, and elected by, IAVCEI members:
 - President
 - Secretary General
 - two Vice-Presidents
 - four Ordinary Committee Members
 - an Early Career Researcher, aged 35 or less at the time of nomination
12. In addition, the the immediate past-President will be an ex-officio member of the Executive Committee for one term to provide continuity and offer advice to the new committee.
13. The Editor of Bulletin of Volcanology is invited to be a non-voting observer on the Executive Committee to provide insight from his/her dealings with IAVCEI members through the association's publication processes. She/he may also be nominated to become an elected member of the Executive Committee.
14. The President may only serve for one term as President.
15. The Secretary General is elected for two 4-year terms.
16. All other members of the Executive Committee are elected to serve for one term of 4 years in the first instance, but may serve one extra term if nominated and elected for a second term at the next election.
17. No more than two members from the same country can be elected to the Executive Committee during one 4-year term of office.
18. An Assistant Secretary may be appointed by the Secretary General to help with his/her duties, including the role of web-master for the IAVCEI website.
19. The Executive Committee shall have the power to fill any vacancy that arises on the Executive Committee during the interval between successive elections for the IAVCEI Executive Committee.
20. The Executive Committee shall have the power to appoint the Executive Editor of the Bulletin of Volcanology, as well as of other publications of the Association.
21. The Executive Committee shall have the power to create and disband Research Commissions and Task Groups of the Association.
22. Only members of IAVCEI can present papers at IAVCEI conferences, but scientists wanting to present papers at IAVCEI conferences can join IAVCEI at the time of registering for the conference. Distinguished invited keynote speakers may be exempted from this requirement.
23. Countries that are represented by individual members may apply to the IAVCEI Executive Committee to have a National Correspondent for IAVCEI to represent their national volcanological community.
24. National Correspondents are also appointed by the IUGG adhering scientific organisations in each IUGG financial member country, but it is recommended that appointments of such member country National Correspondents be done in consultation with the IAVCEI Executive Committee.
25. National Correspondents are required to act as conduits of information flow between IAVCEI and national volcanological communities, and may make representations on behalf of their national volcanological communities to the IAVCEI Executive Committee.

V. Nomination and Voting for the IAVCEI Executive Committee

26. Only individuals who are members of IAVCEI can be nominated for election to the IAVCEI Executive Committee.
27. Only members of IAVCEI can nominate another member for election to the IAVCEI Executive Committee.

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28. Candidates for election to the IAVCEI Executive Committee can be from any country, except candidates for the Presidency, who must come from IUGG member countries, according to IUGG Statutes.
29. Only members of IAVCEI can vote in the election for the IAVCEI Executive Committee.
30. Nominations for candidates for election to the IAVCEI Executive Committee, must be seconded by three other current individual members, each from countries other than that of the candidate.
31. The outgoing Executive Committee has the power to nominate candidates for particular positions on the Executive Committee, when only one, or no candidates are nominated by members.
32. Nominations must be called for and submitted to the Chairperson of the IAVCEI Nominating or Election Committee no later than six months before the General Assembly.
33. The voting process will be anonymous and conducted electronically through the IAVCEI web site and will be initiated by the Secretary General and President at least three months before, and must close no later than one month before, the IAVCEI General Assembly.
34. The Secretary General and Assistant Secretary are responsible for establishing a secure on-line voting site and process, that ensures that only IAVCEI members registered as members at a defined date can vote, and that members can only vote once.
35. A Nominating or Election Committee will be responsible for overseeing the voting process to ensure that it is undertaken in accord with the current IAVCEI statutes and by-laws.
36. The members of the Nominating Committee will be proposed by the President and endorsed by the Executive Committee no later than nine months before the IAVCEI General Assembly.
37. The Nominating Committee will consist of no less than five current individual members of IAVCEI, one of whom, usually the Past President bar one, will be nominated to be the Chairperson.
38. All nominations of candidates for election to the IAVCEI Executive Committee shall be considered by the Nominating or Election Committee, which will produce a shortlist of at least one, but no more than three candidates for each of the positions on the new Executive Committee, except for the 4 general committee positions, for which no more than 12 candidates should be proposed.
39. Not more than two candidates from the same country, can be proposed by the Nominating Committee as candidates for election to the Executive Committee as a whole.
40. The Nominating Committee is also responsible for scrutinising the results and reporting the results to the President and Secretary General within a month following the close of voting.
41. The candidate(s) with the largest number of votes for each position will be elected.
42. The President-elect must be endorsed by a majority of IAVCEI National Correspondents from IUGG member countries. A non-response from a National Correspondent will be taken to be an endorsement for the President-elect.
43. In case of a tie the Executive Committee at the time of the election will elect the candidate from among those with the same number of votes.
44. The Secretary General will communicate through the website to all IAVCEI members the results of the elections before the General Assembly, and the new officers of the Executive Committee will be officially appointed during the General Assembly.

VI. IAVCEI Awards

45. To honour outstanding achievements in research and contributions to volcanology and to IAVCEI, IAVCEI will make awards at the General Assembly and Scientific Assembly to the most suitable candidates who have been nominated.
46. The awards to be made are:
 - a) The *George Walker Award* is for an early career researcher within 7 years of being awarded the PhD degree at the time of nomination. This is awarded every 2 years at each General and Scientific Assembly. Detailed criteria are available on the IAVCEI website.

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- b) The *Wager Medal* is for a mid-career researcher within 15 years of being awarded the PhD degree at the time of nomination. This is awarded every 2 years at each General and Scientific Assembly. Detailed criteria are available on the IAVCEI website.
 - c) The *Thorarinsson Medal* is awarded to a senior researcher with an outstanding international research record. The medal is awarded only at the Scientific Assembly. Detailed criteria are available on the IAVCEI website.
- 47. Candidates for IAVCEI awards must be members of IAVCEI.
 - 48. Candidates for IAVCEI awards can only be nominated and supported by IAVCEI members.
 - 49. Nominations for all IAVCEI awards must be made in writing by one member, and supported with supporting letters by no more than 3 other members.
 - 50. The principal nominator and the 3 supporting members must be from different countries to ensure that all candidates have international profiles, and have contributed to volcanology at the international level.
 - 51. An Awards Sub-Committee will be established by the President 6 months before a General Assembly or Scientific Assembly. The President will be Chairperson of the Awards Committee and will invite at least 4 other members with significant international research profile and experience, representing different geographic regions around the world and ensuring gender balance, to join the committee. Each member of the Awards Committee will have an equal say in the outcome for each award.
 - 52. In addition, at each Scientific Assembly, the IAVCEI Executive Committee may decide on and award Honorary Life Membership to up to 3 members for their contributions and services to volcanology and IAVCEI over an extended period of time.

VII. Alteration and Interpretation of Statutes

- 53. These statutes shall be changed only by a majority of at least two thirds of votes by members in attendance at the General Assembly business meeting for members, or through an on-line plebiscite for members.
- 54. Any individual member may propose in writing an alteration, or alterations, to the Statutes, provided the proposal is supported by three other, current individual members in writing.
- 55. The Executive Committee may also propose changes to the Statutes.
- 56. The Executive Committee shall have the power to decide whether the proposal will be distributed to members to vote on through an on-line plebiscite or at a General Assembly.

BY-LAWS

I. National Volcanological Communities/Organisations, and National Correspondents

- 1. Individual countries are encouraged to establish national volcanological communities/organisations, with the following functions:
 - a) To foster volcanological research within their own country, and encourage membership of IAVCEI;
 - b) To nominate through their National Committee a National Correspondent who will act as the principal contact between IAVCEI and their national community and have the power to represent their country's views at IAVCEI General Assemblies;
 - c) To submit topics for discussion at the General Assemblies of the Association. Topics so submitted should be notified to the Secretary General of the Association at least three months before the General Assembly;
 - d) To facilitate and coordinate, as appropriate and necessary, the dissemination of IAVCEI NEWS, correspondence and other information relating to the affairs of IAVCEI.
- 2. National Correspondents of IUGG member countries are asked to endorse the IAVCEI President-elect at the General Assembly.

II. Duties of Officers of the Association

3. The function of the Executive Committee is to exercise general oversight of the affairs of the IAVCEI. It should meet during each General Assembly and Scientific Assembly, and when possible during other IAVCEI meetings. At other times the Executive Committee will conduct the affairs of the Association by email exchange among its members. Its duties include the following:
 - a) To consider proposals for changes to the Statutes and By-Laws
 - b) To fill committee vacancies arising between elections for the Executive Committee.
 - c) In the event of the President's position becoming vacant between General Assemblies, the Executive Committee shall appoint one of the Vice Presidents to act as President until the next General Assembly.
 - d) To assist in preparing the agenda and making arrangements for General Assemblies and other meetings
 - e) To appoint a Nominating Committee for the short-listing of candidates for election as new office bearers and the conduct of the election
 - f) To appoint the Executive Editor and Associate Editors of the Bulletin of Volcanology and other publications
 - g) To endorse Commissions and Working Groups proposed by the Vice-Presidents.
 - h) To consider applications for funding to the Executive Committee by Commissions, IAVCEI Conference organizing committees, individual members seeking support to attend conferences, and special purpose grants from affiliated organisations
 - i) To determine the membership fee structure and membership fees
 - j) To promote the interests of the Association.
4. The Executive Committee will also conduct the business of the Association between General Assemblies and take on the particular responsibility of pro-actively fostering the objectives and interests of the Association, the Commissions and Task Groups. The Executive Committee is responsible also for establishing Sub-committees to deal with specific aspects of the work of the Association.
5. The duties of the President are to
 - a) Preside at General Assemblies and Scientific Assemblies of the Association and, in consultation with the Secretary General, to regulate the business of the Association.
 - b) Sign documents on behalf of the Association.
 - c) Select and chair the Awards Committee.
 - d) To appoint Task Groups to address specific issues and to liaise and work with them to ensure the goals of the Task Group are achieved in a timely manner.
 - e) Be responsible for all protocol aspects related to the Association.
6. The duties of the Vice-Presidents are to
 - a) Preside at General Assemblies and Scientific Assemblies in the absence of the President.
 - b) Be prepared to become President should the presidency become vacant between elections.
 - c) Foster pro-actively the objectives and interests of the Association.
 - d) Manage the IAVCEI Commissions and Task Groups program, and have the responsibility for ensuring that all Commissions and Task Groups are active and functioning effectively.
7. The duties of the Secretary-General of the Association are:
 - a) To carry on all correspondence relating to the affairs of the Association;
 - b) To maintain and preserve the records of the Association;
 - c) To maintain a mailing list of members of the Association, and to receive and process membership applications;

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- d) To administer the funds of the Association, to prepare at the end of the calendar year preceding a General Assembly the accounts of the Association, and to arrange that they shall be properly audited
 - e) To prepare annual Financial and Activities reports for members and for IUGG
 - f) To ensure that the annual reports of the Association are published and distributed;
 - g) To prepare a budget for the ensuing four-year term.
 - h) In consultation with the President and members of the Executive Committee, to prepare the agenda and make arrangements for the next General Assembly, and
 - i) To cooperate with the other Associations of IUGG in arranging the scientific program for IUGG/IAVCEI General Assembly conferences, and with the local organising committee for the IAVCEI Scientific Assembly conferences.
8. The duties of the Assistant Secretary, in the case where one has been appointed, are to assist the Secretary-General in carrying out the duties of the Secretary General, especially in maintaining the membership register, email address list of members, and the Association website. The Assistant Secretary may be appointed Secretary-General in the event of that position becoming vacant between General Assemblies.
9. The duties of the webmaster, in case of one having been appointed, are to assist the Secretary-General in managing the website of the Association.
10. The Executive Editor of the Bulletin of Volcanology shall normally be appointed for no more than 6 years, and shall:
- a) Administer the process of receipt of manuscripts and their distribution to the Associate Editors for review and acceptance (or otherwise).
 - b) Be responsible for maintaining high standards of content and presentation of the Bulletin of Volcanology.
 - c) Be empowered to sign documents on behalf of the Association that are pertinent to the Bulletin of Volcanology.
 - d) Appoint Associate Editors, with the approval of the Executive Committee; AEs will normally serve for periods not exceeding four years.

III. Commissions, Working Groups, Task Groups, and other committees

- 11. The Executive Committee, on the advice of the Vice Presidents, may establish any Research Commission devoted to the international promotion of research in any speciality of volcanology and chemistry of the Earth's interior.
- 12. Commissions are usually initiated by submission of an application to the Vice-Presidents and Executive Committee by a group of members with common, but well-defined research interests, which can be presented an important research theme. Commissions may also be initiated by the Executive Committee to fill a need or gap in the research activities of IAVCEI, by contacting groups of members to encourage them to form a Commission.
- 13. Each Commission will have one or more leaders.
- 14. At least one leader should be an early career researcher.
- 15. The leaders will present proposals for the objectives, program, and membership of the Commission for approval by the Executive Committee.
- 16. Leaders normally will serve for periods not exceeding four years.
- 17. Leaders are expected to solicit interest and participation from IAVCEI members who may be interested in the research theme(s) of the Commission, and build up a contact list of such members.
- 18. Leaders should regularly provide information to and solicit suggestions from their network of members on proposed activities, and make arrangements to organize Commission activities.
- 19. Every Commission is *required* to propose and organize at least one symposium research theme for *every*

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IAVCEI General Assembly and Scientific Assembly.

20. The convenors of every Commission hosted symposium must include at least one Early Career scientist.
21. Commissions are also encouraged to organize workshops and field workshops affiliated with the major IAVCEI conferences, or outside of these, or jointly with other commissions within IAVCEI, or with Commissions from other IUGG Associations, which have related research interests.
22. Commissions may propose the formation of Working Groups to explore research interests that represent a sub-theme of related research theme to that of the Commission.
23. Working Groups should also submit an application to the Vice-Presidents, with the endorsement of the Commission leaders, with a specified life-span and clearly enunciating the goals of the Working Group.
24. At the end of the term of the Working Group it is expected to submit a report to the Vice Presidents, summarizing the outcomes.
25. At the end of the term of a Working Group, it may be terminated, or if the members of the Working Group feel there is continuing momentum, then the Working Group may submit an application to become a Commission.
26. All Commissions and Working Groups are required to submit a brief one to two page report of activities annually to the Vice-Presidents.
27. The President in consultation with the Executive Committee may establish Task Groups devoted to the short-term completion of specific scientific tasks, at the end of which term, a report(s) will be submitted to the President and the Executive Committee.
28. The President in consultation with the Executive Committee may also establish small committees devoted to the completion of specific administrative tasks.
29. These will include the Awards Committee whose responsibility, under the chairmanship of the President, is to prepare recommendations for the IAVCEI Awards at the time of the Association's General Assemblies or Scientific Assemblies, and the Election Nominating Committee, which will oversee the election process.

IV. Alteration and Interpretation of By-Laws

30. These By-Laws shall be changed only by a majority of at least two thirds of votes by members in attendance at the General Assembly business meeting for members, or through an on-line plebiscite for members.
31. Any individual member may propose in writing, alteration, or alterations, to Statutes and By-Laws, provided the proposal is seconded (in writing) by three other current individual members.
32. The Executive Committee may also propose changes to the By-Laws.
33. The Executive Committee shall have the power to decide whether the proposal will be distributed to members to vote on through an on-line plebiscite, or at a General Assembly.

APPENDIX

Principle of Freedom of Participation in Learned Societies

IAVCEI adheres to the Principle of Freedom of Participation in Learned Societies for all scientists:

- a) All scientists should be able to apply for, and be accepted for, individual membership of scientific learned societies or associations, and should be able to participate freely irrespective of age, cultural background, race, religion, political or scientific views, disability, gender, gender orientation, country of origin, country of residence, or financial status of those countries in the learned society or association.

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- b) All scientists who become individual members of scientific learned societies or associations should be able to participate in the activities of such societies or associations, including attendance at conferences and other activities, voting on matters that are brought to the membership, nominating others for committee positions, being nominated for committee positions and serving in those capacities if voted in by the membership.
- c) Membership of a learned society or association may only be rejected or cancelled if the candidate or member has been guilty of (i) professional malpractice, (ii) discrimination against others on the grounds of age, cultural background, race, religion, political or scientific views, disability, gender, gender orientation, country of origin, country of residence, or financial status of those countries in the learned society or association, or (iii) bringing the society or association into disrepute by unfairly maligning it.
- d) Disagreeing with the policies of the association or society in good faith is not deemed to malign the learned society or association, but represents the democratic right of any member of an enlightened learned society or association to state their views.

Part III

Assembly Statistics: Facts and Figures

ASSEMBLY REGISTRATION BY COUNTRY

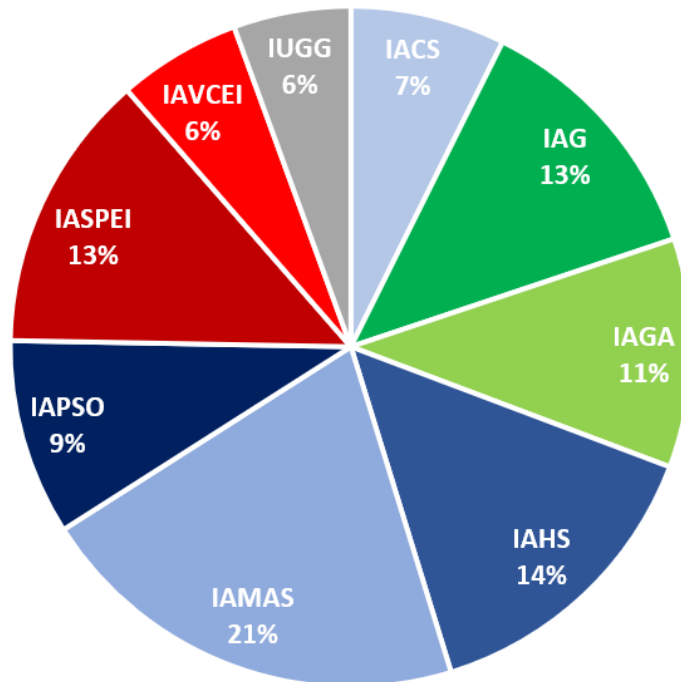
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Country	Delegates	Country	Delegates	Country	Delegates
ALGERIA	5	GERMANY	222	PANAMA	1
ANGUILLA	1	GREECE	10	PERU	1
ARGENTINA	8	GUADELOUPE	1	POLAND	50
AUSTRALIA	75	GUATEMALA	1	PORTUGAL	15
AUSTRIA	27	HUNGARY	20	ROMANIA	6
BANGLADESH	1	ICELAND	8	RUSSIA	75
BELARUS	1	INDIA	70	RWANDA	1
BELGIUM	14	INDONESIA	3	SAUDI ARABIA	3
BENIN	1	IRAN	14	SENEGAL	1
BHUTAN	1	IRELAND	2	SIERRA LEONA	1
BRAZIL	40	ISRAEL	5	SINGAPORE	1
BULGARIA	2	ITALY	109	SLOVAK REPUBLIC	5
CANADA	674	JAPAN	284	SLOVENIA	3
CHILE	13	KAZAKHSTAN	1	SOUTH AFRICA	10
CHINA	396	KENYA	1	SPAIN	34
CHINA-TAIPEI	42	KOREA, REP.	74	SRI LANKA	1
COLOMBIA	8	KYRGYZSTAN	2	SWEDEN	39
CONGO, D. R.	1	LATVIA	2	SWITZERLAND	55
COSTA RICA	3	LUXEMBOURG	4	THAILAND	8
COTE D'IVOIRE	3	MALAYSIA	1	TOGO	1
CROATIA	4	MALTA	1	TRINIDAD AND TOBAGO	4
CUBA	1	MEXICO	29	TUNISIA	4
CZECH REPUBLIC	37	MONTSERRAT	1	TURKEY	11
DENMARK	17	MOROCCO	4	UGANDA	1
ECUADOR	3	NAMIBIA	1	UKRAINE	2
EGYPT	7	NETHERLANDS	28	UNITED ARAB EMIRATES	3
ESTONIA	3	NEW ZEALAND	34	UNITED KINGDOM	156
ETHIOPIA	3	NIGERIA	9	USA	655
FINLAND	23	NORWAY	41	VIETNAM	2
FRANCE	160	OMAN	1	ZAMBIA	1
FRENCH POLYNESIA	1	PAKISTAN	2	ZIMBABWE	2
				UNKNOWN	3
				TOTAL	3715

ASSEMBLY REGISTRATION BY ASSOCIATION

IUGG 2019 Montreal

Association	Number of Registered Delegates
IACS	273
IAG	465
IAGA	404
IAHS	539
IAMAS	770
IAPSO	346
IASPEI	494
IAVCEI	217
IUGG	207
Total	3715



*Name of the association and percentual value from total of 3715 delegates

PHOTO GALLERY

The following photos were taken during the XXVII IUGG General Assembly, Montreal, July 8 – 18, 2019 (Source: IUGG & JPdL).



Impressions of the IUGG 2019 Opening Ceremony on 10 July 2019: Addresses by Fiona Darbyshire, Chair of the Local Organizing Committee (upper left), Spiros Pagiatakis, Chair of the Science Program Committee (upper right), Julie Payette, Governor General of Canada (middle left), Michael G. Sideris, IUGG President (middle right), Daya Reddy, President of the International Science Council (lower right), and during a Canadian jazz intermezzo (lower left).

XXVII General Assembly of the International Union of Geodesy and Geophysics
Photos



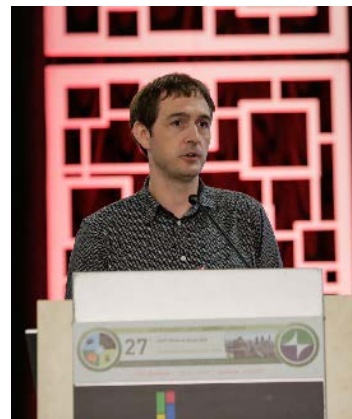
During the IUGG 2019 Awards Ceremony on 13 July 2019, the Union Awards were bestowed. IUGG President Michael G. Sideris congratulates the Gold Medalist W. Richard Peltier (upper left) and Elected Fellow and Silver Medalist Barbara Romanowicz (upper right). IUGG Vice-President Kathryn Whaler congratulates the Early Career Scientist Awardees Qiuzhen Yin (middle left) and Juan Carlos Afonso (middle right). The lower picture shows all awardees, and, on the left in the front row, IUGG Executive Secretary Franz Kuglitsch, Secretary General Alik Ismail-Zadeh, Vice-President Kathryn Whaler, and President Michael G. Sideris (from left to right).

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Impressions of the IUGG Welcome Reception and Dinner, taking place at the IUGG 2019 venue, the Montreal Convention Centre, on 13 July 2019.

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Photos



Union Lecturers on 11 July 2019 (top row, from left to right):

IUGG: David Grimes (World Meteorological Organization, Canada)

IAHS: Veena Srinivasan (Ashoka Trust for Research in Ecology and the Environment, India)

IAPSO: Karen Kohfeld (Simon Fraser University, Canada)

Union Lecturers on 13 July 2019 (middle row, from left to right):

IACS: Waleed Abdalati (Cooperative Institute for Research in Environmental Sciences, USA)

IAMAS: Ed Hawkins (University of Reading, United Kingdom)

IAGA: Lisa Tauxe (Scripps Institution of Oceanography, USA)

Union Lecturers on 16 July 2019 (bottom row, from left to right):

IAG: Kosuke Heki (Hokkaido University, Japan)

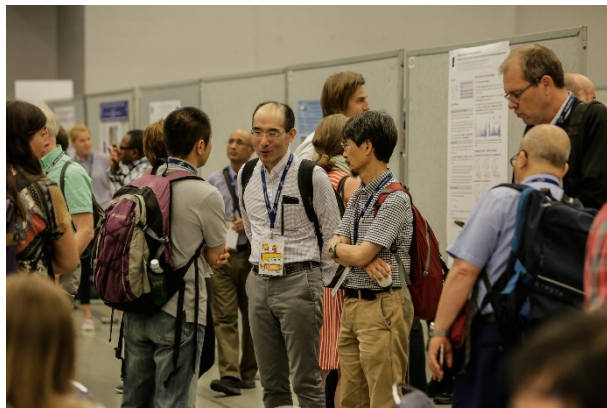
IASPEI: Vera Schlindwein (Alfred Wegener Institute, Germany)

IAVCEI: Paolo Papale (University of Pisa, Italy)

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Photos



Oral session

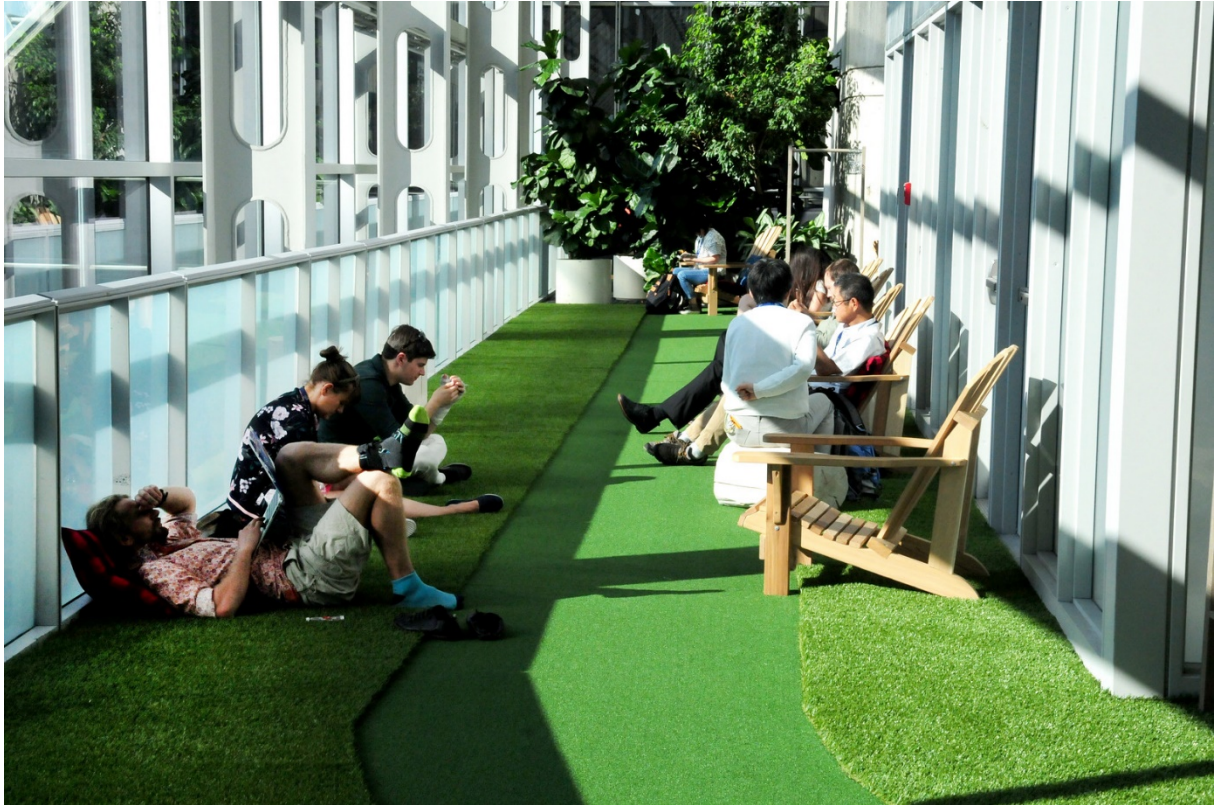


Poster session



Session break

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Photos



Preparing and recovering



IUGG Council Meeting Participants

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Photos



Remembrance during the IUGG 2019 Closing Ceremony.



Reports of the Secretary General Alik Ismail-Zadeh (left) and the Treasurer Aksel Hansen (right) at the IUGG 2019 Closing Ceremony.

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Photos



*Staff from JPdL and the Montreal Convention Centre helped to make the Assembly a big success.
Thank you very much!*



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