

REPORT IMAA 2020

The Institute of Methodologies for Environmental Analysis of the National Research Council (IMAA-CNR) has its headquarters in the CNR Potenza Research Area and a Lab in Marsico Nuovo, Val d'Agri (Basilicata region).



Consiglio Nazionale
delle Ricerche



<http://www.imaa.cnr.it>



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About us

The Institute of Methodologies for Environmental Analysis (IMAA) originated within the CNR reform process (CNR Decree n. 15788 of 12.02.2001) from the grouping of the three pre-existing institutes: the Institute of Advanced Methodologies for Environmental Analysis (IMAAA), the Institute of Research on Clays (IRA) and the Institute of Horticulture and Industrial Cultivation (IOCI). At present, IMAA is the only CNR Institute having its headquarters in the Basilicata region (CNR Research Area of Potenza).

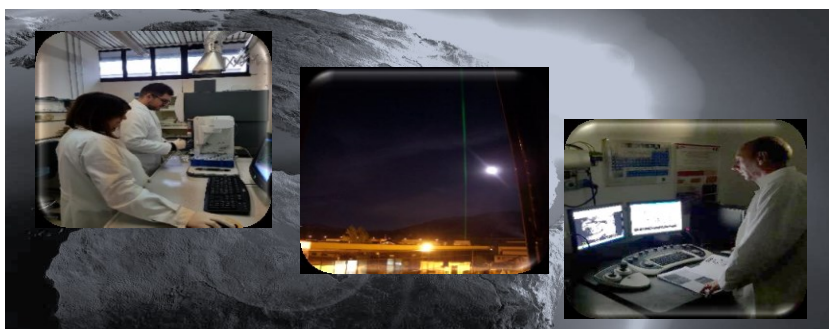
Research Activity

Since the setting up of IMAA, the research activities have been devoted to the development and the integration of Earth Observation technologies with the aim of studying environmental and geophysical processes. The IMAA's activities are organized within the four following axes:

- Satellite, airborne and ground-based Earth Observation for the study of the atmosphere, hydrosphere, lithosphere and biosphere plus their interactions, for the development of meteo-climatic applications and the prediction, prevention and mitigation of risks;
- Chemical-physical characterization of ground, soil and subsoil;
- Development of advanced environmental monitoring techniques based on the integration of in-situ and remote sensing chemical-physical, biological and ecological methods;
- Integrated methodologies for energy-environmental planning and modeling as well as the management and interoperability of geospatial data.

This multidisciplinary approach has permitted the study of geophysical and environmental processes of remarkable complexity in an innovative way by following the GMES/COPERNICUS (Global Monitoring of Environment and Security) program guidelines and the GEOSS strategy (Global Earth Observation System of Systems).

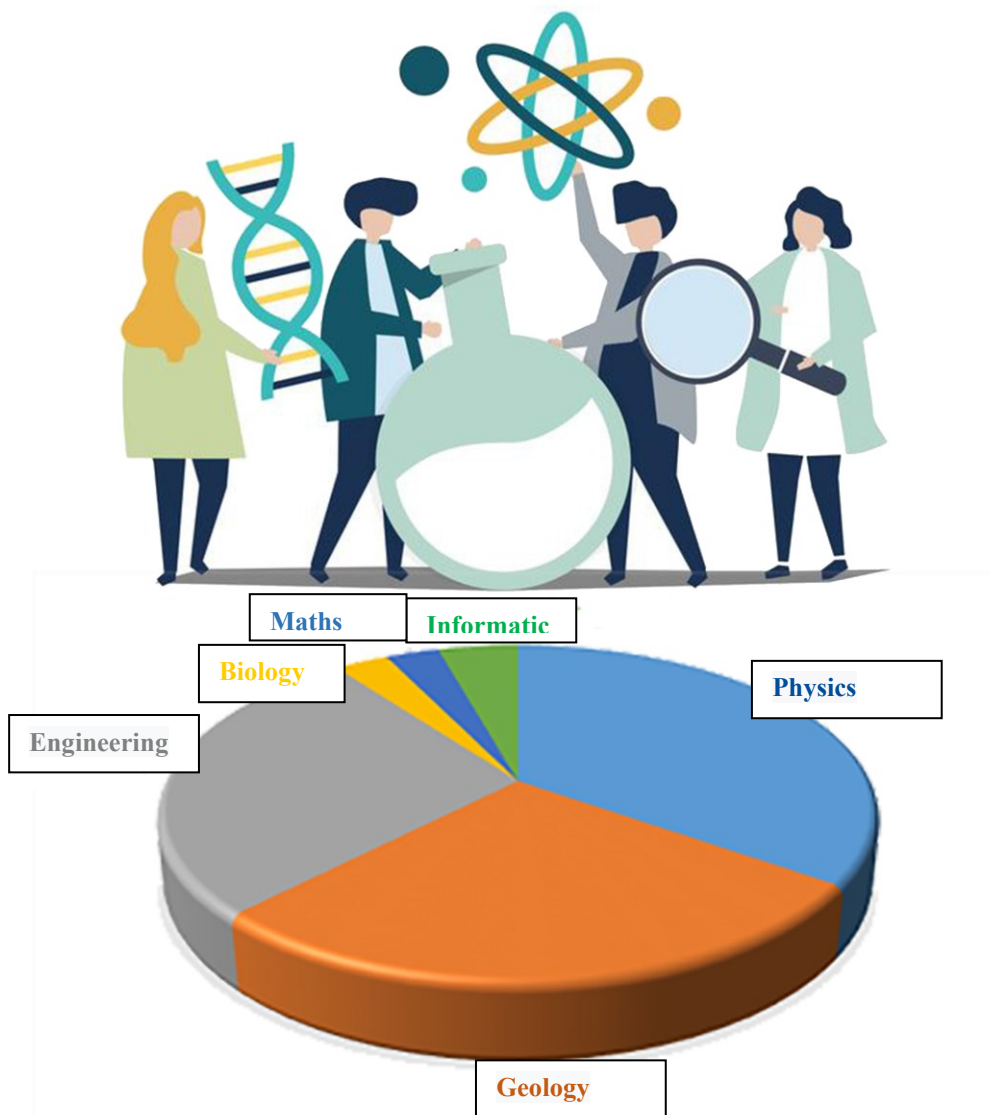
During 2020 the role of the IMAA in the framework of the national and international research context has strengthened by: i) an increase of the scientific productivity with over 100 papers published on ISI journals with peer-review system, ii) a large participation in the international projects (H2020, Copernicus, ESA, Eumetsat, PRIMA) of interest for the strategic CNR areas "Earth Observation" and "Natural and Anthropogenic Risks"; iii) the launch of new projects to upgrade Research Infrastructures (PNIR 2014-2020) and to develop fundamental research activities (PRIN); iv) the start of new research industrial projects with leading international companies (ENI, FCA, Leonardo-Finmeccanica) and networks/clusters of SMEs. It also carried out an intense third mission activity providing technical-scientific support to the PA system and promoting actions for the diffusion of scientific culture in the environmental sector.



Staff

At IMAA there are about 101 working units (75 researchers and technologists, 23 technicians, 3 administrative employers) and about 40 non-permanent units among post-graduated fellows, PhD students, associate university professors and other collaborators.

At IMAA there is great attention to the gender aspects (40% of female in the permanent staff) and 4 out of 7 research groups are coordinated by women researchers.



Scientific production

In 2020 the researchers have published about 100 papers on the international journals with peer-review system. The number of publications/year is increased respect to the publication rate of the previous years, it is of worth attention that is increased the quality of scientific production (IFmean=3.7 with about the 50% of papers falling in the Q1 category and 40% in Q2). Many papers have been published in top-leading international journals (i.e. Remote Sensing of Environment, Atmospheric Chemistry and Physics, Atmospheric Environment, Engineering Geology, Microporous and mesoporous materials, Renewable and Sustainable Energy Reviews). Finally, there is a strong capacity to promote the international collaborations: about the 50% of the scientific products is characterized by the presence of a foreign researcher within the author list.

Table 1. Data on scientific productivity in the period 2015-2020.

Year	Number articles	IF Mean	Q1	Q2	Q3	Q4	NO ISI	Articles with foreign authors
2015	79	2.635	29	36	5	4	5	30
2016	70	2.928	38	18	6	3	5	41
2017	69	2.884	30	24	8	3	4	31
2018	90	3.281	34	37	10	5	4	53
2019	109	3.480	56	33	7	8	5	52
2020	100	3.722	47	41	9	1	2	58
TOTALI	517	3.155	234	189	45	24	25	265

Research Infrastructures

IMAA has been proved to be capable of designing and creating important Research Infrastructures, some of these of international level. The economic value of the IMAA's scientific equipment is now estimated at more than 12 MEuro. The main instrumental facilities operating at the IMAA laboratories are:

- The CIAO-CNR-IMAA Atmospheric Observatory which is one of the 12 worldwide sites within the GRUAN network for the study of the high atmosphere and node of the IR-ACTRIS included in the ESFRI roadmap;
- A system for receiving, processing and storing satellite images (NOAA, MSG, EOS-AQUA, EOS-TERRA), which is capable of providing near real time geospatial information for environmental and geo-hazard monitoring.
- The Hydrogeosite Experimental test site at the Marsico Nuovo Lab, which is the first full-scale laboratory in Italy for the investigation of hydrogeophysical processes and a geophysical multiparametric network in High Agri valley;
- Instrumental facilities for in-situ and lab measurements consisting of a Lidar system, a system for interferometric and radiometric measurements, a system for non-invasive chemical-physical and geophysical measurements, an integrated system for geochemical and mineralogical measurements and hyperspectral sensors for airborne platforms.

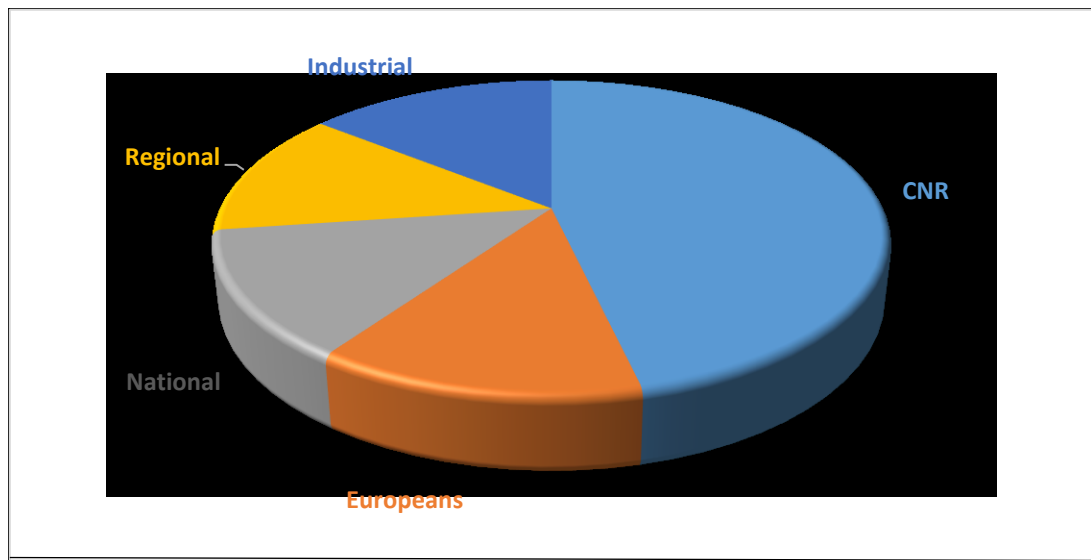
IMAA is the coordinator of ACTRIS "Aerosols, Clouds, and Trace Gases Research Infrastructure Network" project, funded within the FP7 framework and Horizon 2020. On December 2016, ACTRIS has been adopted on the ESFRI (European Strategy Forum on Research Infrastructures) roadmap for Research Infrastructures. With the ESFRI status, ACTRIS will initiate the implementation of the European-wide ACTRIS operations and establishment of the organizational framework to provide services for the ACTRIS users.

These Research Infrastructures system really plays as an attractor to both Italian and foreign researchers and contributes to enhance the CNR participation in international programs. Besides this, it has a high application impact also in providing support to the end-users.



Financial resources

IMAA shows a strong tendency towards self-fund rising in the frame of competitive calls. During 2020 active contracts were stipulated with third parties for about 2.85 MEuro, about 49% coming from European projects. The portfolio of the projects covers European, national and regional funds, with a significant percentage of industrial contracts. During 2020 IMAA has developed a strong capacity to lead and manage research projects, to-date IMAA is the coordinator of international and national projects with a budget of more than 20MEuro and with a large participation of public and private partners.



Research and innovation projects in Europe and at international level

Horizon 2020

The IMAA position in the international programs furtherly increased in 2020 thanks to the successful participation in Horizon 2020 calls where IMAA researchers have experienced scientific responsibility as well as played coordination roles. It was recently granted a new project within H2020, increasing the portfolio of the IMAA projects up to 12 (ACTRIS-IMP, e-SHAPE; CORDINET; GAIA-CLIM; ACTRIS-2; ACTRIS PPP, ENVRIPLUS; ENVRI-FAIR; ATHENA; ECARS; EUNADICS) and 2 projects under the COSME programme.

European Research Area for Climate Services (ERA4CS) and Copernicus Climate Change Service (C3S)

IMAA has reinforced its participation in the European Research Area for Climate Services (ERA4CS), by coordinating two projects: SERV_FORFIRE e DustClim. In the framework of the Copernicus Climate Change Service (C3S), since 2017, IMAA has been coordinating a service for the development of products related to the Access to Observations from Baseline and Reference Networks, which is at its second phase of the contract. Recently, IMAA has started the coordination of the CAMS21b, a pilot project aiming to provide to CAMS (Copernicus Atmospheric Monitoring Service) ACTRIS data related to aerosol vertical profiles measured by 9 stations ACTRIS/EARLINET at ECMWF. Besides these projects, IMAA, through the participation in TeRN Consortium, is also involved in Network of European Regions Using Space Technologies (NEREUS), by participating in two activities aiming to promote the use and uptake of Copernicus data and information by users (intermediate and end-users).



European Space Agency and EUMETSAT

With ESA, IMAA has recently concluded the project ARTEK “Satellite Enabled Services for Preservation and Valorisation of Cultural Heritage” and is playing the role of contractor of several services for Earth Observation, such as EC-ACTS “Earlinet and Cloudnet - Aerosol and Clouds Teams for Sentinel-5P Validation (ESA-ESTEC ID28659), Wrad “Characterization of W-band propagation channel through ground-based observations”. IMAA has recently started a new project funded by EUMETSAT, the ComboCloud “Combined MWS and IASI-NG Soundings for Cloud Properties” and carried out the activities related to the contract APPLES “Applicability of Langley method for EPS-SG EIRP measurement at Svalbard”.

Interregional and international cooperation

IMAA has played the role of Lead Partner of PrioritEE “*Prioritise energy efficiency (EE) measures in public buildings: a decision support tool for regional and local public authorities*”, a modular project aimed at fostering low-carbon strategies and energy efficiency in specific MED territories, recently closed. In the framework of the COST actions, IMAA has recently started a new action, COST PROBE related to the study of the atmospheric boundary layer. The IMAA participation goes ahead in the COST action “In Dust” addressed to establish a network on airborne dust. Besides these actions, IMAA participates in the JP EERA Smart Cities, in the Thematic Working Groups TWG2 Urban Environmental Sustainability and Resilience and TWG4 Urban Governance and Participation of the JPI UERA.

IMAA has also promoted activities and bilateral projects of international cooperation with scientific institutions from European countries (e.g. Portugal, Polonia, Bulgaria, Czech Republic) and extra-EU countries (China, Azerbaijan, Mexico, Egypt, etc.) to favour the mobility of the personnel and the realization of joint research laboratories.

Research activities at national level

IMAA cooperates intensively with other CNR Institutes and Universities, with the most important national research organizations (ASI, INGV, OGS, ENEA) and with University Consortia CNIT, CNISM, RELUIS. Among the main research activities there are 3 projects for the up-grade and implementation of Research Infrastructure funded in the frame of MIUR PNIR 2014-2020 program. In particular, IMAA is the coordinator of the PER-ACTRIS-IT project and it is active partner of the PRO-ICOS and GRINT projects. The total budget for these projects is about 15MEuro.

During 2020 IMAA continued to carry out the industrial research project OT4CLIMA coordinated by IMAA with participation of 13 institutes of the CNR scientific network, leading international private companies (e-Geos of Leonardo-Finmeccanica, IDS) and many consortia of PMI. Furthermore, the activities of the projects; “Smart Cities - Clara” and INSIEME funded by MIUR and the projects SOLARCLOUD and SPOT funded by MISE are completed. Furthermore, IMAA launched a new project FLUIDS “Detection and tracking of crustal fluid by multi-parametric methodologies and technologies” coordinated by University Federico II of Naples (funded by MIUR PRIN Program – ERC sector PE10).

Projects and cooperation with the Public Administration

IMAA is a Competence Centre for the Department of Civil Protection (D.M. n. 252/06) and member of “Grandi Rischi” national commission (D.M. 5-12-2017). During the 2020, the institute has continued to support the Department of Civil Protection for the activities related to seismic microzonation and the geospatial data managing and interoperability. In particular, IMAA supported the Civil Protection for managing the emergency of the Pomarico landslide planning an integrated geophysical field survey.

In 2020 IMAA continued to support the Basilicata Regional Authority for the development of innovative methodologies for the prevention of fires, the study of hydrogeological risk and the seismic microzonation. The Lab. of the Medical and Environmental Geology was involved in activities to evaluate the presence of asbestos materials in the indoor environment. Finally, IMAA has continued to support the Environmental and Biomedical Foundations of the Basilicata region for studying the environmental impact of the anthropic activities.

Projects and collaborations with industrial partners

During the 2020 IMAA has improved the collaborations with industrial sector promoting projects with leading international enterprises (ENI, Leonardo-Finmeccanica, FCA, IDS). The most relevant initiatives are: a project financed by ENI to test innovative electromagnetic technologies at the Hydrogeosite experimental site; a project in cooperation with FCA for testing the MARKAL/TIMES model and studying innovative materials for productive industrial plants; a project funded by ITALGAS for the mineralogical and geochemical characterization of soil samples in areas interested by the presence of strategic life-pipeline. IMAA has contributed to the set-up of technological clusters related to the 5 priority themes of the S3 program of the Basilicata region (Aerospace, Energy, Bioeconomy, Automotive, Creative Industry). To the end of 2020 IMAA started a new research industrial project (ARPA) in collaboration with Centro Ricerche FIAT and MASMEC company.

Outreach and dissemination activities

In general, the dissemination and dissemination of scientific research results relating to the year 2020 were significantly affected by the Covid 19 emergency, which undoubtedly conditioned if not hindered for a long time their implementation and future planning.

Despite the aforementioned contextual problems, the activities of the third mission carried out are reported below.

- Design and Coordination of the "SuperScienceMe - REsearch is your R-Evolution" Project (Event associated with the European Researchers' Night, launched by the European Horizon 2020 Program and part of the Marie Skłodowska-Curie actions) which took place online on 27 November 2020.
- Coordination and organization of the scientific dissemination Webinar "Mallet's vision. Comics meets and tells about scientific research "(held by Giuseppe Palumbo on June 17, 2020), aimed at researchers and focused on how to communicate and disseminate science.
- Bimonthly drafting of an IMAA-CNR informative newsletter (6 issues) concerning environmental issues. The Newsletter - addressed to the general public - collects information, updated news on the activities / initiatives / events of the Institute, the projects in place, the results achieved, the latest publications, the reports of the conferences.
- Design and coordination of the PCTO "Geophysics for Archeology" for third year students of the "G.Peano" Liceo Classico in Viggiano. The activities started regularly - as per the scheduled calendar - on 21 February 2020, but then suspended due to a pandemic (Covid19 emergency)
- Promotional activities through relations with the media (newspapers, radio, TV, newsrooms, CNR press office, etc).
- Promotion of institutional research activities through social channels (Facebook, YouTube, Twitter).



THE CNR-IMAA IN NUMBERS

151

Staff

- 101 units of permanent staff made of researchers, technologists, technicians and administrative workers;
- 50 units of non-permanent staff made of fellowships, post-doc fellows, PhD students, visiting scientists, associate researchers and professors and other collaborators



517

ISI papers published on international journals in the period 2015-2020

The Italian Agency for the Evaluation of the University and Research system (ANVUR) has classified IMAA at first position in a ranking list for the 33 research structures working in the public research organizations in Italy (VQR 2011-2014, www.anvur.org).

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Research Groups

The research activities are mainly addressed to the developing and integration of methodologies for Earth Observations, both in-situ and in remote sensing, and the energy-environmental modeling:

- ❑ Development and integration of lidar, radiometric and microwave techniques for the characterization 4D of the atmosphere;
- ❑ Remote Sensing of Clouds and Precipitations;
- ❑ Earth Observation (EO) methodologies and technologies for the characterization of surface processes and for the NRT monitoring of natural and anthropic risks;
- ❑ Integrated technologies of Earth Observation (EO) for the environmental and archaeological research;
- ❑ Micro and bio-minerals in the environment and human health studies.
- ❑ Integrated methodologies for the study of soil and subsoil;
- ❑ Integrated modeling for the energy-environmental sustainability.

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Ongoing projects

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- 22 European projects (H2020; Copernicus; ESA)
- 12 International Cooperation projects
- 6 National projects (MIUR; MISE)
- 7 Projects for the Public Administration

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Research Infrastructures

- ❑ CIAO - CNR-IMAA Atmospheric Observatory, main node of the IR-ACTRIS that is included in the roadmap ESFRI;
- ❑ Receiving, processing and archiving system of satellite data (NOAA, MSG, EOS-AQUA, EOS-TERRA) with the capacity to process in real time geospatial data for geo-hazard monitoring;
- ❑ Field experimental test site Hydrogeosite at Marsico Nuovo that is the first full-scale laboratory in Italy for studying hydrogeophysical processes and a geophysical multiparametric network.
- ❑ Integrated facilities for in-situ and laboratory measurements (chemical-physical, biological, geochemical, mineralogical and geophysical instruments); thermal and infrared sensors for the airborne remote sensing.

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Financial Resources (Meuro)

18 MEuro coming from competitive calls (2015-2020)