



International Association of Geodesy of the International Union of Geodesy and Geophysics

Current activities of the IAG

Hermann Drewes, Secretary General

Organisation of International Science

International Council for Science (ICSU): 142 countries, 31 unions, e.g.



International Union of Geodesy and Geophysics (IUGG)



International Association of Geodesy (IAG): 69 Member countries

- **Council:** Representatives of the member countries
- **Executive Committee:** 16 members elected by the Council
- **Bureau:** Administrative work
- **Office:** Management (Secretary General)

IAG Scientific Structure 2015 – 2019

Bureau

President: *Harald Schuh, Germany*
 Vice-president: *Zuheir Altamimi, France*
 Secretary General: *Hermann Drewes, Germany*

Commissions

1 Reference Frames
(G. Blewitt, US)

2 Gravity Field
(R. Pail, DE)

3 Geodynamics
(M. Hashimoto, JP)

4 Applications
(M. Santos, CA)

Inter-Commission Committee on Theory *(P. Novák, CZ)*

Scientific Services

Geom.:

IERS

IGS

Gravim.:

IGFS

BGI

ICGEM

General:

BIPM

IDS

ILRS

IVS

IDEMS

IGETS

ISG

PSMSL

(Representatives in the EC: *R. Neilan, US, R. Barzaghi, IT, A. Nothnagel, DE*)

Global Geodetic Observing System (GGOS) *(R. Gross, US)*

Communication and Outreach Branch (COB) *(J. Ádám, HU)*

(EC Members at Large: *L. Combrinck, ZA, M. C. Pacino, AR; Past President: Ch. Rizos, AU*)

Commission 1 “Reference Frames” Activities

1.1 Coordination of Space Techniques

- Local ties between co-located VLBI antennae by local time transfer
- Performance simulations and architectural trade-off (of the ITRF)

1.2 Global Reference Frames

- Offset detection in geodetic coordinate time series

1.3 Regional Reference Frames

- EUREF, SIRGAS, NAREF, AFREF, APREF, Antarctica
- Time-dependent transformations between reference frames

1.4 Interaction of Celestial and Terrestrial Reference Frames

- Consistent realization of ITRF, ICRF and EOP
- Impact of geophysical and astronomical modelling

WG1: Site survey and co-location

WG2: Modelling environmental loading effects

WG3: Troposphere ties

Commission 2 “Gravity Field” Activities

2.1 Gravimetry and Gravity Network

- Techniques and metrology in land, marine & airborne gravimetry
- Establishment of a global absolute gravity reference system

2.2 Methodology for Geoid and Physical Height Systems

- Integration and validation of local geoid estimates

2.3 Satellite Gravity Missions

- CHAMP, GRACE, GOCE and follow-on missions

2.4 Regional Geoid Determination

- Europe, South, N & Central America, Africa, Asia-Pacific, Antarctica

2.5 Satellite Altimetry

2.6 Gravity and Mass Transport in the Earth System

WG: Relativistic Geodesy: Towards a New Geodetic Technique

3.1 Earth Tides and Geodynamics

3.2 Crustal Deformation

3.3 Earth Rotation and Geophysical Fluids

3.4 Cryospheric Deformations

3.5 Tectonics and Earthquake Geodesy

SG1 : Intercomparison of Gravity and Height Changes

WG1: Theory of Earth Rotation and Validation

WG2: Constraining vertical Land Motion of Tide Gauges

Commission 4 “Positioning and Applications”

4.1 Emerging Positioning Technologies and GNSS Augmentation

- Multi-sensor systems
- Indoor positioning and navigation
- 3D point cloud monitoring
- Robust positioning for urban traffic

4.2 Geo-spatial mapping and geodetic engineering

- Mobile mapping technologies
- Geodesy in mining engineering
- Mobile health monitoring
- Building information modelling

4.3 Atmosphere remote sensing

- Iono-atmosphere coupling
- Real-time iono-/atmosph. monitoring
- Multi-dimens. Ionosphere
- Impact on GNSS-positioning
- Ionosphere scintillations
- Troposphere tomography

4.4 Multi-constellation GNSS

- Integrity monitoring for PPP

WG1: Biases in Multi-GNSS data processing

WG2: Integer Ambiguity Resolution for Multi-GNSS PPP and PPP-RTK

Joint Study Groups with Commissions / Services

- 10: High-rate GNSS
- 11: Multi-resolution aspects of potential field theory
- 12: Methods for recovery of high-resolution gravity field models
- 13: Integral equations of potential theory for continuation and transformation of classical and new gravitational observables
- 14: Fusion of multi-technique satellite geodetic data
- 15: Regional geoid/quasi-geoid modelling for sub-centimetre accur.
- 16: Earth's inner structure from geodetic and geophysical sources
- 17: Multi-GNSS theory and algorithms
- 18: High resolution harmonic analysis & synthesis of potential fields
- 19: Time series analysis in geodesy
- 20: Space weather and ionosphere
- 21: Geophysical modelling of time variations in deformation & gravity
- 22: Definition of next generation terrestrial reference frames



IAG Services on Geometry

IERS: International Earth Rotation and Reference Systems' Service

IGS: International GNSS Service

ILRS: International Laser Ranging Service

IVS: International Service for Geodesy and Astrometry

IDS: International DORIS

All the techniques' Services compute epoch station coordinates (weekly, monthly, session-wise) and provide them as free or loosely constrained networks to the ITRF processing centres of the IERS.



IAG Services on Gravimetry



IGFS: International Gravity Field Service



BGI: Bureau Gravimetrique International



ICGEM: International Centre for Global



IDEMS: International Laser Ranging Service



IGETS: International Geodynamics and Earth Tide Service



ISG: International Service for the Geoid

The IGFS will host the International Height Reference System (IHRF)



Comprehensive Services



BIPM: Bureau International des Poids et Mesures
- Time Department -



PSMSL: Permanent Service of Mean Sea Level
- Sea level at tide gauges

All the Services have a general structure including

- Central Bureau coordinating all internal affairs,
- Analysis Centres generating the Services' products.

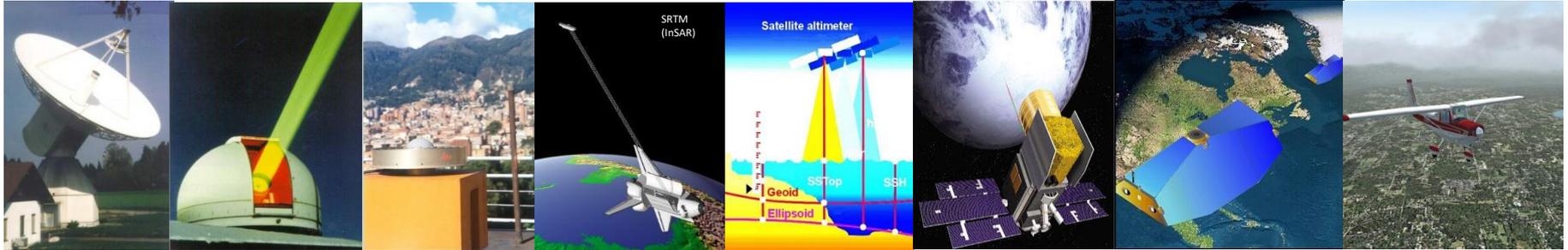
All the Services are working on a voluntary basis, unpaid by IAG or other international organisations.

The Services are cooperating in the Global Geodetic Observing System (GGOS) to achieve consistency of products.



IAG's Global Geodetic Observing System (GGOS)

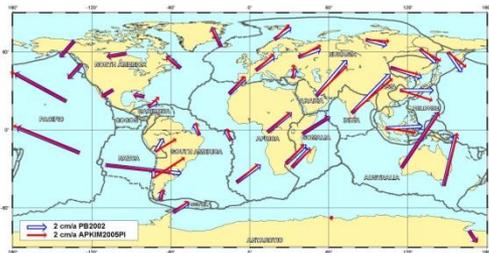
Commissions and International Services providing data and products



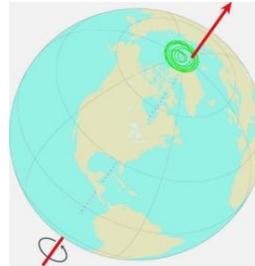
Point positioning

Surface scanning

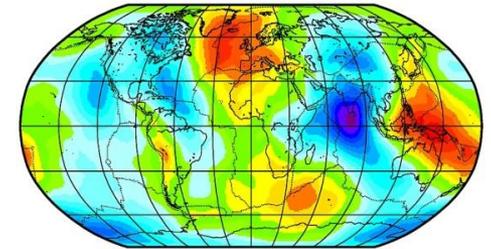
Gravity measurement



Deformations

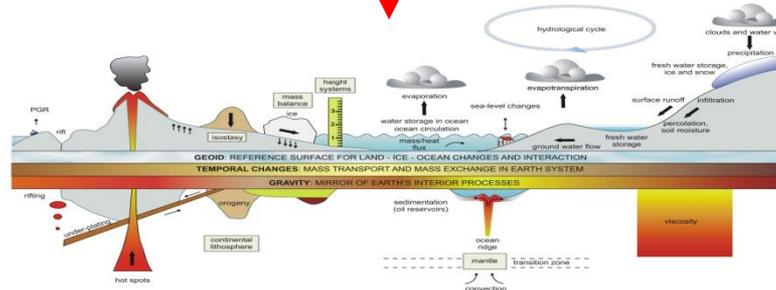


Variations of Earth rotation and the gravity field

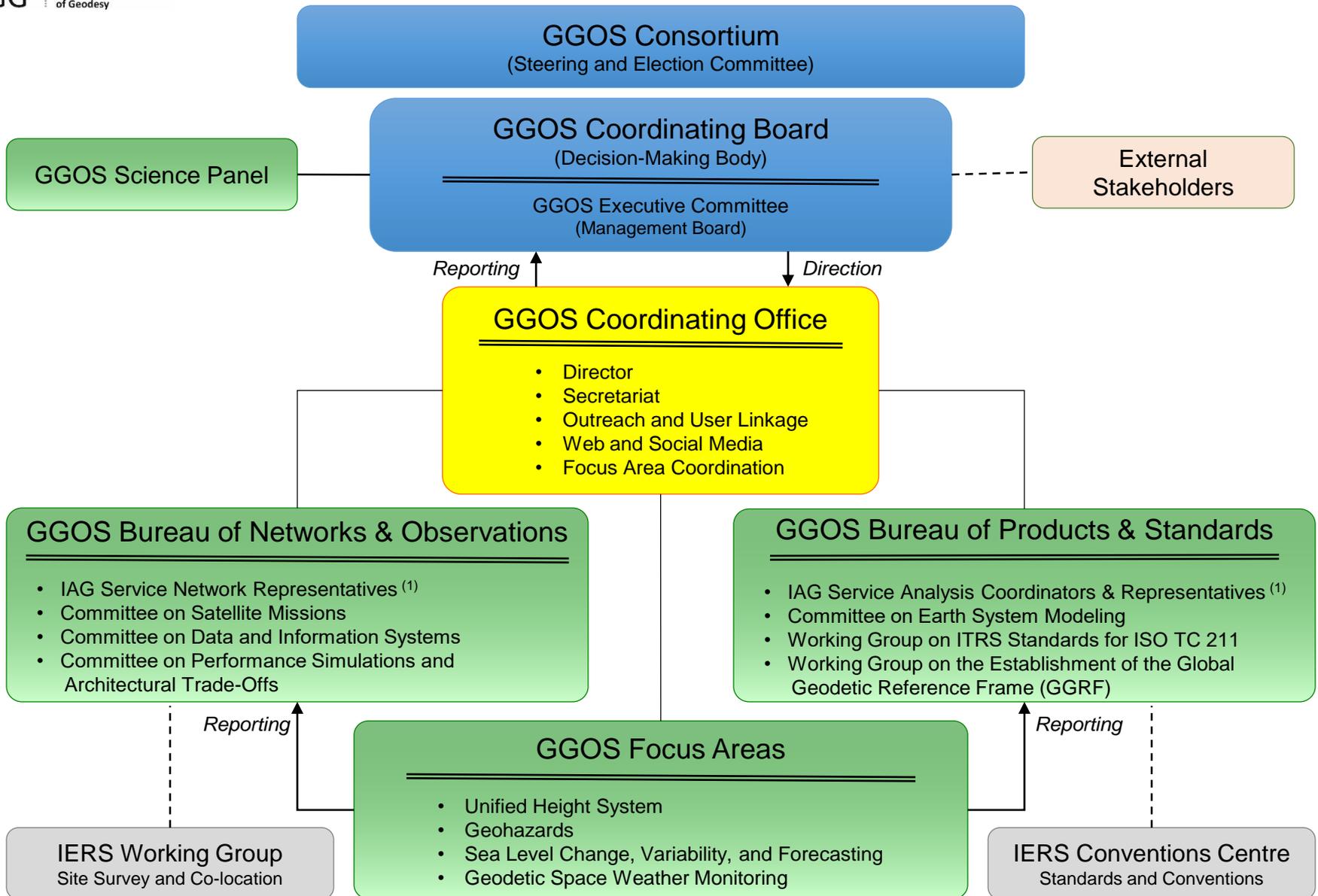


Processes in the atmosphere, hydrosphere, and cryosphere (air and water cycle)

Processes in the solid Earth: geodynamics (deformation)



GGOS Structure



United Nations (UN)

- 2012: Initiative on the **Global Geospatial Information Management (UN-GGIM)**
- 2015: UN Resolution on the **Global Geodetic Reference Frame (GGRF)** approved
- 2015 – 2016: A Roadmap for the GGRF was developed
- 2016: At the UN-GGIM sixth session in New York on August 5, 2016, the UN Committee of Experts on the GGIM
 - endorsed the **GGRF Roadmap** and
- 2017: Decision to establish a **permanent Sub-Committee on Geodesy**.
- **UN-GGIM Working Group on the GGRF**: 32 Member States and 2 organisations:
 - International Association of Geodesy (IAG),
 - World Health Organisation (WHO)
- **UN-GGIM Geospatial Societies** (previously Joint Board of Geo-Information Societies (JBGIS) with GSDI, IAG, ICA, IEEE-GRSS, FIG, IGU, INIA, ISPRS)
- **UN Office of Outer Space Affairs (UN-OOSA)**: Representatives to
 - Space-based Information for Disaster Management and Emergency Response (SPIDER)
 - International Committee on Global Navigation Satellite Systems (ICG)

Cooperation with External Organisations

COSPAR (ICSU Committee on Space Research)

- COSPAR Sub-commission B2: International Coordination of Space Techniques for Geodesy and Geodynamics (CSTG) is identical with IAG Commission 1

Group on Earth Observation (GEO)

- IAG represented by its GGOS (Global Geodetic Observing System) is a Participating Organisation of GEO

International Organisation for Standardisation (ISO)

- TC211 Geographic Information / Geomatics (2 representatives)
- Control Body for Geodetic Registry Network (2 representatives)

International Astronomical Union (IAU)

- Commission A2: Rotation of the Earth (representative)
- Joint Services and Working Groups:
 - International Earth Rotation and Reference Systems Service (IERS)
 - International VLBI Service for Geodesy and Astrometry (IVS)

International Hydrographic Organisation (IHO)

- Advisory Board on the Law of the Sea (ABLOS) (4 representatives)

Publications

- **Journal of Geodesy** (monthly issues edited by Springer)
- **IAG Symposia Series**
 - Vol. 142 Hotine-Marussi Symposium on Mathematical Geodesy (2016)
 - Vol. 143 IAG Scientific Assembly 2013 (2016)
 - Vol. 144 International Gravity Field Symposium 2014 (2017)
 - Vol. 145 Geodesy for Earthquake and Natural Hazards (2017)
 - Vol. 146 Reference Frames for Applications in Geosciences (2016)



Awards for Excellent Publications in Journal of Geodesy

- 2 Young Authors Awards (2015 & 2016) endowed with 1000.- USD

Reports

- **Geodesist's Handbook 2016**

(<https://link.springer.com/article/10.1007/s00190-016-0948-z>)

- IAG history, statutes, bylaws, rules, membership
- Report of the General Assembly 2015
- Structure and program descriptions 2015-2019
- General information

- **IAG Report 2015-2017 (Travaux de l'AIG Vol. 40)**

<https://iag.dgfi.tum.de/en/iag-publications-position-papers/iag-reports-2017-online/>

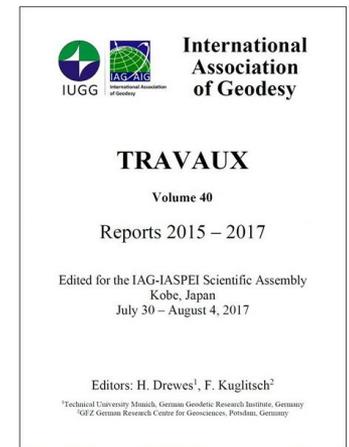
- Activity reports of all IAG components and sub-components

- **Monthly Newsletters**

(http://www.iag-aig.org/index.php?tpl=cat&id_c=44)

- **Position Paper on the UN Global Geodetic Reference Frame (GGRF)**

- **IAG Homepage** (<https://www.iag-aig.org>), **Internal:** (<https://iag.dgfi.tum.de>)



IAG Meetings July 2015 – July 2017

IAG Scientific Meetings (<https://iag.dgfi.tum.de/en/meetings-calendar/>)

- IUGG/IAG General Assembly, Prague, June 22 – July 2, 2015
- IAG-IASPEI Scientific Assembly, Kobe, July 30 – August 4, 2017
- 19 International Symposia of IAG (Sub-) Commissions/Services
- 16 Workshops of IAG Sub-Commissions
- Various meetings of Commissions/Services Boards

IAG Schools (typically 50 ... 150 participants)

- 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;

Awards for Participation in IAG Scientific Meetings

- 42 Travel Awards to young scientists in 7 symposia (30750.- EUR)

Joint IAG-IASPEI Scientific Assembly

Kobe, Japan, July 30 - August 4, 2017

IAG Symposia

- G01 Reference frames (50 presentations);
- G02 Static gravity field (63 presentations);
- G03 Time variable gravity field (38 presentations);
- G04 Earth rotation and geodynamics (31 presentations);
- G05 Multi-signal positioning: Theory and applications (26 presentations);
- G06 Geodetic remote sensing (39 presentations);
- G07 GGOS and Earth monitoring services (43 presentations).

Joint Symposia IAG-IASPEI

- J01 Monitoring of the cryosphere;
- J02 Recent large and destructive earthquakes;
- J03 Deformation of the lithosphere: Integrating geodesy and seismology through modelling;
- J04 Geohazard early warning systems;
- J05 Crustal dynamics: Multidisciplinary approach to seismogenesis;
- J06 The spectrum of fault-zone deformation processes (from slow slip to earthquake);
- J07 Tracking the sea floor in motion;
- J08 Imaging and interpreting lithospheric structures using seismic and geodetic approaches;
- J09 Geodesy and seismology general contributions.

Joint IAG-IASPEI Scientific Assembly

Kobe, Japan, July 30 - August 4, 2017

Statistics:

- IAG registered participants: 361 from 65 countries (of 1107 in total)
- 2013 Potsdam, Germany: 533 from 46 countries
- 2009 Buenos Aires, Argentina: 363 from 64 countries
- 2005 Cairns, Australia: 145 from 62 countries (of 724 in total)
- 2001 Budapest, Hungary: 461 from 57 countries
- 1997 Rio de Janeiro, Brazil: 359
- 290 Abstracts submitted for IAG symposia
- 330 Abstracts submitted for joint IAG-IASPEI symposia
- 2 Young authors awards presented to
 - Xingxing Li, GFZ Potsdam, Germany (for 2015)
 - Olga Didova, DUT, The Netherlands (for 2016)
- 15 Travel awards granted to young scientists (not older than 35 years)

Joint IAG-IASPEI Scientific Assembly

Kobe, Japan, July 30 - August 4, 2017

Decisions at 6th IAG EC Meeting, Kobe, 2017

- **Two Resolutions**

1. IAG Resolution for the definition and realization of an International Height Reference System (IHRIS)
2. IAG Resolution for the establishment of a global absolute gravity reference system

- **Three Working Groups are discontinued because of inactivity**

- **New sub-components of IAG Commissions will be established as Inter-Association Commissions on**

- Volcano-geodesy (IAG and IAVCEI), new Sub-Commission 3.2 of IAG
- Earthquake-geodesy (IAG and IASPEI), in IAG SC 3.5 will be the partner
- Cryosphere deformations (IAG and IACS), in IAG SC 3.4 will be the partner

- **Two new Inter-Commission Projects of IAG will be set-up**

- New technologies in geodesy (quantum technology, optical clocks, atom gravimeters, ...)
- Marine geodesy

- Planning groups will be established to discuss changes in the IAG structure

Union Symposia (Lead bodies: IUGG Commissions, Associations, and supporting bodies)

U01 Future, Climate and Sustainability (Commission on Climatic & Environmental Changes, **IACS**; all IUGG Associations)

U02 Disaster Science for Risk Reduction (Global Risk Commission, **IAVCEI**; all IUGG Associations)

U03 Mathematics of Planet Earth (Commission on Mathematical Geophysics, **IASPEI**; all IUGG Associations)

U04 Data Science, Big Data and Analytics in Earth and Space Sciences (Union Commission on Data and Information, **IAPSO**; all IUGG Associations)

U05 New Discoveries in Earth Deep Interior (Study of the Earth's Deep Interior, **IAGA**; IAG, IASPEI, IAVCEI)

U06 New Discoveries in Planetary Sciences (**UCPS, IAMAS**; all Associations)

U07 Centennial of the International Cooperation in Earth Sciences (Working Group on History, **TF100**; all Associations)

U08 Earth and Space Observations (**GGOS, IAG**; all Associations)

U09 Early Career Scientists Symposium (**IUGG, IAHS**; all Associations)

Joint Association Symposia (lead by IAG)

JG1 Monitoring changes in the cryosphere

JG2 Changes in Arctic hydrology, lake and river ice, and permafrost

JG3 Theory and methods of potential fields

JG4 Near-real time operational monitoring of water mass changes

JG5 Geodesy for atmosphere / climate research

JG6 Remote sensing and modelling of the atmosphere

JG7 Monitoring Sea Level Change by Satellite Altimetry and Gravimetry

JG8 Volcano geodesy

Joint Association Symposia (lead by IACS, sponsored by IAG)

JC8 Monitoring the cryosphere using geodetic and seismological methods

Joint Association Symposia (lead by IAGA, sponsored by IAG)

JA3 Geophysical records of tectonic and geodynamic processes

JA6 Space Weather throughout the Solar System

JA7 Geoscience data licensing, production, publication, and citation

JA9 Joint inversion of different geophysical data sets

JA10 Imaging volcanic belts

Joint Association Symposia (lead by IAHS, sponsored by IAG)

JH4 Innovative monitoring and observation techniques

Joint Association Symposia (lead by IAMAS, sponsored by IAG)

JM2 Cryosphere-ocean-atmosphere system interactions

Joint Association Symposia (lead by IAPSO, sponsored by IAG)

JP1 Tides of the oceans, atmosphere and solid earth

JP7 Advances in Monitoring, Detecting, Understanding, Hazard Assessment and Forecasting of Coastal Sea Level, Tsunamis and other extreme events

Joint Association Symposia (lead by IASPEI, sponsored by IAG)

JS2 Geohazard early warning system

JS4 Seismo-Geodesy

JS6 Historical data in geosciences

Joint Association Symposia (lead by IAVCEI, sponsored by IAG)

JV9 Strain Localisation and seismic processes

JV13 Extrapolation, utilization and evaluation of topographic data

IAG Symposia

G01 Reference systems and frames

Celestial reference frames, global and regional terrestrial reference frames

G02 Static gravity field (including height systems and satellite altimetry)

Terrestrial & space-borne gravimetry, global & regional gravity field models

G03 Time variable gravity field

Continuous and repeated models from terrestrial and satellite missions

G04 Earth rotation and geodynamics

Nutation, polar motion, UT1-UTC, LOD, global and regional deformation

G05 Positioning and applications

Multi-signal positioning, remote sensing and applications

G06 Monitoring and understanding the dynamic Earth with geodetic observations

Global and regional geodetic observation systems

Membership in IAG via IUGG

IUGG member countries from the Americas (1 unit = US\$ 1905)

Regular members

Argentina
Canada
Mexico
USA

Observing members

Brazil
Chile
Colombia
Costa Rica
Nicaragua

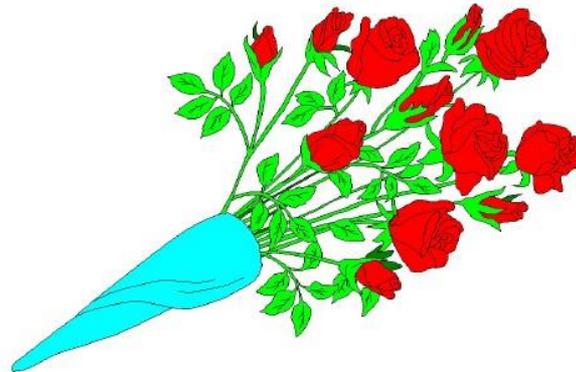
Associate members

Bolivia
Peru

Invitation to SIRGAS countries and others to become members

Dominican Rep.	was member till	1971	Bahamas
Ecuador	---		Belize
El Salvador	---		Cuba
Guatemala	2000		was member till
Guyana	---		1996
Uruguay	2000		Haiti
Honduras	---		1971
Panama	---		Jamaica
Paraguay	---		Suriname
Venezuela	2008		Trinidad and Tobago

IAG is **the** scientific organisation for geodesy. All geodesists are invited to become an individual member (<https://www.iag-aig.org> or <https://iag.dgfi.tum.de>). It is free of charge for young scientists!



Thank you for your attention!
¡Gracias por su atención!