International Association of Geomagnetism and Aeronomy (IAGA)

IAGA Activities in Italy (2011-2012) (www.iagaitalia.it)

IAGA activities in Italy are currently developed by several universities as well as by mayor Scientific Institutions such as Istituto Nazionale di Geofisica e Vulcanologia (INGV), Istituto Nazionale di Astrofisica (INAF) and Consiglio Nazionale delle Ricerche (CNR).

The present document, organized on the basis of IAGA Divisions and Interdisciplinary Commissions, summarizes the principal achievements, the participation to international programs and the most relevant programs in which the Italian Scientific community is involved.

IAGA Community in Italy is organized according to the following scheme:

Italian Correspondent: Prof. U. Villante, University of L'Aquila
Vice Correspondent: Dr. L. Vigliotti, CNR – Istituto di Scienze Marine (ISMAR), Bologna

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DIVISION I:
"Internal Magnetic Field" (Coord.: L. Vigliotti)

A) Institutions involved in research activity

1. Istituto Nazionale di Geofisica e Vulcanologia, INGV-Roma.
2. ALP - ALPINE LABORATORY OF PALEOMAGNETISM - Inter-Universitary Center for Rock Magnetism University of Milano, Torino, Parma, Roma3, Siena and Urbino.
3. Department of Physics of the University of Bari.
4. Department of Physics of the University of Camerino.
5. University of Naples.
6. University of L'Aquila and Consorzio Area di Ricerca in Astrogeofisica.
7. Istituto di Scienze Marine ISMAR-CNR, Bologna.
8. Istituto di Fisica dello Spazio Interplanetario/INAF, Roma.

B) Scientific Report

Main Scientific Themes

Interdisciplinary studies concerning the registration of the Earth magnetic field and the magnetic properties of rocks and sediments focused on different subjects:

- Magnetic polarity and secular variation record of the magnetic field.
- Geodynamic reconstructions.
- Environmental Magnetism.
- Magnetic properties of minerals and rocks

Magnetostratigraphy

With regard to the integrated stratigraphy and magnetostratigraphy, researches focused on Several sections ranging in time from Cretaceous to Pleistocene. Some of them are candidates for the definition of different Global Stratotype Section and Point (GSSP). Early Miocene (Burdigalian) sections were studied in the Conero, Iblei as well as in oceanic cores. Additional GSSP focused on the Paleogene (Lutetian, Thanetian and Selandian) and in particular on stratigraphic series sampled at Gorrondatxe and Zumaia in the Basque countries (Spain).

Additional studies on land took into account sections from the Anatolian Plateau (Turkey), the Piedmont Tertiary Basin and Pleistocenic sequences from the Padania Plain. Measurements on marine sediments include the upper part of the stratigraphic succession recovered in the IODP expedition 317 (Canterbury Basin).

Several studies took into account the paleosecular variations (PSV) of the Earth magnetic field recorded by sediments (Adriatic Sea, Ionian Sea, Barents Sea) and volcanic rocks (Azores), with a re-evaluation of the Italian historical geomagnetic catalogue. The analysis of different cores from the Barents Sea, off the coast of Svalbard, has allowed the reconstruction of the Holocene PSV at high northern latitudes, providing important experimental constraints for models of the geomagnetic field, and allowing the development of an age model for detailed reconstruction of climatic variations. Magnetostratigraphic investigations include also classic sites inhabited by hominid in Puglia (Pirro Nord) and at Ceprano. Paleosecular variations (PSV) recorded in volcanic rocks allowed to determine the age of eruptive events with applications to the islands of Pantelleria and the Azores.

Environmental Magnetism

Magnetic parameters were used to investigate the paleoclimatic and paleoceanographic history recorded by marine and lacustrine sediments in different environments. Results have been obtained on sediments

representing extreme climatic conditions such as greenhouse episodes during the Eocene-Paleocene and the Messinian salinity crisis, but also from young sediments. In the framework of the International Continental Drilling Program (ICDP) “Paleovan”, 150 meters of Late Quaternary sediments collected at Site 5034 in the Lake Van (Turkey) were analyzed for a paleomagnetic/rock magnetic study carried out in collaboration with the University of Florida at Gainesville (USA).

Magnetic data from Antartic and periantartic drillings have been summarized to reconstruct the climatic evolution of this region during the Cenozoic.

Application to studies of environmental pollution, especially pollution by particulate matter were carried out with the aim to determine the contribution of the ultrafine magnetic fraction (diameter less than 30 nm) in atmospheric dust, characterized by superparamagnetic properties.

Geodynamic Reconstructions

With regard to applications to geodynamics, paleomagnetic and magnetic anisotropy were applied to reconstruct the tectonic evolution of the Italian peninsula and the Andes. Studies in the Crotone basin provided new original data for the geodynamic mechanisms responsible of the Plio-Pleistocene deformation of the Calabrian block. Magnetic anisotropy studies conducted in the upper valley of the Tiber gave the possibility to reconstruct the Pleistocenic deformation field of the Alto Tiberina fault. In the Andes region, new studies have been conducted in the Eastern Cordillera of Colombia to constrain the mechanisms for the genesis of this mountain chain. Additional studies based on paleomagnetic data focused on tectonic rotations of regions in the Italian peninsula (Sardinia, Calabria) as well as in the Neogene of Central Iran.

Magnetic Properties of Rocks and Archeomagnetism

An increasing number of studies was focused on the applications of magnetic parameters to volcanic rocks. The emplacement temperatures and depositional mechanism of piroclastic and volcanic units were analyzed to characterize different volcanic eruptions (Breccia di Commenda, Brown Tuff, Ferrar Dolerites).

Archeomagnetic studies took into account furnaces found at Kato Achaia (Grecia), Fontanetto Po, Spilamberto, Portugal, and on ceramics from Skala Sotiros, Archontiko, Tempi, Paros, and Santorini (Greece). Studies for determination the firing temperature of ceramic artefacts were carried out in collaboration with the University of Bari and the Archaeological Office of the Canton of Bern. The origin and composition of Neolithic obsidian as well as Roman and Medieval bricks were investigated in collaboration with the National Institute of Metrological Research to reconstruct the provenance and the commercial roads in the Mediterranean region during the ancient times.

Specific research of the remanent magnetization carried out by magnetic minerals of biogenic origin in marine sediments gave new insights on their influence in the acquisition and retention of the magnetic properties. Additional results focused on peculiar magnetic properties of different species of magnetotactic bacteria.

Main Research Projects/Programmes

PRIN Magnetic models and analyses in the Project “Magnetic Homing”

Bilateral project “Earth Magnetic Field measurements, Modelling and Seismicity – EM3S Italy-Albania

DS3F “Deep Sea and Subseafloor Frontier”

SAGA-4-EPR “Satellite, ground and seafloor measurement for earthquake pattern regnition” Project of Excellnce Italy-China 2010-2012

“Short-Term mobility” program "Paleomagnetic and Magnetic properties of the Lake Van sediments (PALEOVAN PROJECT; ICDP SITE 5034): Paleoclimatic and environmental reconstruction of the last 500000 years"

Acque di fusione glaciale, plumiti e morene recessionali allo sbocco della Fossa di Storfjorden durante la deglaciazione della Calotta Glaciale del Mare di Barents (MELTSTORM)

Studio multidisciplinare dei sedimenti glaciomarini deposti nel Mare di Ross (Antartide) negli ultimi 50 Ka: informazioni sulle fluttuazioni dell'estensione dei ghiacci nel corso della transizione glaciale-interglaciale

ANDRILL- ANtarctic DRILLing - Rapporti Temporali tra Attività Vulcanica e Sedimentazione nell'Area McMurdo Sound - Ross Ice Shelf : Implicazioni Tettoniche e Paleoclimatiche.

“Paleomagnetic Analyses of Drifting and Tectonic Rotations of Central Iran“nell’ambito del consorzio internazionale DARIUS (2009-2011).

“Magnetostratigraphy and stratigraphy of Miocene to Present lacustrine basins in central Anatolia” nell’ambito del Collaborative Research Project Vertical Anatolian Movement Project (VAMP), Progetto TOPOEUROPE (ESF) (2008-2012).

“Genesi e differenziazione dei magmi in relazione all'ambiente geodinamico ed alle caratteristiche petrologiche e geochimiche delle loro sorgenti: implicazioni per l'evoluzione del sistema convergente Africa-Europa” PRIN.

Funding Agencies

MIUR PRIN Magnetic models and analyses in the Project “Magnetic Homing”

Italian Foreign Office Bilateral project “Earth Magnetic Field measurements, Modelling and Seismicity – EM3S”(validity 2012-2013) Italy-Albania

European Project DS3F “Deep Sea and Subseafloor Frontier” 2010-2012

Italian Foreign Office SAGA-4-EPR “Satellite, ground and seafloor measurement for earthquake pattern regnition” Project of Excellnce Italy-China 2010-2012

CNR “Short-Term mobility program” "Paleomagnetic and Magnetic properties of the Lake Van sediments (PALEOVAN PROJECT; ICDP SITE 5034): Paleoclimatic and environmental reconstruction of the last 500000 years"

PNRA Acque di fusione glaciale, plumiti e morene recessionali allo sbocco della Fossa di Storfjorden durante la deglaciazione della Calotta Glaciale del Mare di Barents (MELTSTORM)

PNRA Studio multidisciplinare dei sedimenti glaciomarini deposti nel Mare di Ross (Antartide) negli ultimi 50 Ka: informazioni sulle fluttuazioni dell'estensione dei ghiacci nel corso della transizione glaciale-interglaciale

PNRA ANDRILL- ANtarctic DRILLing - Rapporti Temporali tra Attività Vulcanica e Sedimentazione nell'Area McMurdo Sound - Ross Ice Shelf : Implicazioni Tettoniche e Paleoclimatiche

C) Goals, priorities and plans for future activities

Main Scientific Themes

Development of an integrated network of research infrastructures, in particular rock physics labs, in the framework of the EPOS project

Integrated magnetostratigraphy, as a high-resolution correlation and dating tool for marine and continental stratigraphic sequences

Paleomagnetism applied to geodynamics; new experimental data and insights for understanding the evolution of the central Mediterranean and the genesis of complex orogens

Environmental magnetism as an original proxy for the reconstruction of paleoenvironmental and paleoclimatic changes, with particular emphasis on the Mediterranean and both polar regions

Environmental magnetism, as an original tool to investigated particulate matter air pollution

Reconstruction of paleosecular variation of the geomagnetic field for the Holocene and of relative paleointensity curves for the Pleistocene, and application to correlation and dating of geologic events with implication for the evaluation of volcanic and seismic risks.

Main Research Projects/Programmes

- European Plate Observing System (EPOS)
- Funding agency: European Community
- Studio multidisciplinare dei sedimenti glaciomarini deposti nel Mare di Ross (Antartide) negli ultimi 50 Ka: informazioni sulle fluttuazioni dell'estensione dei ghiacci nel corso della transizione glaciale-interglaciale

Funding agency: PNRA

- NEXTDATA un sistema nazionale per la raccolta, conservazione, accessibilità e diffusione dei dati ambientali e climatici in aree montane e marine

Funding agency: MIUR

- Indagini ad alta risoluzione per la stima della pericolosità e del rischio sismico nelle aree colpite dal terremoto del 6 aprile 2009

Funding agency: MIUR

- Reconstructing 2500 years of environmental change at the periphery of Rome: Integrating paleoecology and socioeconomic history to understand human response to climate

Funding agency: NSF

- ARctic: present Climatic change and pAst extreme events (ARCA)

Submitted to MIUR

DIVISION II:
"Aeronomic Phenomena" (Coord.: B. Zolesi)

A) Institutions involved in research activity

The principal Italian groups involved in research activities related with Division II "Aeronomic Phenomena" are: Istituto Nazionale di Geofisica e Vulcanologia, Roma ; Consiglio Nazionale delle Ricerche, Firenze and the "Abdus Salam " International Centre for Theoretical Physics, Trieste.

B) Scientific Report

1) Istituto Nazionale di Geofisica e Vulcanologia

a) Main scientific themes

Presently, ionospheric vertical soundings are performed in two ionospheric observatories in Italy, Rome (41.8° N, 12.5° E) and Gibilmanna (37.9° N, 14.0° E), and one in the Italian Antarctic base M. Zucchelli. Considerable cooperation has been activated with the Argentinean colleagues to install and operate the Italian ionospheric station AIS in Tucuman (26.9° S, 294.6° E), Argentina.

Hourly systematic measurements of the critical frequency of the F2 layer, foF2, recorded at the Rome and Gibilmanna ionospheric observatories, along with the hourly quiet time reference values of foF2, $foF2_{QT}$, were considered around the periods of minimum and maximum solar activity over the years 1976-2008, to study the ionospheric variability over Rome and Gibilmannna.

Power Virtual Height measurements (PVH) of radio echoes reflected from the ionosphere acquired at the Rome ionospheric observatory have been used to study the multipath fading variations through time of the ionospheric channel on a temporal scale from 0.5 to 256 s.

INGV is managing a network of high rate (50 Hz) sampling GNSS (Global Navigation Satellite Systems) receivers at polar, equatorial and mid-latitudes. The network now counts instruments in Antarctica (at Mario Zucchelli Station and at Concordia), in Arctic (at Svalbard Islands), in the Mediterranean area (lampedusa and Rome, Italy; Crete, Greece) and in Argentina (Tucuman). Through a network funded by different project INGV cooperates also to the operation of similar receivers in Brazil. Such observations are used to investigate the irregular behaviour of the ionosphere causing scintillation, a diffractive and refractive effect on the trans-ionospheric signals transmitted by GNSS satellites. INGV has achieved a robust expertise in modelling the scintillation and has activated several international collaborations in the field.

B) Ionospheric morphology and modelling

A short-term ionospheric forecasting empirical regional model (IFERM) to predict the state of the critical frequency of the *F2* layer (*foF2*) and M3000F2 over Europe during moderate, disturbed, and strongly geomagnetic conditions, has been developed.

A comparative study between the sporadic E layers over the ionospheric stations of Rome and Gibilmanna has been carried out using hourly systematic measurements of the highest frequency reflected by the *Es* layer (*foEs*) recorded during the period January 1976 - July 2008 at the Rome and Gibilmanna ionospheric observatories.

A three-dimensional (3-D) IRI-SIRMUP-P (ISP) model of electron density of the ionosphere was developed and tested over several periods characterized by very disturbed geomagnetic conditions.

The three-dimensional (3-D) electron density representation of the ionosphere computed by the assimilative IRI-SIRMUP-P (ISP) model was used in connection with IONORT (IONOspheric Ray-Tracing), a software application for calculating a 3-D ray-tracing in the ionospheric medium. For testing the reliability of IONORT-system, several comparisons between measured oblique ionograms over the radio link between Rome (41.8_N, 12.5_E) and Chania (35.7_N, 24.0_E), and synthesized oblique ionograms from the IONORT – system have been performed.

In the framework of the project ESA Space Weather Network -IV3 project European ionosonde and neutron monitor services, two original software for the achievement of maps of foF2 and M3000F2 extending from 34° N to 80° N in latitude and from -10° W to 40° W in longitude are under development.

Seasonal (Winter/Summer) and solar cycle NmF2 variations as well as summer saturation effect in NmF2 have been analyzed using Millstone Hill ISR daytime observations. A new mechanism (qualitative) to explain the

December anomaly in NmF2 is proposed. A new method has been developed to retrieve neutral temperature Tn and composition [O], [N_2], [O_2] from electron density profiles in the daytime mid-latitude F2-region under both quiet and disturbed conditions.

Other themes of main interest are: empirical and theoretical modeling of ionospheric scintillations to forecast and mitigate the ionospheric corruptions on GNSS signals; scientific understanding of the cause-effect mechanism leading from the ionospheric irregularities formation to the scintillation effects; structuring and accessibility of the ionospheric data for real-time and post processing use.

Main Research Projects/Programmes

CIGALA project "Concept for Ionospheric Scintillation Mitigation for Professional GNSS in Latin America" FP7, Collaborative projects, GALILEO 2008GSA, 2010-2012.

ESPAS: "Near-Earth Space Data Infrastructure for e-Science" a FP7 project.

Royal society Project: in collaboration with University of Nottingham and INGV funded by the Royal Society (UK): "Original and Novel Solutions to Counter GNSS Ionospheric Scintillation Effects", 2010-2012;

Research Project IDIPOS "Italian Data Base Infrastructure for Polar Observation Science", funded by National Program of Antarctic Research (PNRA).

Research Project 2009/B03 "Upper Atmosphere Observations and Space Weather", 2009-2012, funded by National Program of Antarctic Research (PNRA).

SWING : (Short Wave Critical infrastructure Network based on new Generation prediction Tools) EU Directorate Justice,Freedom and Securety. 2012- 2013

TELEDIFE :Training courses and Ionospheric radio propagation prediction; Minisistry of Italian Defense

TRANSMIT project (Training Research and Applications Network to Support the Mitigation of Ionospheric Threats), 2011-2015, FP7 Marie Curie-ITN.

MIMOSA, GINESTRA, MEDSTEC 2012-2013, ESA Alcantara initiatives to survey the ionospheric monitoring capabilities over South America, Africa, Asia.

Funding Agencies : FP7, ESA, PNRA, Minisistry of Italian Defense.

2) Consiglio Nazionale delle Ricerche, Firenze

During the years 2010-2013 CNR's activity in the field of near-Earth space research has been concentrated mainly in the study of the dynamics of complex/irregular plasmas and near-Earth space imaging/observation. CNR team conducts the project named ISIS, ESA-CNR about the observation of the Earth's plasmasphere.

3) Abdus Salam " International Centre for Theoretical Physics, Trieste.

The Telecommunications/ICT for Development Laboratory (T/ICT4D) (formerly Aeronomy and Radiopropagation Laboratory) of the Abdus Salam International Centre for Theoretical Physics has concentrated its ionosphere research and applications work in the following lines: Earth and Mars Ionosphere modelling, data ingestion and assimilation in models, use of radio occultation for ionosphere characterization, lower latitudes ionosphere, ionosphere effects in GNSS operations at range and position domains. The work has been carried out in collaboration with groups of European and African universities.

DIVISION III:
"Magnetospheric Phenomena" (Coord.: G. Consolini)

A) Institutions involved in research activity

The Italian scientists/groups involved in research activities related with the IAGA Div. III themes "Magnetospheric Phenomena" work both at Universities and research istitutions (INAF, INGV), in detail:

Department of Physics of the University of L'Aquila

The Department of Physics of the University of L'Aquila is involved in several research activities mostly concerning the Solar-Terrestrial Physics and Magnetospheric Dynamics. In particular, the group is responsible of the SEGMA magnetometer array and of the Antarctic Geomagnetic Stations at Terra Nova Bay and Concordia.

Institute of Space Astrophysics and Planetology of the Istituto Nazionale di Astrofisica (INAF-IAPS)

The INAF-IAPS, located in Roma, is the new institute of the INAF, born in January 2012 from the merging the IASF-Roma and the IFSI-Roma. The IAPS includes a group of scientists, whose main research activities focus on the investigation of the space plasma physics in the context of magnetospheric systems and interplanetary medium. The group was and is still involved in several magnetospheric missions (e.g., CLUSTER, Double-Star, Bepi-Colombo,.....) and ground-based measurements (e.g., Super-DARN,...).

Istituto Nazionale di Geofisica e Vulcanologia

The Istituto Nazionale di Geofisica e Vulcanologia (INGV) conducts research in the fields of geophysics and volcanology. In the Sezione Geomagnetismo, Aeronomia e Geofisica Ambientale of INGV studies related to the Earth's magnetic field and its temporal variations as well to ionospheric physics are carried out.

Scientific Report

Main Scientific Themes

The magnetospheric studies in Italy are mainly focused on 1) the interaction between the solar wind and the planetary magnetospheres (mainly the Earth's magnetosphere), 2) the Earth's magnetospheric dynamics, 3) the processes responsible for the plasma transport in the magnetospheric regions, and 4) the Earth's magnetosphere-ionosphere coupling.

During 2010-2011 a particular interest has been devoted to the study of acceleration plasma processes, such as magnetic reconnection, which are responsible for the enhancement of plasma transfer and transport in the inner magnetospheric regions, and to the study of ULF waves and pulsations, of the emergence of complexity and the role of turbulence and intermittence in the global magnetospheric dynamics. These studies are mainly based on magnetic field and plasma data recorded on-board of magnetospheric spacecrafts (e.g., CLUSTER, Geotail, Double-Star,....) and on ground-based geomagnetic and ionospheric observatories. Using data coming from Cluster and Double Star TC-1, it has been possible to study the interaction of the solar wind with the terrestrial magnetosphere. In particular, research has been performed concerning processes like reconnection, interaction of interplanetary shocks with the magnetosphere. Such research has been funded by ASI in the framework of the contract I/023/09/0 which ended in June 2012. Using detailed Double Star observations of proton distribution functions and magnetic field data around a Flux Transfer Event (FTE) at the terrestrial magnetopause, useful information on the FTE generation mechanism have been obtained. These observations have suggested that two X lines active at the magnetopause are probably the generation mechanism of the observed FTE confirming the Lee and Fu FTE model of multiple reconnection X lines rather than the patchy reconnection proposed in the Russell and Elphic model.

Special attention has been paid to the study of the magnetic storms and substorms, which are two important manifestations of the interaction between the solar wind and the Earth's magnetic field. The relationship between these two phenomena is a key point in the study of the Sun-Earth connection and despite numerous studies conducted over the past years, there are still problems that are not completely solved. In this context, during the period 2011-2012, the relationship between these two classes of magnetospheric phenomena has been studied through an approach based on the information theory. In detail, the dependence of the information transfer on the conditions of the solar wind has been investigated. It has been found that the flow of information between these two classes of magnetospheric phenomena depends on the global level of magnetic

activity. The influence (in terms of information flows) of substorms on storms is maximum in the case of moderate/intermediate geomagnetic activity level while the driving of storms by substorms seems to be less effective during intense magnetic storms. Furthermore, studying the multiscale features of some large geomagnetic storms by applying the empirical mode decomposition technique it has been shown that there is an increase of dynamical complexity and multi-scale properties for intermediate geomagnetic activity levels. This increase seems to reflect the influence of substorms to storms that is maximum during these periods. In contrast, during low and high geomagnetic activity levels, the geomagnetic field fluctuations seem to be a consequence of a very stochastic dynamics, similar to the global dynamics that characterize a Markovian nonequilibrium relaxation process.

Using geomagnetic field data collected on the ground, the magnetospheric dynamics has been investigated analyzing the low frequency geomagnetic pulsations and the daily variation of the Earth's magnetic field. In detail, the analysis of magnetic data collected by geomagnetic observatories placed at high latitude all located within the polar cap but at different distance from the auroral oval (Antarctic and Artic) has allowed analyzing the diurnal variation of the magnetic field. The results have shown that the diurnal variation strongly depends on the position within the polar cap, both regarding its shape and its dependence on season, solar wind and magnetospheric parameters. At the same time, a statistical analysis of low frequency (1-5 mHz) pulsations, at different Antarctic stations situated along the same geomagnetic parallel (80S) within the polar cap, has allowed to study the azimuthal propagation of the observed signals; the results have shown that the pulsations are originated preferably in two different regions: around local geomagnetic noon and around local geomagnetic midnight; they are interpreted in term of cusp-related and geomagnetic tail-related phenomena, respectively; these signals are well coherent between station spaced up to 5 hours in magnetic local time. This research activity has been developed in the framework of PNRA (Piano Nazionale Ricerche in Antartide) together with another interesting study that has permitted us to investigate the transmission processes of upstream waves in the Earth's magnetosphere. The analysis, conducted also using data from Cluster and Geotail, has suggested that waves can transmit across the magnetopause flanks and tail lobes and, propagating along the outermost field lines, reach the ground at polar latitudes. The ULF magnetometer stations, which have allowed us to achieve positive results on the dynamic magnetospheric studies, have been installed in a new area. Indeed, as responsible of the Work Package "Retrieval of equatorial plasma mass densities by magnetometer arrays and cross-calibration" an Italian group of researchers has participated to the activities connected to the FP7 Project PLASMON ("A new, ground based data-assimilative model of the Earth's plasmasphere - a critical contribution to Radiation Belt modeling for Space Weather purposes", 2011-2014). In the framework of this project, a new latitudinal array of 25 ULF magnetometer stations (EMMA) extending from Italy to Finland (including SEGMA) has been created. A code has been developed to deduce in quasi-real-time the equatorial plasma mass density at different L-shells using the field line eigen-frequencies automatically determined from the EMMA array and the real-time solar wind parameters from the ACE satellite which are necessary for modelling the magnetospheric field by the Tsyganenko model. Data coming from ULF magnetometer stations have been used to analyze the possibility that electromagnetic signals can precede the occurrence of an earthquake. In particular, everal papers have been dedicated to the possible occurrence of electromagnetic signals preceding the L'Aquila earthquake (6 April, 2009) mostly in the ULF range. The results do not show, in general, any clear evidence for ULF precursors.

Finally, the Italian community is involved in the studies concerning the global solar wind - magnetosphere - ionosphere coupling and the inter-hemispheric magnetic conjugacy. Such studies are performed throughout the measurements provided by the SuperDARN network. In relation to this activity, in late 2012 – early 2011 the Dome C East radar has been successfully installed in the framework of a French-Italian co-operation (LPC2E-CNRS and INAF/IAPS). On the Italian side the participation to the SuperDARN project is financed by the Italian PNRA (Piano Nazionale Ricerche in Antartide). The context of solar wind - magnetosphere - ionosphere coupling includes also the analysis of SI (Sudden Impulses) events, which have been measured both at geostationary orbit and on the ground. This analysis, allowing careful comparisons with theoretical models of the magnetospheric field representation, has been useful to distinguish the contribution of magnetospheric and ionospheric current systems to the magnetospheric and geomagnetic perturbations.

Main Research Projects/Programmes

1. PNRA-PEA (U. Villante, resp.)
   Title: ULF pulsations, magnetospheric dynamics and Space Weather aspects at polar latitudes (2011-2013).

2. FP7-SPACE-2010.2.3-1 PLASMON (M. Vellante, resp.)
   Title: A new, ground based data-assimilative modeling of the Earth's plasmasphere - a critical contribution to Radiation Belt modeling for Space Weather purposes (2011-2014).

3. PNRA-PEA (L. Cafarella, resp.)
   Title: Osservazioni di geomagnetismo ed elettromagnetismo in Antartide

Funding Agencies

1. Italian National Programme for Antartica Research (PNRA)
2. Italian Space Agency (ASI)
3. European Commission (FP7-Space Call)

Organization of Conferences and Workshop of international relevance

- The International School of Space Science (ISSS) organized a Course on: "*Frontiers of Space Science: from Solar Activity to NEOs*" held in L'Aquila, (17 – 22 April 2011) directed by F. Berrilli, A. Celletti (University of Roma "Tor Vergata"), E. Flamini (Agenzia Spaziale Italiana of Roma) and D. Muller (European Space Agency of Paris).
- The ISSS organized a Course on "*Astrophysical and Space Plasmas*" held in L'Aquila, (2 – 7 September 2012) directed by A. Ferrari (CIFS, Torino & University of Torino), M. Tavani (INAF-IAPS & University of Roma "Tor Vergata"), B. Coppi (M.I.T., Cambridge , USA), R. Rosner (University of Chicago, USA)

Prizes (received by Italian scientists)

In the year 2011 Prof. Umberto Villante received the "Antonio Feltrinelli" Prize on Astronomy, Geodesy, Geophysics and applications, assigned by the Italian Accademia dei Lincei, for his relevant scientific activity in the field of interplanetary space and magnetospheric physics.

B) Goals, priorities and plans for future activities

In these next two years the scientific activities of the previous period 2011-2012 will continue. In particular, the Italian groups will devote to:

- the studies of the interaction of solar wind structures with the Earth's magnetosphere, with a special emphasis to the influence of the magnetospheric and ionospheric current systems in the manifestation of magnetic storms and substorms, as well as sudden impulses of the magnetospheric and ground field. Always in this framework a particular attention will be devoted to the investigation of the role of turbulence, intermittency and multifractal features of the geomagnetic disturbances and in situ satellite measurements (FP7 STORM project);
- the analysis of ULF waves (10-100 mHz) and geomagnetic pulsations in the solar wind, magnetosheath, magnetosphere, and at low and Antarctic latitudes. These studies will concentrate on the short and long term variations of the magnetospheric activity, through the analysis of long series of ULF magnetic measurements and geomagnetic pulsations, to investigate the possible influence on the different layers of the Earth's atmosphere. This research will benefit of the data from the new geomagnetic station at Talos Dome,;
- the remote sensing of the plasma mass density in the plasmasphere by the resonance frequency of geomagnetic field lines. This information, together with observations from a network of whistler receivers, will be used to create a dynamical model of the Earth's plasmasphere (FP7 PLASMON project);
- the study of plasma processes in the ionosphere conditioned to solar wind conditions. It is foreseen to install the second radar at Dome C, the Dome C radar North (Italian PNRA - project), which will fill existing gaps in latitudinal coverage of SuperDARN network in the Southern Hemisphere.

DIVISION IV:
"Solar Wind and Interplanetary Magnetic Field" (Coord.: R. Bruno)

Main goals of this division is to study the solar wind in its various aspects, from its generation low in the corona throughout its expansion into the heliosphere in order to gain a global view of the physical governing processes.

C) Institutions involved in research activity

INAF-OATO (Turin) – studies of the extended corona and the origin, acceleration and transient perturbations of the solar wind. PI-role in ESA/Solar Orbiter-METIS instrument

INAF-OAA & Astronomy Dpt. Univ. of Florence – studies of explosive phenomena, solar surface magnetism, solar instrumentation, and theory of the generation and transfer of polarised radiation in the solar atmosphere and the solar corona.

INAF-IAPS (Rome) – studies related to solar wind plasma, solar energetic particles and cosmic rays; design and realization of plasma sensors; management of IAPS Large Plasma Chamber for ionospheric payloads plasma environmental tests; CoPI-role in ESA/Solar Orbiter-SWA(Solar Wind Analyzer) instrument

INAF-OAR (Rome) – studies of solar irradiance; involved in the Conceptual Design Study of the EST; continuous management of the PSPT telescope (RISE project) for acquisition of photometric images of the whole Solar disk.

INGV (Rome) – Space-Weather studies with particular emphasis on ionospheric perturbations following the IMF-solar wind coupling with the Earth's magnetosphere

Physics Dpt., Univ. Roma Tor Vergata – studies of the dynamics of solar photosphere; involved in the Conceptual Design Study of the EST; leading role in a small space mission in response to ASI-Small Missions Program call; participation to space weather awareness programme.

Physics Dpt., Univ. L'Aquila – studies related to the solar wind properties;

Physics Dpt., Univ. Cosenza – theoretical studies on space plasma kinetic properties; solar wind data analysis and modeling;

INAF-OACt & Physics Dpt., Univ. Catania – studies of solar active regions and eruptive phenomena with data analysis and modeling; involved in the Conceptual Design Study of the EST.

D) Scientific Report

Main Scientific Themes

One of the central scientific interests of Division IV is the study of the solar wind and, more in general, the problem of MHD turbulence in space plasmas. In particular:

- Statistical investigation of the MHD invariants of magnetic fluctuations in the interplanetary space, particularly within flux ropes, have been performed;
- Other studies have been made on the possible role that turbulence and magnetic coherent structures advected by the wind have in the modulation of Solar Energetic Particles produced by impulsive events;
- Finally, the role of turbulence in solar wind heating has been evaluated estimating the energy transferred across the inertial range of the spectrum of the fluctuations to be dissipated at ion and/or electron scales. In addition, theoretical speculations, based on the available data, have been proposed about the nature of the fluctuations within the kinetic range.

Within the participation to SOLAR ORBITER-SWA, the involvement is both managerial and scientific. In particular, the scientific activity mainly focusses on the use of numerical simulations apt to produce the ions and electrons velocity distributions for different solar wind conditions. The main goal is that of setting up the best measurement strategy to be adopted by SWA consistently with the DPU performances and the available telemetry.

Another important scientific themes of Div. IV is the dynamics of solar photosphere, particularly the convective regime present in the outer layers of the sun. This topic is tackled by means of experimental techniques, images analysis procedures and numerical simulations:

- Experimental techniques: realization of solar image acquisition systems based on CCD and CMOS detectors for panoramic Fabry-Pèrot based monochromators (IBIS@DST/NSO) and achievement of observational campaigns at various ground-based telescope often coordinate with spatial instrumentation.
- Image analysis: realization of automatic procedure of image segmentation (dynamic and optimal threshold, Medial Axis Transform, skeleton, spatial operators) and investigation of statistical tools for pattern analysis.
- Numerical simulation: realization of dynamical models of passive magnetic advection.

Efforts have been devoted to study the acceleration and propagation of solar energetic particles (SEPs) in the interplanetary space as well as their interaction with the Mercury's environment. Moreover, the general features of the cosmic ray modulation, such as most of the step-like decreases and the Gnevyshev Gap phenomenon, have been investigated through non stationary data processing methods (e.g., empirical mode decomposition and wavelet analyses) in association with the variability of solar activity and the interplanetary magnetic field. The same analyses have been applied to the photospheric magnetic field data to understand the spatio-temporal dynamics of the solar magnetic field.

Div. IV is also active in Space Weather. This research, mainly performed by means of GPS sampling measurements at 50 Hz, allows the study of the ionospheric irregularities causing scintillation on the trans-ionospheric signals transmitted by GNSS satellites. The experimental observations can provide information useful for purely scientific advancements and for improve the predicting capabilities for Space Weather purposes. As a matter of fact, the original development of scintillation models needs to characterize the ionosphere also as function of the interplay between IMF-solar wind and ionosphere. Another topic on which this Division is working on is about the understanding of the long-term variation of the ionosphere: the investigation of upper atmosphere secular trends, eventually connected to anthropogenic effects (greenhouse effect) and/or natural causes (next excursion or inversion of the geomagnetic field).

Main Research Projects/Programmes

SOLAR ORBITER: Supporto Scientifico per la Realizzazione degli Strumenti METIS e SWA_DPU. The related ASI contract for phase A-B1 ended in September 2011. The new contract for phase B2-C1 started in May 2012 and will last 3 years.

EST: European Solar Telescope Conceptual Design Study financed by the European Commission

SPARC: Space Awareness for Critical Infrastructure: European Commission - Directorate-General Home Affairs

BEPI-COLOMBO: BepiColombo (SIMBIOSYS, ISA, PHEBUS, MEA, MIXS, SIXS) – The related ASI contract for phase B2/C will end in June 2013

GRAPE (GNSS Research and Application for Polar Environment) Expert Group funded by SCAR (www.grape.scar.org)

Funding Agencies

- European Commission: FP7 and Directorate-General
- ASI: Italian Space Agency
- SCAR: Scientific Committee for Antarctic Research

Organization of Conferences and Workshop of international relevance

- EWASS2012 Symposium 8 - The Sun: new tools and ideas in observational solar astrophysics

- EWASS2012 Special Session 11 - From solar physics to astrophysics: the Sun as Rosetta stone for understanding astrophysical processes
- SOC-5th Earth-Sun-Exploration conference, hold in January 2013
- Co-Chair Solar Wind XIII-2012-Session II – "The dynamical behavior of the interplanetary medium throughout the heliosphere, including large- and small-scale structures, the evolution of disturbances, dissipative processes, including turbulence, and energetic particles";

Prizes/Recognitions
- Daniele Telloni (INAF-OATO) received the Second Edition (2011) of Premio Ferraro Award, for the best PHD thesis on MHD studies in astrophysical or laboratory plasmas
- The Minor Planet Center (MPC) under the auspices of the IAU Division III designates the asteroid 7918 = 1981 EJ22 with the name Berrilli.

E) Goals, priorities and plans for future activities *(next two years)*

SOLAR ORBITER: the ASI scientific contract "Supporto Scientifico per la Realizzazione degli Strumenti METIS e SWA_DPU nelle fasi B2-C1" started in May 2012 and will end in May 2015, after the delivery of the Flight Model to ESA. In the meantime, the scientific team will support the industry during the production of the required deliverables.

BEPI-COLOMBO: recently, because of financial difficulties, ASI decided not to support further activities related to Bepi-Colombo not having a PIship or CoPIship involvement in this program. Despite that, the scientific collaboration on energetic particles will continue as much as possible on the simulation of the propagation of SEPs in Mercury's magnetosphere as well as of the flux of secondary particles produced by interaction with the planetary surface. In addition, evolution of SEP events of different intensities will be studied for the correlation between the observations of the SEP radiation monitor, designed for the LISA Pathfinder mission, and the particle fluxes charging the gravitational sensor test masses.

STORM(FP7): Solar system plasma Turbulence: Observations, inteRmittency and Multifractals. This project will use large datasets instead of focusing on particular events, to advance the understanding of fundamental processes such as the turbulent energy transfer, the intermittent turbulence and multifractals in astrophysical plasmas.

SOLARNET(FP7): High Resolution Solar Physics Network: is the solar successor of OPTICON, and start in April 2013. Main objectives are to provide access to European Solar telescopes and instruments, and to develop data pipelines and innovative instrumentations such that science-ready data is easily available for users of the ACCESS program.

MISW(FP7): Mitigation of space weather threats to GNSS services (2013-2015)

DIVISION V:
"Geomagnetic Observatories, Surveys and Analyses" (Coord.: A. Meloni)

PART A) GEOMAGNETIC OBSERVATORIES

Observatory	IAGA code	Latitude	Longitude	Elev (a s.l. m)
L'Aquila	AQU	42°23'N	13°19'E	682
Castello Tesino	CTS	46°03'N	11°39'E	1175
Mario Zucchelli	TNB	74°42'S	164°6'E	30
Concordia (*)	DMC	75°06'S	123°21'E	3200
Duronia	DUR	41°39'N	14°28'E	918

Magnetic Observatories operated by INGV, Italy.
(*) in cooperation with France, IPEV

L'AQUILA

The Observatory started its activity in 1958 and yearbooks from 1960 onwards were published; last published as now is 2009. Declination and Inclination measurements are carried out by means of an optical theodolite equipped with a fluxgate magnetometer. The horizontal and vertical intensities are determined associating the measured I value to the total field measurements from a proton precession magnetometer (PPM). A PPM for the measurement of F and two fluxgate magnetometers for the measurement of the H, D and Z component variations are used for time variations; both instruments have a 0.1 nT resolution; original sampling rate is 1 Hz, then the data are filtered with a Gauss filter and recorded at 1 min. L'Aquila is an INTERMAGNET Observatory and for this observatory, K magnetic activity indices, SSC, SFE and SI notifications are made.

On April 6th 2009, L'Aquila and surroundings, were struck by a terrible M=6.2 earthquake that destroyed the city and killed 309 people. The Observatory, located near Preturo, ten km north-west from the city, was not severely affected by earthquake but the land on which the observatory buildings: a) absolute measurements, b) variometers, c) proton precession vector magnetometer, d) laboratory and e) general services, were built, was asked back by L'Aquila University (the original landlord) for new student housings. As now we are still waiting for an official request for moving out.

CASTELLO TESINO

The Observatory of Castello Tesino (Northern Italy) is located about fifty-five km East from Trento. It has been working almost continuously since 1964. It works now as an automatic Observatory and consists of three buildings, completely non-magnetic; a) laboratory for small repairs, b) absolute measurement equipments, and c) the automatic digital variometer system. Since some disturbance affected the Observatory variometer house, recently a new small wooden building was built at a safe distance, in order to avoid this problem. After a trial period, the old house was finally left to the end of 2011. Two systems are currently working simultaneously in the new wooden building.

Declination and Inclination measurements are carried out by means of an optical theodolite equipped with a fluxgate magnetometer. The horizontal and vertical intensities are determined associating the I value to the total field measurements made by a PPM. A PPM for the measurement of F and a fluxgate magnetometer for the measurement of the H, D and Z component variations are used for time variations; both instruments have a 0.1 nT resolution; the original sampling rate is 1 Hz, then the data are filtered with a Gauss filter and recorded at 1 min. Recently a recovery of several arrear yearbooks was accomplished. At this time all yearbooks from 1996 to 2009 were completed, all regularly published as standard booklets. From 2010 yearbooks will not be printed but are available on the website of INGV.
At this time 2010 and 2011 are available on the INGV website (http:// roma2.rm.ingv.it/en/facilities/geomagnetic_observatories) where the monthly bullettins and the yearbooks are also available.

TERRA NOVA BAY (MARIO ZUCCHELLI STATION)

This Observatory was installed during 1986-87 austral summer at the Italian Antarctic Mario Zucchelli Station. In the first years geomagnetic field measurements were carried out only during summer expeditions. Since 1991 the recording was implemented with an automatic acquisition system operating through the year. Declination and Inclination measurements are carried out by means of an optical theodolite equipped with a fluxgate magnetometer. The horizontal and vertical components are determined associating the I value to the total field measurement made by a proton precession magnetometer. A proton precession magnetometer for the measurement of F and a fluxgate magnetometer for the measurement of the H, D and Z component variations, are used for time variations; both instruments have a 0.1 nT resolution; the original sampling rate is 1 Hz, then the data are filtered with a Gauss filter and recorded at 1 min.

When absolute measurements are available (summer) results, including hourly mean data, are published on pdf booklets (so far completed up to 2010-2011). Results are available at INGV website: http://roma2.rm.ingv.it/it/risorse/banche_dati/32/dati_osservatorio_di_stazione_mario_zucchelli/46/annuari.

CONCORDIA

In 1994 France and Italy started a program for opening a permanent scientific station on the high East Antarctic plateau at Dome C at 3280 m asl. The national Antarctic Programs (IPEV and PNRA respectively) started logistic, technical and scientific activities at Dome C that were initiated with the realization of a summer camp. The permanent Base opened in 2005

The observatory is constituted by two shelters, a) variometer shelter and b) absolute measurements shelter, at a distance of about 300 m from the old field camp. Operations started regularly at the end of 2004. Variations of the Earth's magnetic field are monitored by a three-axis fluxgate magnetometer along three orthogonal vector components oriented with respect to the local magnetic meridian. The intensity of the field is measured by an Overhauser magnetometer. Absolute measurements are performed during the whole year.

The flux-gate variometer, a suspended DMI magnetometer, and an Overhauser magnetometer operate for the acquisition of the geomagnetic field intensity and components time variations. The instrument sensors are located in a cave under the shelter in order to keep the sensors at a constant temperature (about -40°C). In the absolute shelter D, I, F absolute measurements are carried out according to standard observatory practice. Data quality and standard requirements have allowed the inclusion of Concordia as an INTERMAGNET Observatory.

DURONIA

Since the end of 2007 an electromagnetic field monitoring station has been in operation in at Duronia (Lat. 41°39’N, Lon. 14°28’E). The station was created in the framework of a project headed by the Abruzzo region. The main target was to create a network of stations to monitor the environmental electromagnetic signals in the Adriatic area, in the frequency band from 0.001Hz to 100kHz (ULF-ELF-VLF). The peculiarity of Duronia installation is the site low electromagnetic background noise and the low noise of the instrumentation. A target will also be the long-term monitoring of local magnetic field anomalies possibly related to the local geodynamical processes. After the 2009 L’Aquila earthquake Duronia station was completed to include a full geomagnetic equipment to follow IAGA requirements. On August 28, 2012 Duronia has been accepted as an INTERMAGNET Magnetic Observatory (IMO) .

GEOMAGNETIC STATIONS

Four Geomagnetic time varying stations are currently in operation in Italy.

By the end of 2007 magnetic field time variations are in fact also recorded in Lampedusa Island South-West of Sicily (Lat. 35° 31’ N, Lon. 12° 32’ E). From the beginning of 2007 values of the Earth’s magnetic field were recorded quite regularly. A small stone building with a wooden roof, located within a natural reserve, in an area characterized by a low electromagnetic noise, host the magnetic instruments. Electric current is provided by photovoltaic cells and data transmission is achieved through GSM connection. The little hut hosts only the instruments electronic units; sensors are buried in thermally isolated shafts in the area in front of the building. Total intensity F is measured by an Overhauser magnetometer, while the variations of the magnetic field components H, D and Z are measured by two fluxgate vector magnetometers. Data acquisition is made through a device made on purpose at INGV to avoid the use of a personal computer. Data can be found in the INGV website

(http://roma2.rm.ingv.it/it/risorse/osservatori_geomagnetici) where the monthly bulletins are also available.

A geomagnetic station was installed in Cittareale (Lat. 42.62° N - Long. 13.16° E , 960 m asl) on 23 March 2011 and from that time has been recording continuously three components plus scalar intensity of the geomagnetic field. Its objective is not only just geomagnetic but also to eventually detect any anomaly associated with earthquakes, the place of installation being a seismic area with some frequent seismicity.

Another magnetometric system (formed by a couple of vectorial and scalar magnetometers) is running aboard of the seafloor GEOSTAR-class cabled Observatory (called NEMO-SN-1) which was deployed on 9 June 2012, 25 km offshore Catania (Sicily) (Lat. 37.54765oN, Lon. 15.3975oE, 2010 m depth). Data are streaming on the web through Catania harbor centre of INFN (National Institute of Nuclear Physics). The objective of the magnetic instruments is twofold: a) the magnetic monitoring of the seafloor environment in order to extend the national land network to the sea, b) to assist the other geophysical and oceanographic monitoring in order to check if there are magnetic anomalies eventually associated to extreme events typical of this area such as Etna volcanic eruptions and earthquakes.

Recently, a new multiparametric station including magnetic measurements was set up in Varese Ligure (La Spezia). Currently, the magnetic measurements have been recently analyzed and the results can be considered acceptable. The goal is to start the recording activity in the summer of 2013.

PART B) MAGNETC SURVEYS

The spatial variation of the geomagnetic field and details on local secular variation over Italy, is achieved by means of a national magnetic network of measuring points. This complements the observatory network referred above. The Italian repeat station network consists of more that 110 points. INGV has the task to make measurements and data elaboration. The measurements are generally carried out by means of Declination/Inclination theodolites and total intensity magnetometers; a gyroscope theodolite is used to check and establish new azimuth marks when necessary. The information on the more rapid time variations, both for the diurnal variation and for possible irregular perturbations, is taken at the observatories of L'Aquila and Castello Tesino, in northeast Italy. Moreover, for selected areas, other temporary magnetic time recording stations, properly displaced to have nearly a total coverage of the Italian territory, are installed during the survey. The last full survey was planned for the 2010.0 date. It was competed in November 2010 and consisted of 131 repeat stations, with 55 km average spacing, over Italy, and included also stations surveyed in Albania, Malta and Corsica. After data elaboration was completed a 1/2000,00 cartography for F, H, Z and D was realized. All maps are now published together with a CD rom and interactive program to display maps and magnetic field values across all Italy. A partial survey was planned for the 2012.0 date. This most recent partially survey, that was competed in December 2012, consisted of 25 repeat stations. At this time data elaboration is completed and D, I and F magnetic element values on all stations have been obtained. Data will be soon compared with the 1/2000,00 cartography for F, H, Z and D recently published together with a CD rom and interactive program to display maps and magnetic field values across all Italy.

PART C) OTHER ACTIVITIES RELEVANT TO DIVISION V

Geomagnetic Regional Reference Models: As well known magnetic modeling provides scientific communities with updated information on magnetic field elements as the output of computer programs. They are based on updated measurements taken in the region under modelling. An analytical expression, a second order polynomial, in latitude and longitude for the field elements was determined and coefficients for 2010.0 with average secular variation over the period 2005-2010, were obtained for Italy. Moreover the new maps for Italy, for D, F, H and Z at the epoch 2010.0, were also produced. ARM (Antarctic Reference Model) is a 3D model for the geomagnetic field over Antarctic regions. It is based on the Spherical Cap Harmonic Analysis and allows the computation of the main field and its secular variation over these regions from 1960 onwards. Another regional model with similar characteristics of ARM has been developed to model the geomagnetic field of Southern Italy and Albania (including the confining sea) since 1990. Both models ARM and this latter model have been now updated to include year 2010 with prediction to 2012.

Crustal magnetic field investigations. The study of tectonics can take important advantages by the use of magnetic field surveys that allow the determination of the crustal field contribution. We report here some recent contributions in this field. High spatial resolution aeromagnetic surveys were undertaken, especially at INGV, by the use of helicopter born magnetometry and data interpretation in volcanic magnetized areas. During the recent cruise MAVA2011, performed on the R/V Urania, a new magnetic dataset was obtained from seamounts Vavilov and Marsili. At the Eolie islands archipelago, in the

Tyrrhenian, surveys and studies were made on Salina island and Volcano island. In the Tyrrhenian Sea, in the marine facing on Panarea and Stromboli islands, an high resolution magnetic survey (PANSTR12) was carried out using an Italian Navy ship and marine magnetometers with Overhauser effect sensors.

A group at the Università of Camerino has undertaken analysis and interpretation of marine and in particular devoted to the realization of kinematic models for the Mediterranean and the Atlantic.

“Interdivisional Commission on History” (Coord.: A. De Santis)

IAGA Education and Outreach activities 2011-2013

INGV Open day (“Open Science for Open minds”) 21 May 2011. Exhibits on Geophysics, Geomagnetism and Paleomagnetism.

SCIENZA APERTA (“Open Science”) March 2012 (all INGV centers). In particular: different Exhibits on Geomagnetism and Paleomagnetism (INGV, Rome) and Geomagnetic Prospection (INGV, Catania)

SHINE! (Scientist are Humans - Interactive Night of Entertainment) Sept. 2012. Outreach Events, seminars, museums, exhibits in 24 Italian cities. INGV participated initiatives in all INGV centers.

Realization of Podcast: “Stromboli: a small volcano but a great natural laboratory” by INGV – Catania. This Podcast shows the magnetic monitoring of Stromboli volcano. 2012.

Series of seminars given by INGV researchers (Dep. Rome 2) on Space Weather, Ionospheric Physics at the University La Sapienza, Rome Dec. 2012- Jan. 2013.

SCIENTIFIC PUBLICATIONS

DIVISION I:
"Internal Magnetic Field"

2011:

1. Agnini C., E. Fornaciari, L. Giusberti, P. Grandesso, L. Lanci, V. Luciani, G. Muttoni, D. Rio, C. Stefani, H. PŠlike and D.J.A. Spofforth, (2011) Integrated bio-magnetostratigraphy of the Alano section (NE Italy): a proposal for defining the Middle-Late Eocene boundary, *Geol. Soc. Am. Bull*. 123, 5/6, 841–872; doi: 10.1130/B30158.1.
2. Airoldi G., Muirhead J.D., Zanella E., White J.D.L., Emplacement process of Ferrar Dolerite sheets at Allan Hills (South Victoria Land, Antarctica) inferred from magnetic fabric. *Geophysical Journal International*
3. Benhamou S., Sudre J., Bourjea J., Ciccione S., De Santis A., and Luschi P., The role of geomagnetic cues in green turtle open sea navigation, *PLoS One*, vol. 6, N.10, 1-11, 2011.
4. Barraclough D.R., De Santis A., (2011) Repeat stations activities, in *Geomagnetic Observations and Models*, M. Mandea and M. Korte (Ed.s), IAGA Special Sopron Book Series, vol. 5, 45-55, Springer.
5. Capraro L., Massari, F., Rio, D., Fornaciari, E., Backman J., Channell J.E.T., Macrì, P., Prosser, G. and Speranza, F. (2011), Chronology of the Lower-Middle Pleistocene succession of the south-western part of the Crotone Basin (Calabria, Southern Italy). *Quat. Sci. Rev*., 30, 1185-1200, doi: 10.1016/j.quascirev.2011.02.008.
6. Cicchino A., Zanella E., De Astis G., Lanza R, Lucchi F., Tranne C.A., Airoldi, G., Mana S., (2011). Rock magnetism and compositional investigation of Brown Tuffs deposits at Lipari and Vulcano (Aeolian Islands–Italy). *Journal of Volcanology and Geothermal Research*, DOI 10.1016/j.volgeores.2011.08.007
7. Cifelli F., Minelli L., Rossetti F. & Mattei M., 2011. The emplacement of the Late Miocene Monte Capanne intrusion (Elba Island, Central Italy): constraint from magnetic fabric analyses. *Int. J. Earth Sci*., doi 10.1007/s00531-011-0701-z.
8. Cosentino, D., Bertini, A., Cipollari, P., Florindo, F., Gliozzi, E., Grossi, F., Lo Mastro S., and Sprovieri M. (2011). Orbitally-forced palaeoenvironmental and palaeoclimate changes in the late post-evaporitic Messinian stage of the central Mediterranean Basin. *Geol. Soc, Am, Bull*, 2011B30462.1, doi: 10.1130/B30462.1
9. D'Ajello Caracciolo, F., A. Pignatelli, F. Speranza and A. Meloni (2011), A re-evaluation of the Italian historical geomagnetic catalogue: implications for paleomagnetic dating at active Italian volcanoes. *Solid Earth*, 2, 65-74.
10. Dela Pierre, E. Bernardi, S. Cavagna, P. Clari, R. Gennari, A. Irace, F. Lozar, S. Lugli, V. Manzi, M. Natalicchio, M. Roveri, D. Violanti (2011). The record of the Messinian salinity crisis in the Tertiary Piedmont Basin (NW Italy): The Alba section revisited. *Paleogeogr. Paleoclimatol. Palaeco.*, vol. 310, p. 238-255, ISSN: 0031-0182
11. De Santis A., Qamili E., Cianchini G. (2011) Ergodicity of the recent geomagnetic field, *Phys. Earth Plan. Inter*., vol. 186, 103-110.
12. Di Mauro, D., L. Alfonsi, V. Sapia, L. Nigro and M. Marchetti (2011), First Field Magnetometer Investigation at the Phoenician Island of Mozia (Trapani), Northwestern Sicily: Preliminary Results, *Archaeological Prospection*, Volume 18, Issue 3, pages 215–222, DOI: 10.1002/arp.41
13. D'Oriano F., L. Angeletti, L. Capotondi, M. A. Laurenzi, M.Taviani, L.Torelli, T. Trua, L. Vigliotti and N. Zitellini. (2011). Coral Patch and Ormonde seamounts as a product of the Madeira hotspot, Eastern Atlantic Ocean. *Terra Nova*, Vol. 22 (6), 494-500.
14. Galeotti, S., Lanci, L., Florindo, F., Naish, T., Sagnotti, L., Sandroni, S., Talarico, F. (2011). Cyclochronology of the Eocene-Oligocene transition from a glacimarine succession off the Victoria

Land coast, Cape Roberts Project, Antarctica. *Palaeogeogr., Palaeoclimatol., Palaeocol.*, doi:10.1016/j.palaeo.2011.08.011.

15. Gioia D., Schiattarella M., Mattei M. & Nico G. (2011). Quantitative morphotectonics of the Pliocene to Quaternary Auletta basin, southern Italy. *Geomorphology*, 134, 3-4, 26 –34, 3.doi:10.1016/j.geomorph.2011.07.009.

16. Gurioli L., Zanella E., Gioncada A., Sbrana A. The historic eruption of "Breccia di Commenda" (Vulcano, Italy). *Bulletin of Volcanolology.*

17. Iaccarino S. M., A. Di Stefano, L. M. Foresi, E. Turco, N. Baldassini, A. Cascella, S. Da Prato, L. Ferraro, R. Gennari, F. J. Hilgen, F. Lirer, R. Maniscalco, R. Mazzei, F. Riforgiato, B. Russo, L. Sagnotti, G. Salvatorini, F. Speranza, M. Verducci (2011) High-resolution integrated stratigraphy of the upper Burdigalian-lower Langhian in the Mediterranean: the Langhian historical stratotype and new candidate sections for defining its GSSP. *Stratigraphy*. vol. 8, nos. 2-3, pp. 199-215.

18. Kirscher U., Aubele K., Muttoni G., Ronchi A. and Bachtadse V. (2011). Paleomagnetism of Jurassic Carbonate Rocks from Sardinia – No Indication of Post Jurassic Internal Block Rotations. *Journalof Geophysical Research.*

19. Lanci L., Delmonte B., Maggi V., Kent D.V., Biscaye P.E., Petit J-R. (2011). Magnetization of polar ice: a measurement of terrestrial dust and extraterrestrial fallout, *Quaternary Science Reviews*

20. Lesti, C., Porreca, M., Giordano, G., Mattei, M., Cas, R., Wright, H., Viramonte J. (2011) - High temperature emplacement of the Cerro Galán and Toconquis Group ignimbrites (Puna plateau, NW Argentina) determined by TRM analyses. *Bulletin of Volcanology*. 73,1535-565. DOI 10.1007/s00445-011-0536-2.

21. Manzi V, Gennari R, Lugli S, Roveri M. and Schreiber B.C. (2011). The Messinian "Calcare di Base" (Sicily, Italy) revisited. *Geol. Soc. Am. Bull.*, vol. 123, p. 347-370, ISSN: 0016-7606, doi: 10.1130/B30262.1

22. Mattei M., Cifelli F., Muttoni G., Zanchi A., Berra F., Mossavvari F., Eshraghi S.A. Neogene block-rotation in Central Iran: evidence from paleomagnetic data. *GSA Bulletin.*

23. Molina, E., Alegret, L., Apellaniz, E., Bernaola, G., Caballero, F., Dinarès-Turell, J., Hardenbol, J., Heilmann-Clausen, C., Larrasoaña, J.C., Luterbacher, H., Monechi, M., Ortiz, S., Orue-Etxebarria, X., Payros, A., Pujalte, V., Rodríguez-Tovar, F.J., Tori, F.and Tosquella, J. (2011), The Global Standard Stratotype-section and Point (GSSP) for the base of the Lutetian Stage at the Gorrondatxe section (Spain). *Episodes*, 32, 86-108.

24. Muttoni G., G. Scardia, D.V. Kent, E. Morsiani, F.Tremolada, M. Cremaschi, C. Peretto. First dated human occupation of Italy at ~0.85 Ma during the late Early Pleistocene climate transition. (2011). Earth and Planet. Sci. Lett. 307, 241–252.

25. Nomade, S., Muttoni, G., Guillou, H., Robin, E., Scardia, G. (2011). First 40Ar/39Ar age of the Ceprano man (central Italy). *Quaternary Geochronology*, 6, 453–457.

26. Omodeo Salè S., Gennari R., Lugli S., Manzi V., Roveri M.. Tectonic and climatic control on the Late Messinian sedimentary evolution of the Nijar Basin (Betic Cordillera, Southern Spain): implications for the salinity crisis in the Mediterranean. *Basin Research*

27. Pavia M., Zunino M., Coltorti M., Angelone C., Arzarello M., Bagnus C., Bellucci L., Colombero S., Marcolini F., Peretto C., Petronio C., Petrucci M., Pieruccini P., Sardella R., Tema E., Villier B., Pavia G. (2011). Stratigraphical and paleontological data from the Early Pleistocene Pirro 10 site of Pirro Nord (Puglia, south-eastern Italy). *Quaternary International*, 1-16, doi: 10.1016/j.quaint.2010.12.019.

28. Payros, A., Dinarès-Turell, J., Bernaola, G., Orue-Etxebarria, X., Apellaniz, E. and Tosquella, J. (2011), On the age of the Early/Middle Eocene boundary and other related events: cyclostratigraphic refinements from the Pyrenean Otsakar section and the Lutetian GSSP. *Geol. Mag.*, 148, 442-460, doi: 10.1017/S0016756810000890.

29. Roberts, A.P., Chang, L., Rowan, C., Horng, C.-S., Florindo, F., (2011). Magnetic properties of sedimentary greigite (Fe_3S_4): An update. *Reviews of Geophysics*, 49, RG1002,doi: 10.1029/2010RG000336

30. Roberts, A.P., Florindo, F., Giuliana Villa, Liao Chang, Luigi Jovane, Steven M. Bohaty, Juan C. Larrasoaña, and John D. Fitz Gerald (2011), Magnetotactic bacterial abundance in pelagic marine

environments is limited by availability of dissolved iron and organic carbon flux, *Earth Planet. Sci. Lett*., 310, 441-445.

31. Sagnotti L. (2011), Magnetic Anisotropy, in: Encyclopedia of Solid Earth Geophysics, (Editor Harsh K. Gupta), Springer, 1540 pp., p. 717-728.
32. Sagnotti L., Smedile A., De Martini P.M., Pantosti D., Speranza F., Winkler A., Del Carlo P., Bellucci L.G. and Gasperini L. (2011), A continuous paleosecular variation record of the last 4 millennia from the Augusta Bay (Sicily, Italy). *Geophysical Journal International*, 184, 191-192, doi:10.1111/j.1365 246X.2010.04860.
33. Sagnotti, L., Macrì P., Lucchi, R., Rebesco, M., and Camerlenghi A. (2011), A Holocene paleosecular variation record from the northwestern Barents Sea continental margin, *Geochem. Geophys. Geosyst*., 12, Q11Z33, doi:10.1029/2011GC003810.
34. Saragnese F., L. Lanci and R. Lanza, (2011) Nanometric-sized atmospheric particulate studied by magnetic analysis, *Atmospheric Environment*, 45, 450-459.
35. Speranza, F., P. Macrì, D. Rio, E. Fornaciari, and C. Consolaro (2011), Paleomagnetic evidence for a post-1.2 Ma disruption of the Calabria terrane: consequences of slab break-off on orogenic wedge tectonics. *Geol. Soc. Am. Bull*. 123, 925-933, doi:10.1130/B30214.1.
36. Tema E. & Kondopoulou D. (2011). Secular variation of the Earth's magnetic field in the Balkan region during the last eight millennia based on archaeomagnetic data. *Geophysical Journal International*, 186, 2, pp.603-614, doi: 10.1111/j.1365246X.2011.05088.x**.**
37. Tema E. (2011). Archaeomagnetic Research in Italy: Recent achievements and future perspectives. In: The Earth's Magnetic Interior, IAGA Special Sopron Book Series, Volume 1, Chapter 15, pp. 213-233. Eds: Petrovsky, E., Herrero-Bervera, E., Harinarayana, T., Ivers, D., Springer, doi: 10.1007/978-94-007-0323-0-15.
38. Turco E., Cascella A., Gennari R., Hilgen F.J., Iaccarino S.M. and Sagnotti L. (2011), Integrated stratigraphy of the La Vedova section (Conero Riviera, Italy) and implications for the Burdigalian/Langhian boundary, *Stratigraphy*, vol. 8, nos. 2-3, pp. 89-110.
39. Venuti, A., Florindo, F., Caburlotto, A., Strada, E., Talarico, F., Hillenbrand, C.-D., Hounslow, M. (2011), Late Quaternary sediments from deep-sea sediment drifts on the Antarctic Peninsula Pacific margin: Climatic control on provenance of minerals, *J. Geophys. Res*., 116, B06104, doi:10.1029/2010JB007952.
40. Vigliotti, L., A. Asioli, C. Bergami, L. Capotondi & A. Piva. 2011. Magnetic properties of the youngest sapropel S1 in the Ionian and Adriatic Sea: inference for the timing and mechanism of sapropel formation. *Ital.J.Geosci.*, Vol. 130, No. 1. 106-118. DOI: 10.3301/IJG.2010.29
41. Zanella E., Cicchino A., Lanza R.(2011) Composite detrital and thermal remanent magnetization in tuffs from Aeolian Islands (southern Tyrrhenian Sea) revealed by magnetic anisotropy. *International Journal of Earth Sciences*., DOI 10.1007/s00531-011-0651-5
42. Zanella E., Ferrara E., Bagnasco L., Ollà A., Lanza R., Beatrice C., Magnetite grain-size analysis and sourcing of Mediterranean obsidians. *Journal of Archaeological Science.*

2012:

1. Alfonsi L., F.R. Cinti, D. Di Mauro, S. Marco (2012), Archaeoseismic Evidence of Two Neolithic (7,500–6,000 B.C.) Earthquakes at Tell es-Sultan, Ancient Jericho, Dead Sea Fault. Seismological Research Letters, 83, 4, 639-648.

2. Cascella A., Lirer F., Cesarano M., Casciello E. & Pappone G. (2012). Integrated stratigraphy of middle-late Miocene synorogenic deposits of the southern Apennines chain: the San Bartolomeo Flysch. Riv. It. Paleont. Strat., 118, 2, 295-311.

3. Cianchini G., De Santis A., D. R. Barraclough, L. X. Wu, and K. Qin, (2012). Magnetic transfer function entropy and the 2009 Mw = 6.3 L'Aquila earthquake (Central Italy), *Nonlin. Processes Geophys*., 19, pp. 401-409, doi:10.5194/npg-19-401-2012

4. Cifelli, F., Minelli, L., Rossetti, F. & Mattei, M. (2012) - The emplacement of the late Miocene Monte Capanne intrusion (Elba island, Central Italy): constraint from magnetic fabric analyses. *International Journal of Earth Sciences.* 101, 863–877, DOI: 10.1007/s00531-011-0701-z.

5. De Santis A., E. Qamili, G. Spada, P. Gasperini, (2012). Geomagnetic South Atlantic Anomaly and global sea level rise: a direct connection?, *J. Atm. Solar-Terr. Phys.*, 74, 129-135.

6. Di Chiara, A., Speranza, F. and M. Porreca (2012). Paleomagnetic secular variation at the Azores during the last 3 ka, *J. Geoph. Res.*, 117, B07101, DOI:10.1029/2012JB009285

7. Dinarès-Turell, J., V. Pujalte, Stoykova, K., Baceta, J.I., & Ivanov M. (2012). The Paleocene "top chron C27n" transient greenhouse episode: evidences from marine pelagic Atlantic and peri-Tethyan sections. *Terra Nova.* Article first published online: 1 AUG 2012 doi: 10.1111/j.1365-3121.2012.01086.x

8. Galeotti, S., L. Lanci, F. Florindo, T. Naish, L. Sagnotti, S. Sandroni and F. Talarico (2012). Cyclochronology of the Eocene-Oligocene transition from a glacimarine succession off the Victoria Land coast, Cape Roberts Project, Antarctica. *Palaeogeogr., Palaeoclimatol., Palaeocol*., 335-336, 84-94, doi:10.1016/j.palaeo.2011.08.011

9. Lucifora, S., F. Cifelli, M. Mattei, L. Sagnotti, D. Cosentino and A.P. Roberts (2012), Inconsistent magnetic polarities in magnetite- and greigite-bearing sediments: understanding complex magnetizations in the late Messinian in the Adana basin (Southern Turkey), *Geochem. Geophys. Geosyst*. Vol. 13, No. 10, doi: 10.1029/2012GC004248.

10. Maffione M., S. Pucci, L. Sagnotti and F. Speranza (2012), Magnetic fabric of Pleistocene continental clays from the hanging-wall of an active low-angle normal fault (Altotiberina Fault, Italy), *Int. J. Earth Sci*. (Geol. Rundsch.), 101, 849-861, DOI 10.1007/s00531-011-0704-9

11. Mattei M., Cifelli F., Muttoni G., Zanchi A., Berra F., Mossavvari F., Safar Ali E. (2012) - Neogene block-rotation in Central Iran: evidence from paleomagnetic data. *Geological Society American Bulletin, (The Geological Society of America, Boulder, USA).* doi:10.1130/B30479.1

12. Mercuri, A.M., Bandini Mazzanti M., Torri P., Vigliotti L., Bosi G., Florenzano A., Olmi L., Massamba N's I. 2012. A marine/terrestrial integration for mid-late Holocene vegetation history and the development of the cultural landscape in the Po valley as a result of human impact and climate change. *Veget Hist Archaeobot*; DOI 10.1007/s00334-012-0352-4

13. Nostro C., Amato A., Cultrera G., Margheriti L., Selvaggi G., Arcoraci L., Casarotti E., Di Stefano R., Cerrato S., May 11 Team (2012), Turning the rumor of the May 11, 2011, earthquake prediction in Rome, Italy, into an information day on earthquake hazard. *Annals of Geophysics*, 55, 3, doi: 10.4401/ag-5559, 2012.

14. Porreca, M. & Mattei, M. (2012) - AMS fabric and tectonic evolution of Quaternary intramontane extensional basins in the Picentini Mountains (Southern Apennines, Italy). *International Journal of Earth Sciences.* 101, 787–802, DOI: 10.1007/s00531-011-0670-2.

15. Roberts, A.P. Chang, L., Heslop, D., Florindo, F., Larrasoaña, J.C. (2012) Searching for single domain magnetite in the 'pseudo-single-domain' sedimentary haystack: Implications of biogenic magnetite preservation for sediment magnetism and relative paleointensity determinations. *J. Geophys. Res*., 117, B08104, doi:10.1029/2012JB009412.

16. Sagnotti, L. and A. Winkler (2012). On the magnetic characterization and quantification of the superparamagnetic fraction of traffic-related urban airborne PM in Rome, Italy, *Atmospheric Environment*, 59, 131-140.

17. Speranza, F., Di Chiara, A. and S. Rotolo (2012). Correlation of welded ignimbrites on Pantelleria (Strait of Sicily) using paleomagnetism, *Bull. Volcanol.*, 74, 341–357, DOI 10.1007/s00445-011-0521-9.

18. Speranza, F., L. Minelli, A. Pignatelli, and M. Chiappini (2012), The Ionian Sea: The oldest in situ ocean fragment of the world?, *J. Geophys. Res*., 117, B12101, doi:10.1029/2012JB009475.

19. Vila, B., Galobart, À., Canudo, J. I., Le Loeuff, J., Dinarès-Turell, J., Riera, V., Oms, O., Tortosa, T., and Gaete, R. (2012). The diversity of sauropod dinosaurs and its first taxonomic succession from the latest Cretaceous strata of southwestern Europe: clues to demise and extinction. *Palaeogeogr., Palaeoclimatol., Palaeocol*., 350-352, 19-38, doi:10.1016/j.palaeo.2012.06.008

DIVISION II:
"Aeronomic Phenomena"

1. Adewale, O.; Migoya Orué, Y. O. E.; Oyeyemi, O. Assessment of the NeQuick model at Lagos, Nigeria using GPS TEC, 2012, UNILAG GOLDEN JUBILEE RESEARCH CONFERENCE & FAIR, Proceedings Vol. III.

2. Alfonsi, Lu., L. Spogli, G. De Franceschi, V. Romano, M. Aquino, A. Dodson, and C. N. Mitchell (2011), Bipolar climatology of GPS ionospheric scintillation at solar minimum, Radio Sci., 46, RS0D05, doi:10.1029/2010RS004571.

3. Alfonsi Lu., De Franceschi G., Romano V., Bourdillon A., Le Huy M., GPS scintillations and TEC gradients at equatorial latitudes on April 2006, Adv. Space Res.,Advances in Space Research 47 (2011) 1750–1757

4. Azzarone A., C.Bianchi, M.Pezzopane, M.Pietrella, C.Scotto, and A. Settimi. IONORT: A Windows software tool to calculate the HF ray tracing in the ionosphere., *Computers & Geosciences.* Vol 42, pp 57-63. doi: 10.1016/j.cageo.2012.02.008, Maggio 2012

5. Baumgardner J, J.Wroten, M. Mendillo, C.Martinis, C. Barbieri, G. Umbriaco, C. Mitchell, J. Kinrade, M. Materassi, L.Ciraolo and M. Hairston, "Imaging space weather over Europe", *SPACE WEATHER*, VOL. 11, 1–10, doi:10.1002/swe.20027, 2013.

6. Bolaji, O. S.; Adeniyi, J. O.; Radicella, S. M.; Doherty, P. H. Variability of total electron content over an equatorial West African station during low solar activity. *RADIO SCIENCE* 47, DOI: 10.1029/2011RS004812

7. De Michelis, P., G. Consolini, M. Materassi, R. Tozzi, "An information theory approach to storm-substorm relationship", *Journal of Geophysical Research*, vol. 116, A08225, doi:10.1029/2011JA016535, 2011.

8. Forte B., Materassi M., Alfonsi L., Romano V., De Franceschi G. and Spalla P. (2010), "Optimum parameter for estimating phase fluctuations on transionospheric signals at high latitudes", *Advances in Space Research*, doi: 10.1016/j.asr.2010.04.033.

9. Kashcheyev, A.; Nava, B.; Radicella, S. M. 2012. Estimation of higher-order ionospheric errors in GNSS positioning using a realistic 3-D electron density model. *RADIO SCIENCE* 47, DOI: 10.1029/2011RS004976

10. Katamzi Z. T., N. D. Smith, C. N. Mitchell, P. Spalla, M. Materassi, "Statistical analysis of traveling ionospheric disturbances using TEC observations over more than one solar cycle", *Journal of Atmospheric and Solar-Terrestrial Physics* vol. 74 January, 2012. p. 64-80.

11. Kutiev, I. Tsagouri, L. Perrone, D. Pancheva, P. Mukhtarov, A. Mikhailov ,J. Lastovicka, N. Jakowski, D. Buresova, E. Blanch, B. Andonov, D. Altadill, S. Magdaleno, M. Parisi, and J. Miquel Torta, Solar activity impact on the Earth's upper atmosphere, *Journal of Space Weather and Space Climate*, 3, A06, 2013.

12. Magdaleno, Sergio; Herraiz, Miguel; Radicella, Sandro M. 2012. Ionospheric Bubble Seeker: A Java Application to Detect and Characterize Ionospheric Plasma Depletion From GPS Data. *IEEE TRANSACTIONS ON GEOSCIENCE AND REMOTE SENSING* 50 1719-1727

13. Marradi, L.; Zin, A.; Zago, S.; Landenna, S.; Mangolini, E.; Catalano, V.; Notarpietro, R.; Radicella, S.M. 2012. Nava, B. *The ROSA Project for Radio-Occultation: Findings and Current Status, Proceedings of the ION GNSS 2012, September 2012, Nashville, Tennessee*.

14. Materassi, M., "Stochastic Lagrangian for the 2D Visco-Resistive Magneto-Hydrodynamics", *Plasma Phys. Control. Fusion* 52 (2010) 075004.

15. Materassi, M., L. Ciraolo, G. Consolini, N. Smith, "Predictive Space Weather: an information theory approach", *Advances in Space Research* 47 (2011), pp. 877-885, doi:10.1016/j.asr.2010.10.026

16. Mikhailov A.V., L. Perrone, N. Smirnova, Two types of positive disturbances in the daytime mid-latitude F2-layer: Morphology and formation mechanisms, J*ournal Atm. Space Terr*. in press, 2012

17. Mikhailov A.V., A. Belehaki, L. Perrone, B. Zolesi, and I. Tsagouri, Retrieval of thermospheric parameters from routine ionospheric observations: assessment of method's performance at mid-latitudes daytime hours, *Journal of Space Weather and Space Climate,* 2, A03, 2012.

18. Mikhailov A.V., A. Belehaki, L. Perrone, B. Zolesi, and I. Tsagouri, Retrieval of thermospheric parameters from routinely observed F2-layer Ne(h) profiles at the geomagnetic equator, *Journal of Space Weather and Space Climate,* in press, 2012.

19. Mikhailov A.V. and L. Perrone, On the mechanism of seasonal/solar cycle NmF2 variations: A quantitative estimate of the main parameters contribution using ISR observations, J. Geophys. Res., 116, A03319, doi:10.1029/2010JA016122, 2011.

20. Moreno, B., S. Radicella, M. C. de Lacy, M. Herraiz, G. Rodriguez-Caderot, "On the effects of the ionospheric disturbances on precise point positioning at equatorial latitudes", *GPS Solutions, DOI 10.1007/s10291-010-0197-1, 2010*

21. B. Moreno, S. Radicella, M. C. de Lacy, M. Herraiz, G. Rodriguez-Caderot; On the effects of the ionospheric disturbances on precise point positioning at equatorial latitudes, GPS Solutions 15:381–390 DOI 10.1007/s10291-010-0197-1, 2011

22. Nava B.; Radicella, S.M.; Azpilicueta, F.. Data ingestion into NeQuick 2. Radio Sci. 46, RS0D17., doi:10.1029/2010RS004635, 2011

23. Nava, B.; Radicella, S.M.; Lagrasta, S.; Greco, F. 2012. Using NeQuick to reconstruct the 3D Electron Density of the Ionosphere: benefits and capabilities in single frequency positioning applications, Proceedings of the IEEE First AESS European Conference on Satellite Telecommunications, October 2012, Rome, Italy.

24. Nigussie, M.; Radicella, S. M.; Damtie, B.; Nava, B.; Yizengaw, E.; Ciraolo, L. 2012. TEC ingestion into NeQuick 2 to model the East African equatorial ionosphere. *RADIO SCIENCE* 47, DOI: 10.1029/2012RS004981.

25. Oladipo, O. A., J.O. Adeniyi, S.M. Radicella and I.A. Adimula, "Variability of the ionospheric electron density at fixed heights and validation of IRI-2007 profile's prediction at Ilorin" , *Advances on Space Research, doi:10.1016/j.asr.2010.09.021, 2010*

26. Oladipo O.A., J.O. Adeniyi, S.M. Radicella, I.A. Adimula, Variability of the ionospheric electron density at fixed heights and validation of IRI-2007 profile's prediction at Ilorin, Advances in Space Research ,47, 496–505 201

27. Perrone L., A. Mikhailov and L. Korsunova, FORMOSAT-3/COSMIC E-region observations and daytime foE at middle latitudes, *J. Geophys. Res*., 116, doi:10.1029/2010JA016411, 2011

28. Pezzopane M., M. Pietrella, A. Pignatelli, B. Zolesi, and L. R. Cander. Assimilation of autoscaled data and regional and local ionospheric models as input sources for real-time 3-D International Reference Ionosphere modelling. *Radio Science* , VOL. 46, RS5009, doi:10.1029/2011RS004697, September 2011

29. Pietrella M., A short-term ionospheric forecasting empirical regional model (IFERM) to predict the critical frequency of the F2 layer during moderate, disturbed, and very disturbed geomagnetic conditions over the European area, *Ann. Geophys*., 30, 343-355, doi: 10.5194/angeo-30-343-2012, Febbraio 2012.

30. Pietrella M., M. Pezzopane, C. Scotto. Variability of foF2 over Rome and Gibilmanna during three solar cycles (1976-2000), *J. Geophys. Res.*, Vol 117, A05316, doi:10.1029/2011JA017462, Maggio 2012

31. Śanchez-Cano B., M. Herraiz, G. Rodrıguez-Caderot, S. M. Radicella; Study of the ionosphere of Mars: application and limitations of the Chapman-layer model, Highlights of Spanish Astrophysics VI, Proceedings of the IX Scientific Meeting of the Spanish Astronomical Society, Madrid (2011)

32. Sreeja V V, Aquino M H O, Forte B, Elmas Z, Hancock C, De Franceschi G, Alfonsi L, Spogli L, Romano V, Bougard B, Galera Monico J F, Wernik A W, Sleewaegen J-M, Canto´ M, Ferreira Da Silva E (2011). Tackling ionospheric scintillation threat to GNSS in Latin America. JOURNAL OF SPACE WEATHER AND SPACE CLIMATE, vol. 1, ISSN: 2115-7251

Division III:
"Magnetospheric Phenomena"

1. Coco, I., G. Consolini, E. Amata, M.F. Marcucci, D. Ambrosino, Dynamical changes of the polar cap potential structure: an information theory approach, Nonlinear Proc. Geophys., 18, 607-707, 2011

2. Consolini, G., P. De Michelis, Rank-ordering multifractal analysis of the auroral electrojet index, Nonlinear Proc. Geophys., 18, 277-285, 2011.

3. De Michelis, P., G. Consolini, M. Materassi, R. Tozzi, An information theory approach to the storm-substorm relationship, J. Geophys Res., 116, A08225, doi: 10.1029/2011JA016535, 2011

4. Di Lorenzo, C, P. Palangio, G. Santarato, A. Meloni, U. Villante, L. Santarelli, Non-inductive components of electromagnetic signals associated with L'Aquila earthquake sequences estimated by means of inter-station impulse response functions, Nat. Hazards Earth Syst. Sci., doi:10.5194/nhess-11-1047-2011

5. Lepidi, S., L. Cafarella, M. Pietrolungo, L. Santarelli, Azimuthal propagation of Pc5 geomagnetic field pulsations in the southern polar cap, Adv. Space Res., 47, 966-977, 2011

6. Lepidi, S., L. Cafarella, M. Pietrolungo, D. Di Mauro, Daily variation characteristics at polar geomagnetic observatories, Adv. Space Res., 48, 521-528, 2011

7. Lepidi, S., A. Meloni, P. Palangio, K. Yumoto, The contribution of L'Aquila (Italy) Geomagnetic Observatory to MAGDAS project, Sun and Geosphere, 6, 49-53, 2011

8. Materassi, M., L. Ciraolo, G. Consolini, N. Smith, Predictive Space Weather: An information theory approach, Adv. Space Res., 47, 877-885, 2011

9. Prattes, G., K. Schwingenschuh, H. U. Eichelberger, W. Magnes, M. Boudjada, M. Stachel, M. Vellante, U. Villante, V. Wesztergom, P. Nenovski, Ultra Low Frequency (ULF) European multi station magnetic field analysis before and during the 2009 earthquake at L'Aquila regarding regional geotechnical information, Nat. Hazards Earth Syst. Sci., 11, doi:10.5194/nhess,-11-1959-2011

10. Trenchi, L., Marcucci, M. F., Reme, H., Carr, C. M., Cao, J. B., TC-1 observations of a flux rope: Generation by multiple X line reconnection, J. Geophys. Res. 116, A5, A05202, 5202, 2011

11. Villante, U., C. De Paulis, P. Francia, The transmission of upstream waves to the magnetosphere: an analysis at widely separated ground stations, J. Geophys. Res., 116, A06219, doi:10.1029/2010JA016263, 2011.

12. Villante, U., M. Piersanti, Sudden impulses at geosynchronous orbit and at low latitudes, J. Atms. and Solar Terr. Phys., doi:10.1016/j.jastp.2010.01.008, 2011

13. Chamati, M., P. Nenovski,, M. Vellante, U. Villante, K. Schwingenschuh, M. Boudjada, V. Wesztergom, Application of DFA method to magnetic field data, in Complex Research of Earthquake's forecasting possibilities, Seismicity and Climate Change Correlations, Ilia State University, Georgia, ISSN 2233-3681, pp. 72-79, 2012

14. De Michelis, P., G. Consolini, R. Tozzi, On the multi-scale nature of large geomagnetic storms: an empirical mode decomposition analysis, Nonlinear Proc. Geophys., 19, 667-673, 2012

15. P. Francia, M. Regi, M. De Lauretis, U. Villante, V.A. Pilipenko, A case study of upstream wave transmission to the ground at polar and low latitudes, J. Geophys. Res., 117, A01210, doi:10.1029/2011JA016751, 2012.

16. Nenovski P., M. Chamati, U. Villante, M. De Lauretis, P. Francia, Scaling characteristics of SEGMA magnetic field data around the Mw 6.3 Aquila earthquake, Acta Geophysica, doi: 10.2478/s11600-012-0081-1, 2012.

17. Nenovski, P., M. Chamati, U. Villante, M. DeLauretis, M. Vellante, P. Francia, V. Wesztergom, K. Schwingenschuh, M. Boudjada, G. Prattes, DFA analysis of SEGMA magnetic field data around the M6.3 Aquila EQ, in Complex Research of Earthquake's forecasting possibilities, Seismicity and Climate Change Correlations, Ilia State University, Georgia, ISSN 2233-3681, pp. 157-163, 2012.

18. Piersanti, M., U. Villante, C. Waters, I. Coco, The June 8, 2000 ULF wave activity: a case study, J. Geophys. Res., doi:10.1029/2011JA016857, 117, A02204, 2012.

19. Villante, U., M. Piersanti, Sudden Impulses in the magnetosphere and at ground, in Exploring the Solar Wind, InTech Open Access Library, 399, 2012

DIVISION IV:
"Solar Wind and Interplanetary Magnetic Field"

1. R. D'Amicis, R. Bruno, B. Bavassano, Response of the geomagnetic activity to solar wind turbulence during solar cycle 23, Journal of Atmospheric and Solar-Terrestrial Physics, 73, 653-657, 2011

2. R. Marino et al., The magnetohydrodynamic turbulent cascade in the ecliptic solar wind: study of Ulysses data, Plant. Space Sci., 59, 592, 2011

3. Perri, S., Carbone, V., Yordanova, E., Bruno, R., Balogh, A., Scaling law of the reduced magnetic helicity in fast streams. Planetary and Space Science 59, 575-579, 2011

4. Telloni, D., Bruno, R., D'Amicis, R., Pietropaolo, E., Carbone, V., Wavelet Analysis as a Tool to Localize Magnetic and Cross-helicity Events in the Solar Wind, accepted by ApJ_751_19 2012

5. Marino, R., Sorriso, L., Carbone, V., D'Amicis, R., Bruno, R., Veltri, P., On the nature of magnetohydrodynamic turbulence in high latitude solar wind, ApJ, 750_41, 2012

6. D'Amicis, R., Consolini, G., Bavassano, B., Bruno, R., Conditioned Analysis Of High-Latitude Solar Wind Intermittency, ApJ, 755, 63, http://dx.doi.org/10.1088/0004-637X/755/1/63, 2012

7. Perri, S., Carbone, V., Vecchio, A., Bruno, R., Korth, H., Zurbuchen, T. H., and Sorriso, L., Phase-synchronization, Energy cascade and intermittency in the solar wind turbulence, PRL, 109, 245004, 2012
8. Antonucci, E. et al. including R. Bruno, Multi Element Telescope for Imaging and Spectroscopy (METIS) coronagraph for the Solar Orbiter mission, Space Telescopes and Instrumentation 2012: Ultraviolet to Gamma Ray, edited by Tadayuki Takahashi, Stephen S. Murray, Jan-Willem A. den Herder, Proc. of SPIE Vol. 8443, 844309, 2012

9. Owen et al. including R. Bruno, IMPALAS: Investigation of MagnetoPause Activity using Longitudinally-Aligned Satellites-a mission concept proposed for the ESA M3 2020/2022 launch. Experimental Astronomy 33, 365-401, 2012

10. M. Berthomier, et al. including R. Bruno, Alfvén: magnetosphere-ionosphere connection explorers, Experimental Astronomy 33, 445-489, 2012

11. Andretta V. et al., Coronal Diagnostics from Narrowband Images Around 30.4 nm, by., 2012, Solar Physics, 279, 53

12. Antonucci et al., UVCS Observations of Temperature and Velocity Profiles in Coronal Holes, 2012, Space Science Review, 172, 5

13. Macek, W.~M., Wawrzaszek, A., Carbone, V.\ 2012.\ Observation of the multifractal spectrum in the heliosphere and the heliosheath by Voyager 1 and 2.\ Journal of Geophysical Research (Space Physics) 117, 12101.

14. Carbone, V.\ 2012.\ Scalings, Cascade and Intermittency in Solar Wind Turbulence.\ Space Science Reviews 172, 343-360.

15. Lepreti, F., Carbone, V., Abramenko, V. I., Yurchyshyn, V., Goode, P. R., Capparelli, V., Vecchio, A.\ 2012.\ Turbulent Pair Dispersion of Photospheric Bright Points.\ The Astrophysical Journal 759, L17.

16. Donato, S., Servidio, S., Dmitruk, P., Carbone, V., Shay, M. A., Cassak, P. A., Matthaeus, W. H.\ 2012.\ Reconnection events in two-dimensional Hall magnetohydrodynamic turbulence.\ Physics of Plasmas 19, 092307.

17. Perri, S., Carbone, V.\ 2012.\ Comment on "Effect of Current Sheets on the Solar Wind Magnetic Field Power Spectrum from the Ulysses Observation: From Kraichnan to Kolmogorov Scaling".\ Physical Review Letters 108, 199501.

18. Matthaeus, W. H., Servidio, S., Dmitruk, P., Carbone, V., Oughton, S., Wan, M., Osman, K. T.\ 2012.\ Local Anisotropy, Higher Order Statistics, and Turbulence Spectra.\ The Astrophysical Journal 750, 103.

19. Laurenza, M., Vecchio, A., Storini, M., Carbone, V.\ 2012.\ Quasi-biennial Modulation of Galactic Cosmic Rays.\ The Astrophysical Journal 749, 167.

20. Vecchio, A., Laurenza, M., Meduri, D., Carbone, V., Storini, M.\ 2012.\ The Dynamics of the Solar Magnetic Field: Polarity Reversals, Butterfly Diagram, and Quasi-biennial Oscillations.\ The Astrophysical Journal 749, 27.

21. A. Vecchio, M. Laurenza, M. Storini, V. Carbone, New Insights on Cosmic Ray Modulation through a Joint Use of Non stationary Data-Processing Methods, Advances in Astronomy, Volume 2012, Article ID 834247, doi:10.1155/2012/834247, 2012.

22. Romano, P.; Berrilli, F.; Criscuoli, S.; Del Moro, D.; Ermolli, I.; Giorgi, F.; Viticchié, B.; Zuccarello, F., A Comparative Analysis of Photospheric Bright Points in an Active Region and in the Quiet Sun, 2012 SoPh..280.407R

23. Giovannelli, L.; Berrilli, F.; Cocciolo, M.; Del Moro, D.; Egidi, A.; Piazzesi, R.; Stangalini, M., The birth of Tor Vergata Fabry-Pérot interferometer, 2012 JPhCS.383a2014G

24. Fabiani, S.; Bellazzini, R.; Berrilli, F.; Campana, R.; Costa, E.; Del Monte, E.; Muleri, F.; Rubini, A.; Soffitta, P., X-ray polarimetry towards high energy and solar science, 2012JPhCS.383a2013F

25. Criscuoli, S.; Del Moro, D; Giannattasio, F.; Viticchié, B.; Giorgi, F.; Ermolli, I.; Zuccarello, F.; Berrilli, F., High cadence spectropolarimetry of moving magnetic features observed around a pore,2012 A&A...546A..26C

26. Penza, V.; Berrilli, F., Velocity and Temperature Response Functions of 77 Near-Infrared (800 - 1400 nm) Photospheric Lines - I, 2012 SoPh..277..227P

27. Peter, H.; Abbo, L.; Andretta, V.; Auchère, F.; Bemporad, A.; Berrilli, F.; Bommier, V.; Braukhane, A.; Casini, R.; Curdt, W.; and 28 coauthors

28. Solar magnetism eXplorer (SolmeX). Exploring the magnetic field in the upper atmosphere of our closest star, 2012 ExA....33..271P

29. Stangalini, M.; Giannattasio, F.; Del Moro, D.; Berrilli, F., Three-minute wave enhancement in the solar photosphere, 2012 A&A...539L...4S

30. Sobotka, M.; Del Moro, D.; Jurčák, J.; Berrilli, F., Magnetic and velocity fields of a solar pore, 2012 A&A...537A..85S

31. Stangalini, M.; Del Moro, D.; Berrilli, F.; Jefferies, S. M., MHD wave transmission in the Sun's atmosphere, 2011 A&A...534A..65S

32. Viticchié, B.; Sánchez Almeida, J.; Del Moro, D.; Berrilli, F., Interpretation of HINODE SOT/SP asymmetric Stokes profiles observed in the quiet Sun network and internetwork, 2011 A&A...526A..60V

33. A. Damiani, S. De Simone, C. Rafanelli, R. Cordero; M. Laurenza, Three years of ground-based total ozone measurements in Arctic: comparison with OMI and GOME satellites, Remote Sensing of Environment, 127, 162–180, 2012.

34. A. Vecchio, L. D'Alessi, V. Carbone, M. Laurenza, M. Storini, The Empirical Mode Decomposition to study the quasi-biennial modulation of solar magnetic activity and solar neutrino flux, Advances in Adaptive Data Analysis, Vol. 4, Nos. 1 & 2 (2012) 1250014 (17 pages), World Scientific Publishing Company, DOI: 10.1142/S1793536912500148.

35. C. Grimani, C. Boatella, M. Chmeissani, M. Fabi, N. Finetti, M. Laurenza, A. Lobo, I. Mateos, M. Storini, On the role of radiation monitors on board LISA Pathfinder and future space interferometers, Classical and Quantum Gravity, 29, 105001 (13pp), doi:10.1088/0264-9381/29/10/105001, 2012.

36. M. Laurenza, G. Consolini, M. Storini, A. Damiani, An information theory approach to the temporal evolution of SEP energy spectrum, Astrophysics and Space Sciences Transactions, 8, 19–24, 2012.

37. Gardini, M. Laurenza, M. Storini, SEP events and Multi-spacecraft Observations: Constraints on Theory, Advances in Space Research, 47, 2127-2139, 2011.

38. Prikryl P, Spogli L, Jayachandran PT, Kinrade J, Mitchell CN, Ning B, Li G, Cilliers PJ, Terkildsen M, Danskin DW, Spanswick E, Donovan E, Weatherwax AT, Bristow WA, Alfonsi L, De Franceschi G, Romano V, Ngwira CM, Opperman BDL (2011). Interhemispheric comparison of GPS phase scintillation at

high latitudes during the magnetic-cloud-induced geomagnetic storm of 5-7 April 2010. ANNALES GEOPHYSICAE, vol. 29, p. 2287-2304, ISSN: 0992-7689, doi: 10.5194/angeo-29-2287-2011.

39. Forte B., M. Materassi, Alfonsi Lu., V. Romano, G. De Franceschi, P. Spalla, Optimum parameter for estimating phase fluctuations on transionospheric signals at high latitudes, J. Adv. Space Res., 47, 2188-2193, ISSN 0273-1177, DOI: 10.1016/j.asr.2010.04.033, 2011.

40. Vincenzo Romano, Bruno Bougard, Marcio Aquino, Joao F. Galera Monico, Tom Willems, Marc Solé, Investigation of low latitude scintillations in Brazil within the Cigala project, Proocedings of the 3rd International Colloquium on Scientific and Fundamental Aspects of the Galileo Programme, Copenaghen 2011, ESA Publications Division, European Space Agency, Noordwijk, The Netherlands, 2011.

41. Lucilla Alfonsi, Spogli L, Giorgiana De Franceschi, Vincenzo Romano, Marcio Aquino, Alan Dodson, Cathryn N. Mitchell (2011). Bipolar climatology of GPS ionospheric scintillation at solar minimum. In: Proceeding of the IES2011: International Ionospheric Effects Symposium.

DIVISION V:
"Geomagnetic Observatories, Surveys, and Analyses "

1. S. Lepidi, A. Meloni, P. Palangio, K. Yumoto, (2011). The contribution of L'Aquila (Italy) Geomagnetic Observatory to MAGDAS project, Sun and Geosphere, 5, 17-22.

2. Di Lorenzo C., P. Palangio, G. Santarato, A. Meloni, U. Villante, and L. Santarelli, (2011) 'Non-inductive components of electromagnetic signals associated with L'Aquila earthquake sequences estimated by means of inter-station impulse response functions', Nat. Hazards Earth Syst. Sci., 11, 1047–1055.

3. El Hawary R, K. Yumoto, Y. Yamazaki, A. Mahrous, E. Ghamry, A. Meloni, K. Badi, G. Kianji, C.B.S.Uiso, N. Mwiinga, L. Joao, Thomas Affluo, P. R. Sutcliffe, G. Mengistu, P. Baki, S.Abe, A.Ikeda, A. Fujimoto and T. Tokunaga, (2012). Annual and semi-annual Sq variations at 96 MM MAGDAS I and II stations in Africa, Earth Planets Space, 64, 425–432.

4. R. Tozzi, G. Dominici, P. De Michelis, A. Meloni: Influence of solar activity on magnetic network measurements, Annals of Geophysics, 55, 6, 2012; doi: 10.4401/ag-5458.

5. G. Dominici, A. Meloni, A. Di Ponzio, M. Miconi: Italian Magnetic Network and magnetic reference fields at 2010.0, Annals of Geophysics, 55, 6, 2012; doi: 10.4401/ag-5411.

6. S. Lepidi, L. Cafarella , M. Pietrolungo, L. Santarelli, Azimuthal propagation of Pc5 geomagnetic field pulsations in the southern polar cap, Adv. Space Res., 47, 966-977, 2011.

7. S. Lepidi, L. Cafarella , M. Pietrolungo, D. Di Mauro, Daily variation characteristics at polar geomagnetic observatories, Adv. Space Res., 48, 521-528, 2011.

8. Gasperini L., Cocchi L., Stanghellini C., Stanghellini G., Del Bianco F., Serrazanetti M., Carmisciano C., Magnetic and seismic-reflection study of Lake Cheko, a possible impact crater for the 1908 Tunguska Event. Geochem. Geophys. Geosyst AGU (2012), Volume 13, Number 5, 12 May 2012, Q05008, doi:10.1029/2012GC004054, ISSN: 1525-2027

9. Caratori Tontini, F., L. Cocchi, F. Muccini, C. Carmisciano, M. Marani, E. Bonatti, M. Ligi, and E. Boschi (2010), Potential-field modeling of collapse-prone submarine volcanoes in the southern Tyrrhenian Sea (Italy), Geophys. Res. Lett., 37, L03305, doi:10.1029/2009GL041757

10. Palangio P., Carmisciano C., Di Lorenzo C., Caratterizzazione del rumore magnetico di fondo nel nuovo osservatorio di Varese Ligure. Quaderni di Geofisica, Anno 2013, Numero 109, ISSN 1590-2595.

11. Barraclough D.R., De Santis A. , Repeat stations activities, in Geomagnetic Observations and Models, M. Mandea and M. Korte (Ed.s), IAGA Special Sopron Book Series, vol. 5, 45-55, Springer, 2011.

12. G. Cianchini, A. De Santis, D. R. Barraclough, L. X. Wu, and K. Qin, Magnetic transfer function entropy and the 2009 Mw = 6.3 L'Aquila earthquake (Central Italy), Nonlin. Processes Geophys., 19, 2012, pp. 401-409, doi:10.5194/npg-19-401-2012

13. Duka B., De Santis A., Mandea M., Isac A., and E. Qamili, Geomagnetic jerks characterization via spectral analysis, Solid Earth, 3, 131–148, 2012.

14. Tozzi R., De Santis A., Gaya-Piqué L.R., Antarctic geomagnetic reference model updated to 2010 and provisionally to 2012, Tectonophysics, 2013, 585, 13-25.

15. Cafarella, L., S. Lepidi, A. Meloni, P. Palangio, M. Pietrolungo, L. Santarelli, Geomagnetic Observation Results 2007-2008, Terra Nova Bay, Antarctica, National Antarctic Research Program, PNRA, 24pp., 2011.

16. Cafarella, L., S. Lepidi, A. Meloni, P. Palangio, M. Pietrolungo, L. Santarelli, Geomagnetic Observation Results 2007-2008, Terra Nova Bay, Antarctica, National Antarctic Research Program, PNRA, 24pp., 2011.

17. Cafarella, L., S. Lepidi, A. Meloni, P. Palangio, M. Pietrolungo, L. Santarelli, J. A. Baskaradas, Geomagnetic Observation Results 2008-2009, Terra Nova Bay, Antarctica, National Antarctic Research Program, PNRA, 24pp., 2011.

18. Cafarella, L., S. Lepidi, A. Meloni, P. Palangio, M. Pietrolungo, L. Santarelli, J. A. Baskaradas, , Geomagnetic Observation Results 2009-2010, Terra Nova Bay National Antarctica, Antarctic Research Program, PNRA, 25pp., 2011.

19. Cafarella, L., S. Lepidi, A. Meloni, P. Palangio, M. Pietrolungo, L. Santarelli, J. A. Baskaradas, Geomagnetic Observation Results 2010-2011, Terra Nova Bay, Antarctica, National Antarctic Research Program, PNRA, 26pp., 2012.