



International workshop for the
**Implementation of the Global Geodetic Reference Frame (GGRF)
in Latin America**
Buenos Aires, Argentina, Sep 16 - 20, 2019

Summary

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Symposium SIRGAS2019

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UN Global Geodetic Reference Frame – GGRF

The GGRF is an *authoritative, reliable, highly accurate, and global spatial referencing infrastructure*. It is the foundation of almost every aspect of the *collection, management and use* of *national* geospatial information and *global monitoring* of the Earth. The GGRF underpins: Earth and Climate science, Economic Development and Sustainability, Public Safety and Disaster Management, Land and Water Administration, Environmental Management, etc.

The GGRF includes:

- the celestial and terrestrial reference frame products and Earth Orientation Parameters (EOPs) that connect them,
- gravimetric observations and products as well as height systems,
- the infrastructure used to create them, the observational data, the data analysis, and product generation systems.

Achievements of the International Association of Geodesy

- - International Celestial Reference System and Frame (ICRS/ICRF)
- International Terrestrial Reference System and Frame (ITRS/ITRF)
- - International Gravity Reference System and Frame (IGRS/IGRF)
- International Height Reference System and Frame (IHRM/IHRF)
- Global Gravity Models (GGM), gravity field modelling of high resolution
- - IAG Commissions and Inter-Commission Committees → Theory and innovation
- IAG Scientific Services → Data storage, data analysis, product generation in a continuously operational basis
- IAG Global Geodetic Observing System (GGOS) → Integrated geodetic infrastructure for monitoring the Earth System and global change research

Long-term sustainability of geodetic infrastructure

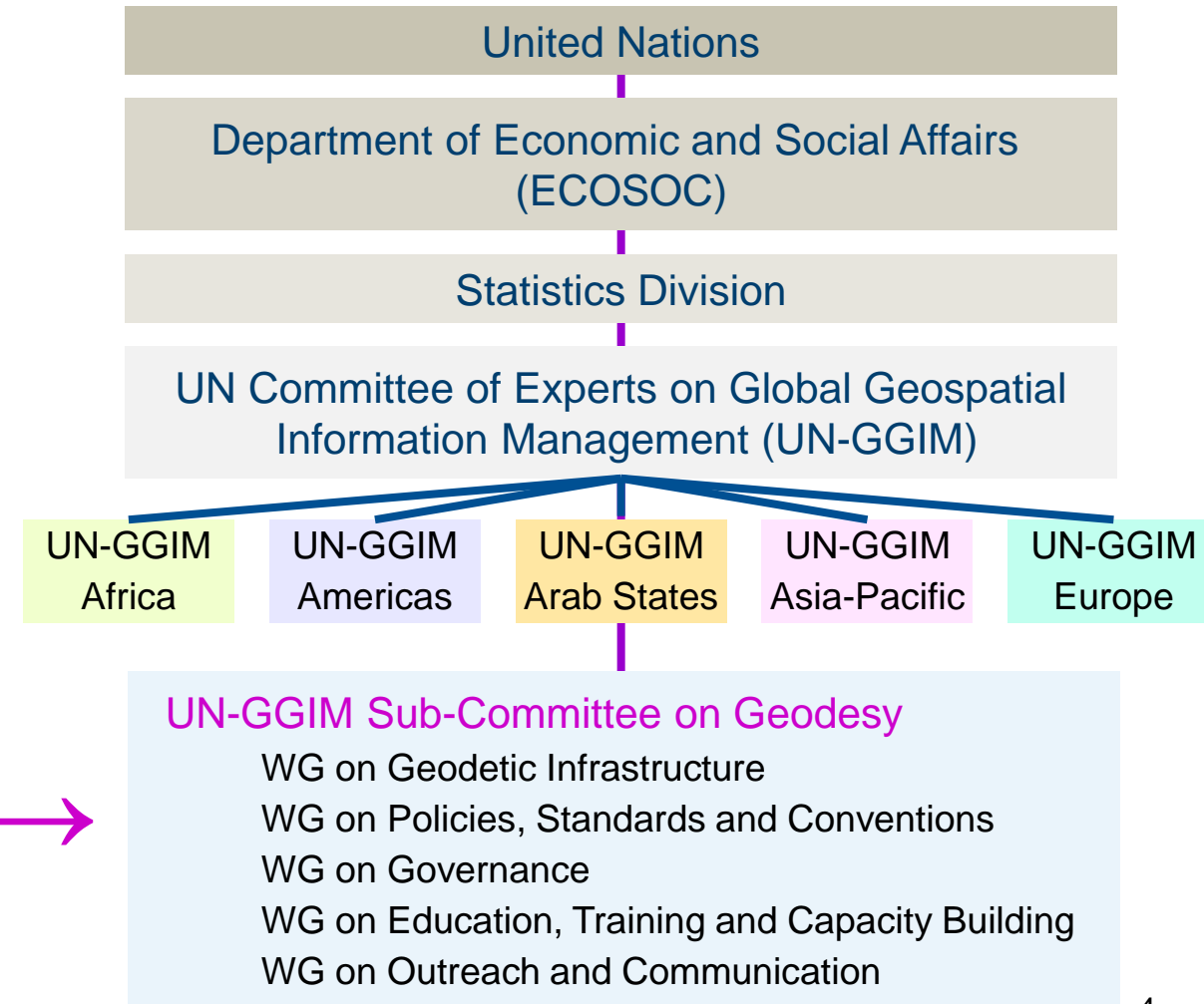
- The achievements of the IAG are the result of an international cooperation based on the *best effort principle*.
- All the IAG Components (Commissions, Inter-Commission Committees, Scientific Services, GGOS) are working on a highly professional level but *unpaid* by IAG or other international organisations.
- The geodetic infrastructure (observing stations/networks, data centres, processing centres, data repositories, etc.) is installed, maintained and operated mainly by *national agencies/institutes/universities (usually) founded by local/national/regional governments*. But
 - The geodetic infrastructure is *degrading*,
 - The geographical distribution is *biased towards North*,
 - *Gaps* in the networks of infrastructure exist, even in the North,
 - Many of the legacy infrastructure are *aging, difficult to maintain, and of poor performance*,
 - Operating *costs* for geodetic infrastructure are at risk for sustainable operation,
 - Coordination across nations, regions and globally is not always fully effective.

The UN Resolution on the Global Geodetic Reference Frame (GGRF)

A direct *channel of communication between Geodesy and Governments*; it opens a wide range of opportunities to *capture the attention of policy makers* (at the political level) in geodetic matters.

Key objectives:

- Development of a *global geodetic road map for the GGRF* (to be used by UN Member States and development organisations *to drive investment*),
- Global *cooperation* in providing technical assistance in Geodesy for those countries in need to ensure the development, sustainability and advancement of a GGRF,
- Implementation of *open geodetic data sharing*,
- Improvement and maintenance of *national geodetic infrastructure*,
- Enhanced *multilateral cooperation* to address infrastructure gaps and duplications globally,
- Appropriate outreach to make the GGRF more visible and understandable to society; *if decision makers understand the value of investing in geodetic infrastructure, they will prioritise investments in Geodesy.*

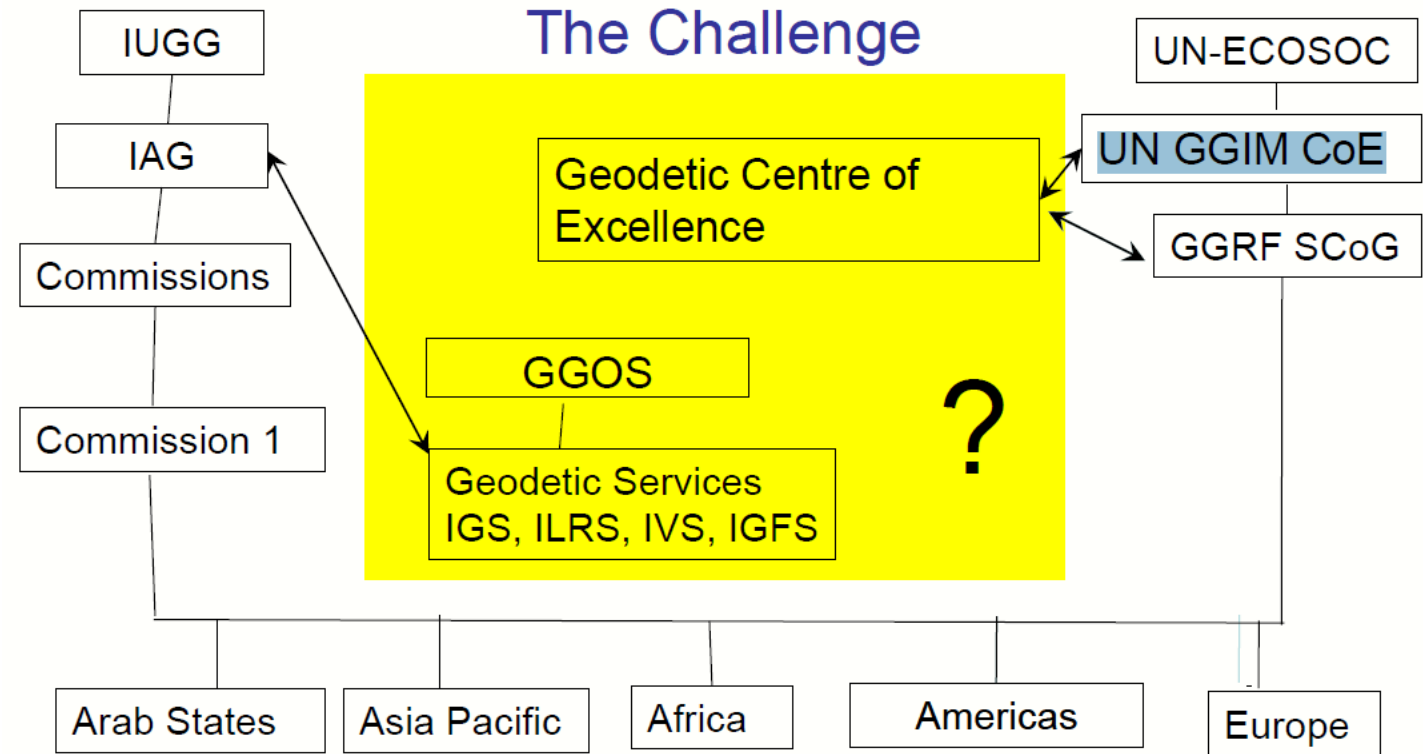


Use of appropriate vocabulary

- To make evident how Geodesy contributes to address present needs of society, it is important to *advertise geodetic products and achievements in a standardised language, comprehensible by any group of specialists in any scientific, social, economic or political discipline.*
- Geodesists have to use *words that are attractive for and comprehensible by politicians.*
- Priority initiatives at the United Nations level:
 - Sendai Framework for Disaster Risk Reduction 2015-2030,
 - Sustainable Development Goals,
 - The Paris Agreement on Climate Change.
- UN-GGIM Integrated Geospatial Information Framework (IGIF)
 - Guide for developing, integrating and strengthening geospatial information management.
 - Developed in collaboration between the United Nations and the World Bank.

Global Geodetic Centre of Excellence (GGCE)

- Coordination (under the auspices of UN-GGIM) of all entities contributing/supporting the GGRF to avoid duplication and to ensure the maximum use of available resources. Priorities:
 - Enhance global cooperation,
 - Provide operational coordination,
 - Provide technical assistance and capacity building.



Workshop for the implementation of the GGRF in Latin America

The two main objectives of the workshop were

1) To bring together

- Politics (*UN-GGIM, UN-GGIM Subcommittee on Geodesy, GEO, UNOOSA-ICG, IGIF*)
- International organisations promoting science (*ISC, IUGG, IAG, IASPEI, FIG, PAIGH*)
- The highest level of expertise in Geodesy worldwide (*IAG, IAG Services, GGOS*) and
- Regional experts in Geodesy (*SIRGAS, gravity field modelling, geodetic observatories*)

to identify/design strategies that allow the Latin American agencies responsible for the geodesy of reference to approach policy makers for getting support to improve the geodetic infrastructure in their countries.

2) To know in detail *how AGGO was planned and installed and how it is maintained*. The improvement of the global geodetic infrastructure necessarily requires the installation of more geodetic observatories like AGGO in “uncovered” regions (Latin America, Africa, Oceania), but *costs and know-how* are a challenge for “local” geodesists. Could the *AGGO experience* be an example to be followed?

Supporting entities



International Committee on Global Navigation Satellite Systems (ICG) of the United Nations Office for Outer Space Affairs (UNOOSA)



AGGO



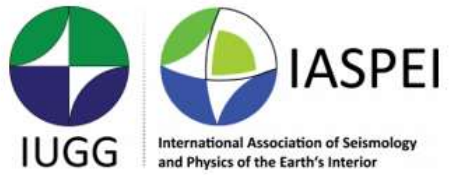
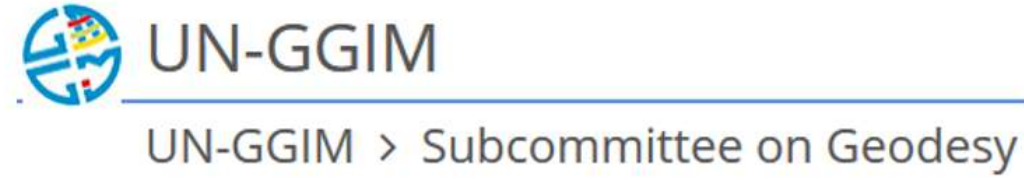
CONICET



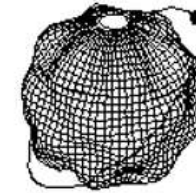
Bundesamt für Kartographie und Geodäsie

- Project *Implementation of the United Nations' Resolution on the Global Geodetic Reference Frame (UN-GGRF) for Sustainable Development in Latin America*, initiated by L. Sánchez (lead in the implementation of the IHRF) and C. Brunini (Science Director of AGGO).
- 15,000 USD → 28 travel awards for colleagues from 14 Latin American countries.
- Six flight tickets (Colombia, Peru, Chile, Brazil, Costa Rica, Ecuador)
- Logistical organisation

Supporting entities: International organisations supporting/promoting the GGRF



Supporting entities: IAG Scientific Services



Supporting entities: Speaker's affiliation (33 speakers, 52 presentations)



Conclusions/recommendations

- Attendants were provided with *scientific, technical, social and political arguments* to negotiate with the local policy makers the implementation of the UN initiative on the GGRF at regional level. To maximise this benefit, attendants should act as knowledge multipliers in their home countries.
- The workshop made evident how *important the international and multidisciplinary cooperation* within the ISC, IUGG, IAG (and its Services and GGOS), IASPEI, FIG, ICG-UNOOSA, UN-GGIM and PAIGH is.
- The *progress* in geodetic matters under the umbrella of *SIRGAS* during the last 25 years is *incontrovertible*. SIRGAS is today an operating organisation that coordinates a powerful observation and analysis infrastructure, generates reliable and community-accepted products, and provides outreach and capacity building at the regional level. However, *continuous improvement is required* to avoid degradation of the geodetic infrastructure (geodetic reference stations, processing centres, geodetic products, etc.) and to guarantee a long-term sustainability of the regional reference frame organisation in the region.
- Thanks to its performance, *SIRGAS has been endorsed by the main regional forums* related to the generation and use of geo-referenced data, like the UN Cartographic Conference for the Americas, PAIGH, and UN-GGIM Americas. *SIRGAS plays the key role in the implementation of the GGRF in Latin America.*

Conclusions/recommendations

- Problem: *SIRGAS covers de facto Latin America*. UN-GGIM Americas includes also *USA and Canada*. Therefore, the implementation of the UN-GGRF has opened a debate on how Geodesy should be represented in UN-GGIM Americas.
- This debate should be based *on the solid foundations constructed by SIRGAS* and should turn around the changes that have to be implemented in *SIRGAS to better fit the UN-GGRF road map* designed by UN-GGIM Sub-Committee on Geodesy.
- The *SIRGAS statute should be reviewed* and the necessary modifications to comply better with the UN-GGIM Americas structure should be introduced.
- The objectives of *SIRGAS Working Group II* (SIRGAS at national level) should be focused *on supporting the implementation of the GGRF in the Latin American countries*. This implies the implementation of geodetic standards, mechanisms for data sharing, and the improvement of geodetic infrastructure in accordance with the UN-GGRF objectives. A *stronger networking* between *SIRGAS* and the representatives of the Americas to *the UN-GGIM Sub-Committee on Geodesy* should be sustained.

Conclusions/recommendations

- To cover the complete spectrum of the geodetic geometric and physical reference frames, *SIRGAS should install new working groups dedicated to gravimetry and gravity field modelling*. This will allow a harmonised and consistent densification of the ITRF, the IHRF and the IGRF in Latin America. This goal has to be necessarily supported by the IAG Regional Sub-Commissions for Reference Frames and Geoid Modelling. If this is accomplished, *the meaning of the ‘G’ in SIRGAS could be changed from ‘Geocentric’ to ‘Geodetic’: SIRGAS – Sistema de Referencia Geodésico para las Américas*.
- The enterprise of installing geodetic observatories similar to AGGO in Latin America *cannot be assumed by only one country*. Multilateral cooperation between less developed and industrialised countries is indispensable. From this perspective, the UN Resolution of GGRF not only opens new opportunities for developing countries to invest in geodetic infrastructure, but also *commits industrialised countries to cooperate and to invest* in those uncovered regions to fill the gaps where core observatories are needed. This procedure must be accompanied by dedicated capacity building activities.
- The installation of geodetic core observatories in less-developed regions should follow the example given by *AGGO and the efforts of the strong Argentine-German cooperation*.

130 participants from 20 countries (Argentina, Australia, Bolivia, Brazil, Chile, China, Colombia, Costa Rica, Dominican Republic, France, Germany, Guatemala, Italy, Mexico, Panama, Paraguay, Peru, United States of America, Uruguay, and Venezuela).

Presentations, list of participants and conclusions of the workshop are available at <http://www.sirgas.org/en/ggrf/>.





