

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

Activities Report - Year 2023

Mattia Crespi, Marco Cuffaro

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 (Sapienza, University of Rome) 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 until December 31, 2018.

Then, Mattia Crespi was confirmed for the period January 1st, 2019 - December 31, 2022, and Paolo Messina (Past Director CNR-IGAG) was nominated substitute representative for CNR and substitute national representative within the IAG Council.

Then Mattia Crespi was confirmed for the period January 1st, 2023 - December 31, 2026, and Marco Cuffaro (Senior researcher CNR-IGAG) was nominated substitute representative for CNR and substitute national representative within the IAG Council.

2. Main activities carried on by IAG during 2023 relevant for Italy and for CNR

The main IAG activities concerned both international conferences organization:

- Geodesy Division at *EGU 2023 General Assembly* (23-28 April 2023)
- *28th IUGG General Assembly (IUGG2023)*, Berlin (Germany), July 11-20
- *EUREF Symposium 2023*, Gothenburg (Sweden), May 22-26, 2023
- *GGOS Days 2023*, Yebes (Spain), September 20-22, 2023
- *ILRS Technical Workshop 2023*, Arequipa (Peru), October 16-20, 2023
- *14th International School on "The Determination and Use of the Geoid"*, Buenos Aires (Argentina), November 13-17, 2023
- XXII Giornata Mondiale dell'Acqua - *The Mediterranean System: a Hotspot for Climate Change and Adaptation*, Roma, Accademia Nazionale dei Lincei, March 21-22, 2023
- *Bologna-VLBI: Life begins at 40!*, Bologna (Italy), May 22-26, 2023

and scientific research:

- the research and service activities at the ISG-International Service for the Geoid at the Politecnico di Milano
- the research and service activities at ASI-Agenzia Spaziale Italiana Matera Space Geodesy Center
- the activities in altimetry at CNR-IFB and in GNSS-derived tropospheric delay assimilation in weather forecasting models at CNR-ISAC
- the research and service activities at INGV-Istituto Nazionale di Geofisica e Vulcanologia in the geodetic field
- the gravimetric activities at INRIM-Istituto Nazionale di Ricerca Metrologica and the University of Trieste
- the high-rate GNSS activities at Sapienza University of Rome

- the participation of INGV, Politecnico di Torino, Sapienza University of Rome and e-Geos 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 almost 40 new stations for global/regional reference frame maintenance

Politecnico di Milano:

- Determination of a global unified reference frame for physical heights (IAG-GGOS ongoing project)

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 Ionospheric Seismology - AXA - IOC UNESCO Postdoctoral Project on Coastal Livelihood Preservation & Resilience (PI Michela Ravanelli) - *Mitigating tsunamis' threat and destructive impact on coastal communities through enhanced navigation satellite system to tsunami early warnings*
- 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 (ongoing projects PRIN-MUR and Pianeta Dinamico project-INGV)

CNR-ISAC and Sapienza University of Rome:

- GNSS Meteorology - NEW ARGENT - *Improvement of Numerical Weather prediction through data Assimilation of Real-time GNSS-Estimated Non-isotropic Troposphere* (project PRIN-PNRR-MUR)

3. Activities carried on as Italian Delegate name within the Union during 2023 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 2023 General Assembly (23-28 April 2023)
- the 2nd Summer School of the EU-Horizon 2020 project *GATHERS* (GNSS Seismology, SAR and LiDAR) at Delft (Netherlands) (19-24 August 2023)

At the IUGG General Assembly 2023 in Berlin Mattia Crespi was appointed President of the IAG InterCommission Committee on Theory (IAG-ICCT) for the term 2023-2027, became member of the IAG Executive Committee (IAG EC) and of IAG Global Geodetic Observing System (IAG-GGOS) Science Panel representing IAG-ICCT.

Also, as member of the IAG-EC, he was one of the founders of the IAG EC Task Force for Inclusion, in order to explore different ways and means of making the IAG more inclusive, primarily but not only with respect to “3G” (gender, geographic, generational) balance.

As President of IAG-ICCT he started to organize its new structure (Steering Committee, Joint Study Groups), taking into account the first recommendations from the IAG EC Task Force for Inclusion, to pursue the 3G balance.

Not directly connected to IAG/IUGG but to the Italian activities in Geodesy in a broader sense, it has to be reported that Mattia Crespi was elected member (Socio Corrispondente) of the Accademia dei Lincei for the Category II - Section B - Geodesy, Geophysics and applications.

4. Evaluation of the participation 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), significantly consolidated with the foundation of the UN-GGCE (United Nations - Global Geodetic Center of Excellence) in Bonn in March 2023.

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 and how to improve interest and involvement

Italians' attendance to IAG events at international and national level is limited to about 20-25 Colleagues, mainly since the Italian research activities in Geodesy are developed at few Universities and Institutes (Politecnico di Milano, University of Bologna, University of Genoa, University of Naples “Parthenope”, University of Padua, Sapienza University of Rome, University of Trento, University of Trieste; ASI-Agenzia Spaziale Italiana, CNR-Consiglio Nazionale delle Ricerche, INGV-Istituto Nazionale di Geofisica e Vulcanologia, INRIM-Istituto Nazionale di Ricerca Metrologica).

A significant contribution to encouraging and increasing the participation of young researchers in IAG events is expected to come from the National PhD Program in Earth Observation, established in November 2022 at Sapienza University of Rome (Coordinator: Mattia Crespi). This is also thanks to the availability of funding for travel and research activities, which is twice as much as that of traditional PhD programs. A further contribution is also expected from the informal coordination between the National PhD Program in Earth Observation and the Italian Association of University Professors of Geomatics (AUTEc, Coordinator: Donatella Dominici, University of l'Aquila).

A possible, formal 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 Union or within related Commissions and Programs (if known)

- 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 - Riccardo Barzaghi (Service Representative), Mattia Crespi (IAG-ICCT President), Vincenza Luceri (Service Representative)
- Commission 1 - SC 1.1: Francesco Vespe; SC 1.3: Alessandro Caporali, Alessandro Capra, Rosa Pacione
- Commission 2 - Gravity Field - SC 2.1: Alessandro Germak, Alessio Facello, Domenico Iacovone, Andrea Prato; SC 2.2: Riccardo Barzaghi, Mirko Reguzzoni; SC 2.5: Marco Restano, Stefano Vignudelli
- Commission 3 - Earth Rotation and Geodynamics - WG 3.1: Chair - Carla Braitenberg
- Commission 4 - Positioning and Applications - WG 4.1.2: Mirko Reguzzoni; WG 4.1.5: Chair - Andrea Masiero, Paolo Da Bove, Vincenzo Di Pietra; WG 4.2.3: Umberto Robustelli, Paolo Da Bove; WG 4.3.4: Lucilla Alfonsi; WG 4.3.8: Rosa Pacione, Alessandra De Pace; WG 4.3.9: Riccardo Biondi, Flavio Cannavò
- Inter-Commission Committee on Theory (ICCT) - President: Mattia Crespi; JSG T.38: Riccardo Barzaghi; JSG T.42: Mirko Reguzzoni; JSG T.43: Riccardo Barzaghi; JSG T.45: Paolo Panicucci, Alberto Pastorutti, Daniele Sampietro; JSG T.46: Alberto Pastorutti, Carla Braitenberg, Daniel Melini, Elia Giliberti, Giorgio Spada; JSG T.48: Riccardo Barzaghi, Fernando Sansò; JSG T.49: Chair - Michela Ravanelli, Alessandra Mascitelli, Eugenio Realini
- Inter-Commission Committee on Geodesy for Climate Research (ICCC) - JWG C.4: Francesca Silverii; JWG C.7: Vice-Chair - Rosa Pacione; JWG C.9: Stefano Vignudelli
- International Service for the Geoid (ISG) - President: Mirko Reguzzoni, Director: Daniela Carrion
- International Gravity Field Service (IGFS) - Vice-Chair: Riccardo Barzaghi
- EUREF Governing Board - Members: Rosa Pacione, Alessandro Caporali
- Global Geodetic Observing System (GGOS) - Science Panel: Mattia Crespi (ICCT Representative); International Height Reference Frame (IHRF) Coordination Centre: Riccardo Barzaghi; Focus Area - Geohazards Monitoring: GNSS Augmentation of Tsunami Early Warning (GATEW): Mattia Crespi, Michela Ravanelli

7. If Union with CNR Commission, short summary about the 2023 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

Rome, June 15, 2025



Maria Crespi