

International Association of Geodesy (IAG)
within
International Union of Geodesy and Geophysics (IUGG)

Activities Report - Year 2021

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1. Introduction

The Commission for the participation of the CNR in the International Union of Geodesy and Geophysics (IUGG) was restarted (decree of CNR President) on February 29, 2016.

Mattia Crespi was nominated representative for the CNR within the IAG Council on May 23, 2016, and member of the above-mentioned Commission on May 27, 2016.

Paolo Messina (Part Director CNR-IGAG) was nominated substitute representative for CNR, and substitute national representative within the IAG Council.

2. Main activities carried on by IAG during 2021 relevant for Italy and for CNR

The main IAG activities concerned both international conferences and schools organization:

- 13th International School on *The Determination and Use of the Geoid* (Milan, 13-26 October 2021)
- the successful Italian candidacy for the IAG Scientific Assembly 2025, which will take place in Rimini in September 2025 (see point 3)
- the start of the organization of the *X Hotine-Marussi Symposium* on geodetic methodologies, which will take place in Milan (13-17 June 2022)
- the start of the organization of the *Gravity Geoid Height Systems 2022 (GGHS2022) Symposium* at Austin (Texas) (12-16 September 2022)

and scientific research:

- the research and service activities of the ISG-International Service for the Geoid at the Politecnico di Milano
- the research and service activities of the ASI-Agenzia Spaziale Italiana Matera Space Geodesy Center
- the research and service activities of the INGV-Istituto Nazionale di Geofisica e Vulcanologia in the geodetic field
- the gravimetric activities of INRIM-Istituto Nazionale di Ricerca Metrologica and the University of Trieste
- the high-rate GNSS activities of Sapienza University of Rome
- the participation of INGV, Politecnico di Torino and Sapienza University of Rome in the *Task Force on Raw Data Measurements* promoted and coordinated by EUSPA (former GSA - European GNSS Agency)
- the contribution of universities and national research centers to the maintenance of national (under the coordination of the Italian Military Geographical Institute), European and international reference frames through their permanent GNSS stations

Regarding scientific research, the following projects deserve particular interest:

ASI Matera Space Geodesy Center:

- SLR - ILRS (International Laser Ranging Service): ITRF maintenance, weekly orbits, station qualification, Analysis Standing Committee; new SLR at Matera Space Geodesy Center
- VLBI - IVS (International Very Long Baseline Interferometry Service): CRF and TRF maintenance, Earth Orientation Parameters, tropospheric parameters, contribution to the new International Terrestrial Reference Frame (ITRF2020)
- GNSS - EUREF activities: support to the European reference frame maintenance, coordination of the EPN troposphere solution; GNSS Italian network densification with 31 new stations for global/regional reference frame maintenance

Politecnico di Milano:

- Regional Geoid - *GEOMED2*: new geoid for Mediterranean Sea; new Italian geoid for the Italian Military Geographical Institute
- GNSS meteorology - EU-Horizon 2020 project *TWIGA Enhancement of heavyrainfall predictions in Africa: low-cost GNSS network deployment and NWP model parameterization*

Sapienza University of Rome:

- GNSS Seismology - EU-Horizon 2020 project *GATHERS-Integration of Geodetic and imAging TechNiques for monitoring and modelling the Earth's surface defoRmations and Seismic risk*
- GNSS Meteorology - EU-COST Action CA20136 *OPENSENSE-Opportunistic precipitation sensing network*

Politecnico di Milano, INGV, Sapienza University of Rome, INRIM, ASI:

- Gravimetry and International Height Reference System: new fundamental Italian gravimetric network

Politecnico di Milano, Sapienza University of Rome:

- EU-Horizon 2020 project *ICARUS-Integrated Common Altitude Reference System for U-space*

3. Activities carried on as Italian Delegate within the Union during 2021 and impact on the Italian scientific community

The activities were dedicated to the organization of the following events at international level, aimed at promoting the participation of the Italian geodetic community (in particular PhD candidates, Post-Docs fellows and young researchers/assistant professors) in the international scientific debate on the main research topics in Geodesy and on the interaction between Geodesy and Geosciences:

- session *High-precision GNSS: methods, open problems and Geoscience applications* at the European Geoscience Union 2021 General Assembly (April 2021)
- session dedicated to the IAG Inter-Commission Committees, including the Inter-Commission Committee on Theory (ICCT) at the IAG Scientific Assembly 2021 in Beijing
- successful Italian candidacy for the IAG Scientific Assembly 2025, which will take place in Rimini in September 2025; the Italian candidacy was promoted by the University of Bologna (Susanna Zerbini and Stefano Gandolfi) and supported within IAG Council by the representative for the CNR within the IAG Council (Mattia Crespi); Italy candidacy was selected by the IAG Council out of five candidacies (Algiers, Hyderabad, Paris, Rimini and Wroclaw); it will be the first time that the IAG Scientific Assembly will be hosted in Italy

4. Evaluation of the participation of CNR to IAG and IUGG in terms of benefits and membership cost

It has been recognized at international level the more and more increasing importance of geodetic methods and measurements for research and applications in Geosciences, Climatology and Meteorology, Engineering and natural hazards prediction, mitigation and management.

In this respect, it is of particular relevance the recognition of the fundamental role of IAG by the UN-GGIM (United Nations - Global Geospatial Information Management).

It has to be underlined the institution (in 2019) of the Inter-Commission Committee on *Geodesy for Climate Research* and the general topic of the IAG Scientific Assembly 2021, *Geodesy for a Sustainable Earth*.

At national level it is foreseen a cooperation of the IAG Community with the new governmental agency for meteorology *Italia Meteo* and with the program *Mirror Copernicus* managed by the Ministry for Economic Development (MISE) for the synergistic use of the routinely collected and already available GNSS data (e.g. for weather forecasting improvement).

It is therefore of primary importance to continue the participation within the Union, possibly stimulating a wider participation of PhD candidates, Post-Doc fellows and young researchers also promoting with a dedicated award (may be a 2-years award to support the participation of one/two researcher(s) to the IAG Scientific Assemblies and intermediate symposia and IUGG General Assemblies).

5. Evaluation of Italians' attendance to IAG and IUGG events and actions to improve interest and involvement

Italians' attendance to IAG events at international and national level is limited to about twenty Colleagues, mainly since the Italian research activities in Geodesy are developed at few Universities and Institutes (Politecnico di Milano, Sapienza University of Rome, University of Bologna, University of Padua, University of Trento, University of Trieste; ASI-Agenzia Spaziale Italiana, INGV-Istituto Nazionale di Geofisica e Vulcanologia, CNR-IREA-Istituto per il Rilevamento Elettromagnetico dell'Ambiente, INRIM-Istituto Nazionale di Ricerca Metrologica).

A possible initiative to widen the Italian participation could be the promotion of an Italian Committee for Geodesy under the coordination of CNR Commission for IUGG, with two main aims: 1) to facilitate and coordinate the research activities of the Italian research groups working in Geodesy on the present internationally recognized hot topics (both from the methodological point of view and for application of geodetic methodologies and techniques in Geosciences, Engineering and natural hazards prediction), and 2) to empower the impact of Geodesy on the national community.

6. Italian experts with important roles within the IAG or within related Commissions and Programs

- IAG Fellows: Lucilla Alfonsi, Riccardo Barzaghi, Giovanni Battista Benciolini, Giuseppe Bianco, Carla Braitenberg, Mattia Crespi, Anna Nobili, Rosa Pacione, Mirko Reguzzoni, Fausto Sacerdote, Fernando Sansò, Susanna Zerbini
- Journal of Geodesy Editor: Mattia Crespi
- IAG Executive Committee - IAG Past President (non-voting member) Fernando Sansò
- Commission 1 - Subcommission 1.3 Regional Reference Frames - Rosa Pacione
- Commission 2 - Gravity Field - Vice-President: Mirko Reguzzoni; Steering Committee Members - Mirko Reguzzoni, Riccardo Barzaghi (IGFS Representative); JWG 2.1.1 Establishment of a global absolute gravity reference system - Domenico Iacovone
- Commission 3 - Earth Rotation and Geodynamics - SC 3.1 Earth Tides and Geodynamics - Chair: Carla Braitenberg; SC 3.2 Volcano Geodesy (joint with IAVCEI) - Vice-Chair: Alessandro Bonforte
- Commission 4 - Positioning and Applications - WG 4.1.2 Autonomous Navigation for Systems - Vice-Chair: Giorgio Guglieri; WG 4.1.4 Vision Aided Positioning and Navigation - Chair: Andrea Masiero
- Inter-Commission Committee on Theory (ICCT) - Vice-President: Mattia Crespi; JSG T.32 High-rate GNSS - Chair: Mattia Crespi; JSG T.37 Theory and methods related to high-resolution digital topographic and bathymetric models - Chair: D. Carrion

- Inter-Commission Committee on Geodesy for Climate Research (ICCC) - JWG C.2: Quality control methods for climate applications of geodetic tropospheric parameters - Chair: Rosa Pacione
- International Service for the Geoid (ISG) - President: Mirko Reguzzoni, Director: Daniela Carrion
- International Gravity Field Service (IGFS) - Chair: Riccardo Barzaghi
- EUREF Governing Board - Members: Rosa Pacione, Alessandro Caporali
- Global Geodetic Observing System (GGOS) - Coordinating Board Member: Riccardo Barzaghi (IGFS Representative); Bureau of Networks and Observations Member: Riccardo Barzaghi (IGFS Representative); Bureau of Products and Standards: Riccardo Barzaghi (IGFS Representative); Science Panel: Mattia Crespi (ICCT Representative); Focus Area - Unified Height System: JWG 0.1.2. Strategy for the Realization of the International Height Reference System (IHRIS): Riccardo Barzaghi; JWG 0.1.3 Implementation of the International Height Reference Frame (IHRF): Riccardo Barzaghi (Vice-Chair); Focus Area - Geohazards Monitoring: GNSS Augmentation of Tsunami Early Warning (GATEW): Mattia Crespi

7. Short summary about the 2021 CNR Commission activities

There is no CNR Commission for IAG.

It is considered of high relevance to foresee the institution of an Italian section of the IAG, similarly to other scientific international association.

8. Notes (if any)

No additional notes

9. Conclusions

On the basis of the above information, it is clear the need to stimulate a wider participation of the geodetic Italian community to the IAG international events, with particular focus on PhD candidates, Post-Doc fellows and young researchers.

To this aim, three main actions are proposed:

- the confirmation and extension of the membership to the IUGG, for the undoubted global relevance of this scientific association, for the high and permanent national interest in the advancement of knowledge in the field of Geophysics and Geosciences, and for the specific support and promotion and recognition of the activities of the young researchers in the field of Geophysics and Geosciences
- the promotion of an Italian Committee for Geodesy under the coordination of CNR Commission for IUGG
- the promotion of a dedicated award to support the participation of one/two researcher(s) to the IAG Scientific Assemblies and intermediate symposia and IUGG General Assemblies

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