

**International Association of Geomagnetism and Aeronomy
(IUGG)**

Activity Report - Year 2022

Delegate: U. Villante

International Association of Geomagnetism and Aeronomy

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on behalf of the IAGA Italian Committee

1. Introduction.

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

and their possible interconnections.

Research activities in these fields are developed in Italy at several universities and major national research organizations, such as the National Institute of Geophysics and Volcanology (INGV), the National Institute for Astrophysics (INAF), the National Research Council (CNR). These activities are usually conducted in the frame of international projects and collaborations and in the context of the traditional Divisions, Interdivisional Committees and Working Groups of IAGA. They involve relevant numbers of researchers, technicians, doctoral students; this broad involvement of institutions, facilities and networks testifies the high degree of interdisciplinarity and the need for a relevant expertise.

IAGA-Italia promotes the coordination of such activities, the development of new ones, the organization of workshops, meetings and schools. For these scopes, the IAGA-Italia community is coordinated by a National Committee, currently composed as follows:

IAGA Italian Committee

President: U. Villante: University of L'Aquila – National Delegate.

Members:

- L.igliotti: CNR/ISMAR, Bologna – Vice-Delegate, Coordinator Division I “Internal Magnetic Field”;
- M. Pezzopane: INGV, Roma, - Coordinator Division II “Aeronomical Phenomena”;
- G. Consolini: INAF-IAPS, Roma, - Coordinator Division III “Magnetospheric Phenomena”;
- R. Bruno: INAF-IAPS Roma, - Coordinator Division IV “Solar Wind and Interplanetary Magnetic Field”;

- S.Lepidi: INGV, L'Aquila, - Coordinator Division V "Geomagnetic Observatories, Surveys, and Analyses";
- A. Siniscalchi: University of Bari, - Coordinator Division VI "Electromagnetic Induction in the Earth and Planetary Bodies";
- A. De Santis: INGV, Roma, - Coordinator Interdivisional Commission on "History";
- F. Berrilli: University of Tor Vergata, - Coordinator Interdivisional Commission on "Education and Outreach".

IGA-Italia has also its own website at <http://www.iagaitalia.it> for the dissemination of data, news and documentation related to IAGA.

2. Main activities carried on by IAGA-Italia during 2022.

a) Management of Observatories and related activities.

- Management of a new continuous magnetotelluric monitoring station in the Gargano Promontory.
- Management of magnetic observatories at Duronia, Castello Tesino, Lampedusa (all three in Italy), Mario Zucchelli (Antarctica, 74.4 S, 164.1 E), Concordia (Antarctica, 75.1 S, 123.2 E) and publication of yearbooks, bulletins, and K indices. Management of magnetic stations at L'Aquila and Gagliano (both in Italy) and at the autonomous monitoring station at Talos Dome (Antarctica, 72.8 S, 159.2 E).
- Management of the permanent magnetic network of Etna volcano area, with the aim to detect and isolate local magnetic variations related to volcanic activity.
- Management of SEGMA (South European Geomagnetic Array) and ULF magnetic stations at Terra Nova Bay and Concordia (Antarctica).
- Management of paleomagnetic laboratory at Rome (INGV), Peveragno (Ciman-ALP CIMAN - Centro Interuniversitario di Magnetismo Naturale "Roberto Lanza", Universities of Milano, Torino, Urbino, Parma, RomaTre, Chieti-Pescara, and INRIM Institute of Turin), Bologna (ISMAR-CNR).
- Management of radars of the SuperDARN international network at Concordia station (Antarctica, 75.1 S, 123.2 E).
- Management of the Italian cosmic ray observatory of Rome, SVIRCO, and publication of monthly/annual reports of cosmic ray measurements, multiplicity and diurnal wave. Data are also provided in real time to the Neutron Monitor Database web site (www.nmdb.eu) and to ESA SSA Space Radiation Expert Service Centre (swe.ssa.esa.int/space-radiation) for space weather applications.
- Management of ITACA² auroral all-sky camera at Ny-Alesund (Svalbard). This is the

Italian contribution to MIRACLE network.

- Management of four AIS-INGV ionosondes: two in Italy (Rome and Gibilmanna) and two in Argentina (San Miguel de Tucumán and Bahia Blanca). One DPS4 digisonde is managed in Italy (Rome). A new DPS4D digisonde is about to be installed at Gibilmanna (March 2023) and a new AIS INGV ionosonde will be installed (April 2023) in Malindi, Kenya at the Broglio Space Center. Another AIS INGV ionosonde is going to be installed in Liguria, near La Spezia.
- An All-Sky camera is about to be installed at Gibilmanna in collaboration with the Boston college (March 2023).
- Managements of multi-constellation receivers for measuring TEC and ionospheric scintillations at Baia Terra Nova, Concordia and SANAE IV (in collaboration with SANSA) (Antarctica), at Ny Alesund and Longyearbyen (Svalbard, Norvegia), Lampedusa and Rome (Italy), Tucumán (Argentina), Crete (Greece), Kilifi (Kenya) (in collaboration with Embry-Riddle Aeronautical University and Pwani University), Sao Paulo (Brazil) (in collaboration with INPE), Nicosia (Cyprus) (in collaboration with Fredrick University), Ushuaia (Argentina) (in collaboration with the Argentinian National Meteorological Service), in Tucuman (Argentina) (in collaboration with Universidad Nacional de Tucuman), and in Malindi, Kenya (Broglio Space Center in collaboration with ASI).
- Management of continuous magnetotelluric monitoring in a site in Southern Italy (Val d'Agri).
- Management of DCE and DCN ionospheric radars of the SuperDARN international network at Concordia station (Antarctica, 75.1 S, 123.2 E).
- Participation to the activities of the International Consortium ULTIMA (Ultra Large Terrestrial International Magnetic Array).
- Underwater monitoring of the geomagnetic field in portual environment (high artificial noise) and development of the singularity measurements technique for the detection of local anomalies due to hostile operators (anti-intrusion system, anti-terrorism purposes, Min. Difesa financing) in the frame of the LAMA2.0 project.

b) Projects of interest in the framework of IAGA.

IAGA-Italia community is involved in several international programs such as:

- **ASI/CUSP.** The CUbesat Solar Polarimeter (CUSP) project has the goal to measure the linear polarization of X rays during solar flares in order to improve the knowledge of physical phenomena responsible for the acceleration of particles originated from the Sun impacting the Earth.

- **ASPIS/CAESAR.** Realization of the ASPIS prototype data center in SSDC for the Italian community involved in Space Weather and Heliophysics Science. It includes the multidisciplinary studies of the chain of Space Weather phenomena occurring from the Sun to the Interplanetary medium, solar wind-magnetospheres-ionospheres at the Earth and the planets, as well as, cosmic rays modulation and impact of space weather events on technological and anthropic systems.
- **ASI-Helianthus.** Feasibility Study (Phase-A) for a Space Weather mission with “Solar Photonic Propulsion” (solar sail). INAF leads the definition of the strawman payload comprising a suite with “in situ” and “remote-sensing” instruments.
- **ASI/HENON** HENON will realize a quantum improvement in our capabilities to predict Space Weather, by proving that a revolutionary extension of the forecasting horizon can be enabled by the use of Distant Retrograde Orbit (DRO), which has never been explored before.
- **ASI/SEE** The Cubesat mission Sun CubE OnE (SEE) deals with the investigation of Gamma and X-ray fluxes and UV (Mg II Imager) solar emission to support studies in Sun-Earth interaction and Space Weather.
- **DRAGON5 2020 – 2024** international project (ID. 59236) “ The cross-calibration and validation of CSES/Swarm magnetic field and plasma data” in the frame of the 2020-2024 cooperation between ESA and NRSCC of China (<https://eo4society.esa.int/2020/02/20/dragon-5-cooperation-call-for-proposals/>).
- **EMSO and EPOS ERICs.** Some of the IAGA activities are performed within the framework of these two European Research Infrastructure Consortia that have their main centre at INGV.
- **EPOS,** TCS Multiscale Laboratories, EPOS MIUR.
- **ESA-BEPI-COLOMBO,** the community participates with several PI-ships MPO/SIMBIO_SYS, MPO/SERENA, MPO/ISA, MPO/MORE) and CoI-ships (MPO/SIXS, MPO/PHEBUS e MMO/MPPE).
- **ESA-Cluster,** the community participates with several CoI-ships for the ion spectrometer, CIS, and actively in the analysis of data and related scientific works.
- **ESA-Venus Express,** the community participates as Co-I at the ASPERA-4 instrument package
- **ESA-Mars Express,** the community participates as Co-I at the ASPERA-3 instrument package

- **ESA-PROBA-3**, the community participates with one Lead Co-ship and several Co-ships for the coronagraph ASPICS.
- **ESA-Solar Orbiter**, the community participates with one PI-ship and several Co-ships for the coronagraph spectrometer METIS, one CoPI-ship and several Co-ships for the plasma suite SWA.
- **ESA-Space Weather Service Network**, Development and Pre-Operation Part 1 (contract no. 4000134036/21/D/MRP)
- **ESA-Variability of Ionospheric Plasma (VIP) Swarm + 4DIonosphere**, AO/1-9660/19/I-DT – 4DIonosphere, to exploit the Swarm data to address the understanding of climate/weather in the ionosphere (under quiescent space climate/weather, extreme weather).
- **ESA-Venus Express**, the community participates as Co-I at the ASPERA-4 instrument package
- **ESA for the “Campaign: Nanosatellites for Space Weather Monitoring”** called “CUBE (CME Catcher Carousel)” (IDEA: I-2021-04591) – Cubesat mission selected for Implementation which will study the energy transfer from the magnetopause to the ionosphere during reconnection process.
- **EST** (European Solar Telescope), is a ESFRI European Project; the community participates for the design and realization of several subsystems, including: Fixed-Band Imager, Spectropolarimeter, Heat rejector, Multi-Conjugate Adaptive Optics, Telescope Control, Data Handling and VO, with the leadership in some of these.
- **FWF** (Austrian Science Foundation). Cyclostratigraphy and the astronomical time scale for the Tethyan Campanian (Late Cretaceous).
- **GRAPE** (GNSS Research and Application for Polar Environment) Expert Group funded by SCAR.
- **H2020-MSCA-RISE-2018**. “BE ARCHAEO-Beyond Archaeology: An advanced approach linking East to West through science, field archaeology, interactive museum experiences”. 2019-2023.
- **iFURTHER** (high Frequency over The Horizon sensors’ cognitive network), funded by the European Community, to perform a feasibility study of a OTH (Over the Horizon) radar over Europe.
- **INGV Department Strategic Project 2019 (Earthquake Department) FURTHER** (The role of Fluids in the preparatory phase of Earthquakes in Southern Apennines), in which a WP addresses the study of the different geolayers coupling (LAIC) before

intermediate-large earthquakes using ground (seismic), atmospheric and satellite (magnetic field and plasma density) data.

- **INGV Strategic Project MACMAP** (A Multidisciplinary Analysis of Climate change indicators in the Mediterranean And Polar regions) in which a task addresses the identification of possible correlations between long-term trends in ionospheric/thermospheric parameters and the troposphere.

- **INGV Department Strategic Project 2019** (Environment Department): **TROPOMAG** - Influence of geomagnetic storms on the TROPOsphere dynamics: Can the Earth's MAGnetic field be considered a proxy of climate changes?

- **INGV Department Strategic Project 2019** (Environment Department): **AMUSED** - A MULtidisciplinary Study of past global climatic changes from continental and marine archives in the MeDiterranean region.

- **INGV Department Strategic Project**: The middle Eocene orbitally driven climate record at Gubbio (Umbrian Apennines, Italy): integrated astrochronology and environmental impact (EoGu_astro).

- **INGV Institutional Project "Rete Multiparametrica" MARGE**. "Space Weather: Mappa di Rischio Geoelettromagnetico per l'Italia centrale" (A Magnetotelluric Survey in Central Italy).

- **INGV Institutional Project "Pianeta Dinamico 2021-2022"**. Subtask A1 SINFONIA: Ionospheric and Atmospheric variations related to strong energetic natural phenomena.

- **INGV Institutional Project "Pianeta Dinamico 2021-2022"**. Theme 8 - **ATTEMPT**: integrATed sysTEM for Multi-hazard from sPace over mediTerranean.

- **INGV Institutional Project "Pianeta Dinamico 2021-2022"**. Theme 3 - **SERENA**: Space weather and climate change: the Solar wind - Earth's magnetosphere Relationships and their Effects on ioNosphere, and upper and lower Atmosphere at various temporal and spatial scales.

- **INGV Institutional Project "Pianeta Dinamico 2021-2022"**. Theme 5 - **CHOPIN**: volCano-atmosphereiOnosphere connection.

- **INFRAIA** (2021-2025) Progetto dedicato all'integrazione in un'unica infrastruttura federata delle infrastrutture di ricerca europee, e di alcune altre extra-europee, dedicate al monitoraggio e allo studio e modellazione della plasmasfera, ionosfera e termosfera.

- **IRIDYA** (Integrated Reconstruction of Ice sheet DYNamics during late quaternary Arctic climatic transitions), PNRA-PROGRAMMA DI RICERCHE IN ARTICO.

- **ISSI** Project “Unravelling Solar Wind Microphysics in the Inner Heliosphere”, <https://www.issibern.ch/teams/unravelwind/>
- **ISSI** Project “Solar sources and evolution of the Alfvénic slow wind”, <https://teams.issibern.ch/alfveniclowwind/>
- **ISSI** Project “Turbulence at the Edge of the Solar Corona: Constraining Available Theories Using the Latest Parker Solar Probe Measurements” <https://teams.issibern.ch/turbulencesolarcorona/>
- **ISSI** Project “Complex Systems Perspectives Pertaining to the Research of the Near-Earth Electromagnetic Environment”.
- **ISSI** Project “Step forward in solar flare and coronal mass ejection (CME) forecasting”.
- **ISSI** Team participation: “Modelling Mercury's Dynamic Magnetosphere in Anticipation of BepiColombo” (PI J Deca)
- **ISSI-Bj** project “The electromagnetic data validation and scientific application research based on CSES satellite” (http://www.ief.ac.cn/laimc_issi_bj/team.php.html)
- **LIMADOU SCIENZA +**: An Italian Space Agency funded project for exploiting CSES (Chinese Seismo-EM satellite) satellite electromagnetic data, which is the continuation of the former “LIMADOU SCIENZA” project. The aim of the project is the investigation of the Lithosphere-Ionosphere-Atmosphere-Magnetosphere coupling in search for earthquake related anomalies, and the characterisation of Magnetosphere-Ionosphere system in connection with solar activity.
- **MeCeMiBaCa**. The record of Meso-Cenozoic Milankovitch cycles in the Basque-Cantabrian area: astrochronology and environmental impact of orbitally driven climate change. Date: 2021-2024 Ente finanziatore: Ministerio de Ciencia, Innovación y Universidades, MICINN (Spain).
- **MINISTERIO DE ECONOMÍA Y COMPETITIVIDAD, (Spain)**. PALEOTRANS (Paleoenvironmental dynamics of transitional settings from Cretaceous to Eocene in the Southcentral Pyrenees)
- **MIUR PRIN 2017: 2019-2022**. CEI6: Circumterrestrial Environment: Impact of Sun-Earth Interaction.
- **MIUR PRIN 2017: 2019: 2023** Detection and tracking of crustal fluid by multi-parametric methodologies and technologies.

- **MIUR PRIN 2020, Dynasty:** Neanderthals dynamic pathway and resilience in central Europe through the chronometric sustainability. Magnetostratigrafia e RPI di sezioni di Loess da Polonia e Ungheria.
- **MUR S-P-HERITAGE:** variazioni del livello del mare nel passato e nel futuro.
- **NORISK:** New observatory for real-time ionospheric sounding over Kenya. Funded by ASI.
- **PECASUS** (Partnership for Excellence in Civil Aviation Space weather User Services) global space weather service center designated by ICAO (Council of International Civil Aviation Organization).
- **PITHIA-NRF** (Plasmasphere Ionosphere Thermosphere Integrated Research Environment and Access services: a Network of Research Facilities), Call H2020-02
- **PNRA. CHIMERA** (Cryptotephra In Marine sEquences of the Ross Sea, Antarctica: implications and potential applications).
- **PNRA COLLAPSE** (Cook Glacier-Ocean system, sea Level and Antarctic Past Stability).
- **PNRA14_00097** - Linea A1 "Osservatorio geomagnetico presso la Stazione Concordia, Dome C, Antartide.
- **PNRA14_00106** - Linea A1 "Osservatorio Geomagnetico a Stazione Mario Zucchelli".
- **PNRA 14/110** "Upper Atmosphere Observation and Space Weather".
- **PNRA 14/00133** "Bipolar Ionospheric Scintillation and TEC".
- **PNRA 14/00085** "SuperDARN: HF ionospheric radars, DCE e DCN, at Concordia" (Antarctica).
- **PNRA 15/00135** "ESCAPE: Solar Coronagraphy from Antarctica for Space Weather studies".
- **PNRA18_00289** "Space weather in Polar Ionosphere: the Role of Turbulence" (SPIRiT)
- **PNRR** partecipazione a Spoke 6 (Protezione Infrastrutture Critiche e Space Weather) per la proposta SpaceltUp.
- **PON InSea** "Iniziativa in Supporto al consolidamento e potenziamento dell'infrastruttura EMSO e delle sue attività", 2019 – 2022. Potenziamento delle infrastrutture a mare e in prossimità della costa italiana con deposizione di SMART cable per scopi di monitoraggio geofisico e marino.

- **PROGETTO DI RICERCA LIBERA INGV (2022-2023)**, PaleoSecular Variations of the GEOMagnetic Field from the western Sicily Channel (PSVGEOFISIC).
- **ReCliAME**. Climatic-environmental feedback under global warming conditions: lessons from the Maastrichtian-Eocene of the Iberian peninsula. Ministerio de Economía y Competitividad, (Spain), Univ. Pais Vasco, UPV/EHU
- **RETRUN** (multi-Risk sciEnce for resilienT commUnities undeR a changiNg climate). Date: 2022-2026. Piano Nazionale di Ripresa e Resilienza. Ente finanziatore: EU.
- **SWERTO** (Space-Weather at the University of Rome Tor Vergata) financed by LazioInnova Regione Lazio. On-line data-base for space (e.g., PAMELA, ALTEA) or ground-based instruments (e.g., IBIS, MOTH) relevant to the determination of Space-Weather conditions (www.spaceweather.roma2.infn.it).
- **SWEATERS** (Space WEATHER Radiation Sensors) An Italian Space Agency funded project (ASI contract 2020-14-HH.0) for ENA (Energetic Neutral Atoms) instrument development devoted to Space Weather monitoring via ENA detection technique.
- **T-FORS** (Travelling Ionospheric Disturbances Forecasting System), funded by the European Community, aimed at developing a prototype system for Travelling Ionospheric Disturbances (Medium and Large scale) forecasting.

3. Italian attendance to international conferences.

As a consequence of the persistent COVID-19 pandemic, as for the previous years, several scheduled activities have been delayed and several participations in international conferences took place via the web.

- European Geosciences Union General Assembly (Vienna).
- AGU Fall meeting (Chicago).
- 44th Scientific Assembly COSPAR (Atene)
- 108° Congresso Nazionale della Società Italiana di Fisica (Milano).
- 18th European Space Weather Week (Zagabria).
- Secondo Congresso Space Weather Italian Community (Roma)
- ESA Living Planet Symposium, Bonn, Germany.
- ESA Swarm 12th Data Quality Workshop, Uppsala, Finland.
- 3rd URSI Atlantic / Asia-Pacific Radio Science Meeting, Gran Canaria, Spain.
- Beacon Satellite Symposium 2022, Boston, USA.
- EMSEV International Workshop 2022, Taoyuan, Taiwan.
- 40° Convegno Nazionale GNGTS, Trieste, Italy.
- XV Reunión Científica Sociedad Española de Astronomía (Tenerife, Spain)
- Solar Orbiter Workshop (Belfast).

- 3rd URSI Atlantic Radio Science Meeting, AT-AP-RASC 2022 (Gran Canaria, Spagna).
- 20th Annual International Astrophysics Conference (Santa Fé, NM, USA).
- 2022 Arcetri Workshop on Plasma Astrophysics (Arcetri, Firenze).
- 10th SCAR Open Science Conference 2022 (Virtual Conference).
- European Cosmic Ray Symposium, Nijmegen, the Netherlands.

4. Education, Outreach and Workshops.

IAGA-Italia pays particular attention to educational aspects and outreach.

a) Collaboration with the *International School of Space Science*.

In collaboration with other institutions and within the framework of the International School of Space Science (L'Aquila), directed by the Italian delegate, the IAGA-Italy community has launched a program of schools dedicated to the training of young researchers in the area of the Solar Terrestrial Physics and Space Weather. During 2002 the following courses have been organized in L'Aquila:

- **The different spatio- scales of the solar magnetism.**

April, 2022. L'Aquila (Italy) <http://www.cifs-iss.org/>.

Directors: F. Zuccarello, L. Bellot Rubio.

- **Radiation belt dynamics and remote sensing of the Earth's plasmasphere**

September, 2022. L'Aquila (Italy) <http://www.cifs-iss.org/>.

Directors: J. Lichtenberger, G. Reeves, M. Vellante.

b) Collaboration with the *Space Weather Italian Community*.

IAGA – Italia continues to promote IAGA scientific interests to the national community. This activity is supported by the different institutions (universities, observatories, institutes) through individual initiatives towards the general public and towards high-school and secondary school students. In the field of the Space Weather, on a national level, the activity is coordinated by the *Space Weather Italian Community (SWiCo; www.swico.it)* which organized monthly webinars on topics mainly related to Space Weather and Sun-Earth relations. The *SWiCo* group of Outreach and Media Public Relations is composed of: Lucilla Alfonsi (INGV), Raffaella D'Amicis (INAF-IAPS), Paola De Michelis (INGV; coordinator), Luca Giovannelli (UNITOV), Antonella Greco (UNICAL), Mauro Messerotti (INAF-OATS), Paolo Romano (INAF-UNICT). In this framework a certain number of Webinars has been given (see below).

Webinars held:

16/05/2022 Giuseppe Prete: Evidence of superdiffusive transport at heliospheric shocks: comparison between a test particle numerical model and ACE data

13/06/2022 Roberto Susino: Studi della corona solare con il coronografo Metis a bordo di Solar Orbiter

04/07/2022 Paolo Massa: Hard X-ray imaging of solar flares by Solar Orbiter STIX

17/10/2022 Raffaella D'Amicis: Il Solar Wind Analyzer a bordo di Solar Orbiter: contributo agli studi di Space Weather

21/11/2022 Monica Laurenza: The CAESAR project: Comprehensive spAce wEather Studies for the ASPIS prototype Realization

19/12/2022: Federica Chiappetta: Energetic Storm Particle events: proton energy spectra and relation with magnetic turbulence nearby IP shocks

SWICO community also organized the **Second Meeting of the Italian Space Weather Community** in Rome (February, 2022) as a moment of encounter and discussion of the entire Italian community engaged in the disciplines in question. It was also open to researchers and technologists not members of SWICO and registered the active participation of students, PhD students and young researchers.

c) Other activities.

Additional tutoring/teaching activities of IAGA members have been the following.

- Tutoring at the Summer School Alpbach 2022 "Comparative plasma physics in the universe" July 2022.
- Teaching at the Master course "Science and technology in space" Università di Tor Vergata, Dip. Fisica.

d) Collaboration with international entities.

- Collaboration with the University of Birmingham, the George Mason University, the Institut de Physique du Globe de Paris, the International Center of Theoretical Physics to develop a new NeQuick topside modelling.

- INGV in collaboration with International Centre for Theoretical Physics (ICTP), Boston College (BC), Pwani University (PU, Kenya) and United Nation Office Outer Space Affairs (UNOOSA) organized the African Capacity Building Workshop on Space Weather Effects on GNSS held in Trieste (3-14 October 2022)

- ICTP in collaboration with Universidad Nacional de Tucumán (Argentina) and sponsored by UNOOSA, BC and SCOSTEP, organized the International Workshop on Machine Learning for Space Weather: Fundamentals, Tools and Future Prospects in Buenos Aires, Argentina (7-11 November 2022).

- ISWI, the International Space Weather Initiative, supported by the United Nations. Among the others activities ISWI organizes schools and workshops.

5. Activities carried on by the Italian Delegate and National Committee during 2022 and impact on the Italian scientific community.

As in the past, the Italian Delegate and the National Committee have developed their activity paying attention mainly to the following aspects: participation of IAGA - Italia to scientific programs and international meetings; development of new initiatives at national level, with particular reference to the cooperation between universities, research institutions and industries; tutoring and training of young researchers and students, encouraging their participation to IAGA activities.

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

- Members of the IAGA National Committee are in the IUGG Network of Italian Experts.
- F. Florindo (INGV) is the chairman of the Working Group I.2 “Paleomagnetism” of the IAGA Division I - Internal Magnetic Fields and President of the Earth Magnetism and Rock Physics Division of European Geophysical Union.
- A. De Santis (INGV) is Member in the ASI Committee on ESA satellite Earth Observation Missions.
- U. Villante (University of L’Aquila) is President of SWICo (Space Weather Italian Community).
- M. Casolino (INFN), D. Del Moro (U. Tor Vergata), M. Laurenza (INAF), S. Lepidi (INGV) M. Piana U. (Genova), M. Piersanti (U. L’Aquila), R. Tozzi (INGV) are members of the Directive Board of SWICo (Space Weather Italian Community).
- I. Coco, M. Laurenza, L. Marcelli, M. Messerotti, M. Piana, M. Piersanti are members of the SWICo Committee “Commissione Collaborazioni Nazionali e Internazionali”.
- A. Greco (University of Cosenza), P. De Michelis (INGV), P. Romano (INAF), L. Giovannelli (University of Rome Tor Vergata), L. Alfonsi (INGV), M. Messerotti (INAF) and R. D’Amicis (INAF) are members of the SWICo working group ‘Outreach and Media Public Relations’.
- I. Ermolli, M. Laurenza, M. Messerotti, A. Pellizzoni, R. Susino are members of the INAF Advisory Committee for “Meteorologia e Climatologia dello Spazio” (Space Weather and Space Climate).
- D. Di Mauro (INGV) is the Italian reference for the Italian magnetic network which contributes to the European network. He also acts as reference for the Italian

geomagnetic observatories at Castello Tesino (North Italy), Duronia (Central Italy) and Lampedusa (South Italy).

- G. De Franceschi (INGV) is the leader of the SCAR expert group GRAPE (GNSS Research and Application for Polar Environment). She has been appointed URSI (International Union of Radio Science) delegate to SCAR since 2014. She has been elected URSI Commission G chair for the period 2021-2023. She is the INGV Representative in the National Scientific Committee for Arctic. Lucilla Alfonsi (INGV) is her Deputy.
- V. Romano (INGV) is the Italian co-expert on Space Weather at ONU COPUOS (Committee on the Peaceful Uses of Outer Space), he is National co-coordinator for Italy in ISWI (International Space Weather Initiative), he is the Italian delegate in the Steering Committee of the PECASUS Consortium, he is the INGV delegate in the COSPAR Panel for Space Weather.
- M. Materassi is the Italian National Delegate to Commission G of URSI (Union Radio-Scientifique Internationale).
- C. Scotto is the Italian National Deputy Delegate to Commission G of URSI (Union Radio-Scientifique Internationale).
- Y. Migoya Orue' (ICTP) is National co-coordinator for Italy in ISWI (International Space Weather Initiative).
- F. Berrilli (University of Rome Tor Vergata) is Delegate for Space Science in ASI Planetary Science Board, and SPIN-IT/CTNA Delegate in "PROTECTION of European assets in and from space" in ASI-H2020 Team.
- R. D'Amicis (INAF-IAPS) is Vice-Chair of the Cospar Capacity Building and CoPI of the Solar Wind Analyser (SWA) onboard Solar Orbiter. She participated in the following proposals for future missions in response to the ESA call 2021 with the following roles: PI of the Particle Processing Unit (PPU) of the plasma instruments on board Plasma Observatory, proposed as M7 mission, selected for phase 0 studies; PI of the Data Processing Unit (DPU) of the plasma instruments on board M-MATISSE, proposed as M7 mission, selected for phase 0 studies; PI of the Particle Data Processing Unit (PSCU) of the plasma instruments on board Alfvén, proposed as M7 mission; PI of the Particle Data Processor (PDP) of the plasma suite on board Debye, proposed as F2 mission.
- F. Zuccarello (University of Catania) is member of the Board of the European Solar Physics Division of the European Physics Society.
- B. Nava (ICTP) is Italian member of the International Reference Ionosphere Working Group and Co-Chair, Beacon Satellite Studies Working Group, URSI Commission G.
- M. Vellante is Co-PI of EMMA (European quasi-Meridional Magnetometer Array).

- A. Bemporad (INAF) is the Scientific Discipline Representative in the Scientific Committee on Solar-Terrestrial Physics (SCOSTEP).
- A. Bemporad (INAF), F. Berrilli (UNITOV), P. De Michelis (INGV), M. Laurenza (INAF), F. Marcucci (INAF), S. Orsini (INAF), V. Romano (INGV) are members of the ASI Working Team for the Italian Roadmap for Space Weather.
- M. Pezzopane (INGV) is Italian member of the International Reference Ionosphere Working Group and Co-chair of IAGA WGII-E: Ionospheric irregularities, Fields and Waves.
- I. Coco (INGV) is member of the Electric Field Instrument Science Discussion Group of the Swarm ESA mission, and of the ESA Swarm-CSES working group.
- C. Cesaroni (INGV) is the chair of the URSI Commission G working group “Capacity Building and training” and co-chair of the inter-commission (FCGEH) working group “Risk and Disaster Management (Inter URSI Commissions)”. He is also member of the SWICo working group “Technological developments”. He is member of the IGS Ionospheric working group and advisor for the Space Weather to the Italian member of the ICAO MET Panel.
- D. Sabbagh (INGV) has been elected URSI Early Career Representative (ECR) of the Commission G for the years 2021-2026.
- L. Spogli (INGV) has been elected President of the European Space Weather and Space Climate Association (E-SWAN). He is also the advisory for the Italian Member of the Meteorology Panel (METPANEL) of the International Civil Aviation Organization (ICAO) in the frame of the Meteorological Information Service Development Working Group (WG-MISD) (now WG-MOG) for Space Weather.
- L. Alfonsi is member of the Polar Expert Group (PEG) of the EU-PolarNet2 project (eu-polar.net.eu/) aiming at establishing a permanent European coordination of polar research.
- A. Milillo (INAF) is member of ISWAT-COSPAR Cluster H4 team H4-01
- M. Piersanti (UnivAQ) is the Italian PI of the “ The cross-calibration and validation of CSES/Swarm magnetic field and plasma data” in the frame of the 2020-2024 DRAGON 5 cooperation project (ID. 59236) between ESA and NRSCC of China (<https://eo4society.esa.int/2020/02/20/dragon-5-cooperation-call-for-proposals/>). He is also is the PI of the calibration/validation of the Electric Field instrument on board CSES-01 satellite in the frame of the SWARM/CSES satellites cal-val group and PI of the commissioning phase of the Electric Field instrument (EFD) on board the satellite CSES-02 in the frame of the CSES-Limadou collaboration.

- R. Bruno (INAF-IAPS) is one of the members of the Scientific Council of ISSI/ISSI-Beijing (2020-2023)

- L Perrone is the coordinator of the working team on 'MUF/foF2 depression' attended by representatives of the 4 Space Weather Global Centers-SWXC, selected by ICAO to emit real time advisories on space weather events which influence the communication, navigation and the health of the passengers and the crew.

7. Awards and Prizes.

- **Award "Franco Mariani".**

The Award "Franco Mariani", established to honor the memory of a scientific personality of international prestige (former IAGA delegate) and to promote the involvement of young researchers in the disciplines relating to Space Weather has been assigned to dr. Giuseppina Carnevale, University of L'Aquila.

8. Concluding remarks .

As for previous years, despite the pandemic, IAGA- Italia pursued its activity supporting the Italian participation in international programs and promoting the involvement of young researchers and doctoral students in the IAGA activities. IAGA-Italia is also pursuing in the organization of specific training paths for young researchers and PhD students.

As previously reminded, IAGA is one of the most important organizations in the field 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. The Italian community is involved in several international programs in these fields. So, is important that the Italian community continues to have a strong participation in this association.

To stimulate a wider participation of PhD students, Post-Doc fellows and young researchers to IAGA activities, it might be useful a dedicated award to support the participation to the IAGA Scientific Assemblies.

On behalf of the IAGA Italian Committee
The IUGG/IAGA Delegate
Prof. U. Villante