

Report on the Institute of Atmospheric Science and Climate (ISAC)

From the D01SSTA Evaluation Panel

Department: Science of the Earth System and Environmental Technologies

Institute: Institute of Atmospheric Science and Climate

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Executive summary

The Institute of Atmospheric Science and Climate (ISAC) has a permanent staff of 123 units, 95 of which directly involved in the research activity, as researchers or technologists, and is distributed into seven sections. Such a distributed organisation might make more complex the Institute management and the achievement of critical masses in the research teams; the fragmentation of the ISAC research staff is partially dampened by strong collaborations with other CNR Institutes, also through bilateral agreements, and with Universities.

The mission of ISAC is focussed on deepening integrated understanding of the atmosphere at all scales, with multidisciplinary approaches within eight key research lines organised along the following thematic areas: Meteorology and its applications Variability, Change and predictability of climate, Atmospheric structure and composition, Earth Observations. Along these lines, ISAC has developed a dense network of national and international collaborations, with a clear international recognition and coordination of many international initiatives. ISAC coordinates two out of the thirty Global Atmospheric Watch stations of the World Meteorological Organisation (GAW-WMO) and three out of the 400 regional stations, it was leading 2 FP7 projects in the time frame 2011-2014 and other large international project and contributes with its researchers to the implementation of a global observing system, the Global Ocean Observing System (GOOS) of the Intergovernmental Oceanographic Commission (IOC) of UNESCO, to the EU Joint Programming Initiative 'Cultural Heritage' as well as to other international initiatives.

The Institute has top level highly-instrumented research infrastructures and facilities including the two global and three regional GAW-WMO stations and two supersites The scientific production of the researchers of ISAC is excellent, qualitatively and quantitatively very good, showing a high inter-disciplinarity of ISAC researches and demonstrating intense international networking of ISAC research groups with researchers from outside Italy.

The Institute has a good attractiveness for early career researchers with 17,3% of them from countries outside Italy, partly through Marie Curie fellowships. Moreover, in addition to all trainees ISAC has shown attractiveness for visiting scientists from countries outside Italy.

The Institute shows a strong multi-disciplinary portfolio with links to top ranking national and international research groups. It is notable that ISAC have coordinated 2 FP7 projects in the time frame 2011-2014 and participated in other 22 FP7 projects and other international projects. The attractiveness for external funding turns out to be higher than that of the Department. The generation of patents should be more active having recorded no registration in the period, particularly since ISAC includes technological development of sensors and other products for monitoring. On this line is actively involved a spin-off enterprise promoted by ISAC.

The SWOT analysis presented in the ISAC report is very clear and the analysis is well done and generally supported by evidences even though the low critical mass of a number of ISAC sections involved in the coordination of major infrastructural components would probably require a stronger emphasis.

As an integrated evaluation, the Institute is fulfilling its mission and objectives, which fit perfectly with the strategic direction of the CNR as specifically highlighted in the ISAC report. Following all these considerations the panellists give an overall evaluation of the institute as World-Class.

1) Scientific/scholarly production [90 points maximum]

According to the ISAC Report and the documents made available to the Evaluation Panel after the interview with the director of the Institute, the researchers of the Institute have globally published in the period between 2011 and 2014 1615 research products, including contributions in magazines, proceedings or books and other publications. Contributions in magazines were 475 within the four years, with 2,6 papers per individual researcher per year. Globally, the Institute shows a good scientific production in the time frame 2011-2014, both quantitatively and qualitatively, with important contributions both of interdisciplinary research and of joint research activities (resulting in papers) with scientists of other countries.

The capability to produce a high level, frontiers innovation driven, research is witnessed also by the level of the selected 20 publications and their level of impact. All of them are published in Q1 journals and their mean impact factor is higher than the average of the Department. 55% of the selected publications are lead by a ISAC researcher as first author and 65% are joined publications with researchers from other countries.

The Institute shows a strong multi-disciplinary nature with links to top ranking national and international research groups. At the national level, it has a network of collaborations with many CNR Institutes, having bilateral agreements with some of them, with other research Institutes and with Universities. The Institute has also top-level instrumented research infrastructures and facilities. These include the Nepal Climate Observatory – Pyramid (Nepal) and the Monte Cimone (Italy) global stations as part of the Global Atmospheric Watch global station network of the World Meteorological Organisation (GAW-WMO). In addition, ISAC coordinates three GAW-WMO regional stations, respectively at Lecce (suburban background station), Lamezia Terme (coastal station) and Capo Granitola (marine station), two supersites, i.e., the Rome atmospheric supersite and the Bologna air quality measurements supersite, and many other smaller physical infrastructures.

The high international level of ISAC and its well-recognised leadership in the field of atmospheric sciences is also shown by the responsibilities that researchers of the Institute have in international initiatives, boards and Committees. Among others, ISAC contributes with its researchers to the implementation of a global observing system, the Global Ocean Observing System (GOOS) of the Intergovernmental Oceanographic Commission (IOC) of UNESCO, to the EU Joint Programming Initiative ‘Cultural Heritage’, as well as to other international initiatives, to the Commission for Atmospheric Sciences World Meteorological Organisation and its Inter-Commission Coordination Group – Integrated Global Observing System, as well as to other international initiatives.

In the time frame 2011-2014, ISAC shows also a high attractiveness for financial resources, higher than average for the Department and with a good sharing of funds from EU institutions demonstrating the international level of recognition. In the framework of the FP7 calls, the Institute has coordinated 2 projects and participated to

other 22 projects; moreover, it has participated in other international projects (and programmes (e.g., EUMETSAT) and also in many national projects (15% of industry and private sector), in some cases with coordination responsibilities. ISAC has an active spin-off but, unfortunately no patents have been registered during the reporting period. This somewhat at odds with the recorded very good scientific production.

2) Transfer of research results to society [20 points maximum]

The ISAC activity of transfer research results to society is well developed, high-quality and clearly recognised. Most importantly, 5 researchers of ISAC have participated as lead and/or contributing authors in the 5th assessment reports of the Intergovernmental Panel on Climate Change (IPCC) of the UN.

ISAC participates to different technological platforms/clusters, such as the National Aerospace Technology and Apulia Region Aerospace District, to the Smart Community Cluster on ICT for cultural heritage and to the NASA GeoStorm, mission. On related fields ISAC has partnerships with the R.E.D spin-off, the PROAMBIENTE Consortium in agreement with the Regione Emilia –Romagna, CGS, ARIANET and NESAs and with other public and private companies.

ISAC has produces services for different stakeholders of atmospheric science applications regarding flight safety, take-off and landing, remote sensing from current and future satellites, remote sensing of state of marine ecosystems at different spatial scales.

Moreover, ISAC has outreach activities as consultant for different Italian Ministries, in support of decision-making and referent for technology transfer.

The transfer of research results to society developed by the ISAC research group has been excellent in the period interested by the current assessment.

3) Formation of highly qualified personnel [10 points maximum]

The well developed national and international recognition of ISAC and the collaboration among ISAC and Universities have surely contributed to the attractiveness to early career scientists, together with the highly multidisciplinary research and the spectrum of advanced and productive research activities in which they have the possibilities to be involved on lines ranging from climatology and climate hotspots to dynamic meteorology and turbulence, ocean satellite monitoring Mediterranean cities and environment and cultural heritage.

Attractiveness to young researchers is at good level with a notably attractiveness from other countries; ISAC has received 98 visiting PhD or post doc with 17,3% of early career

scientists from other countries. These latter include also two Marie Curie incoming fellows.

4) Quality of management and environment within the institute [10 points maximum]

ISAC has a distributed structure with seven sections and eight research lines. The Institute has great infrastructural components, excellent scientists and a very good scientific production, high attractiveness for competitive funds and for talented early research scientists. The high national and international recognition of ISAC and its international leadership on different fields of atmospheric sciences is following these strength points, all well represented in the SWOT analysis reported. The leadership of ISAC is highly commended for the successful streamlining and focussing of the research portfolio during the recent reporting period.

However, attention is required by the low critical mass of at least half of the ISAC sections, one of which with the responsibility of managing a GAW-WMO regional station.

In the time frame 2011-2014, the Institute has organised and hosted international Conferences and Workshops in the framework of international research projects or of the international initiatives.

ISAC has already established collaboration on different levels with other institutes of the Department having complementary expertise and infrastructures; in two cases the collaborations are formalised with a bilateral protocol of agreement. This intense and organised collaboration with other Institutes of the Department and of other Departments is considered a strong point of ISAC.

5) Recommendations, supported by a brief justification for each [use this heading, if applicable advice]

- a. Critical mass of researchers has to be ensured to all sections and research groups. ISAC has most of its research staff concentrated in three sections, Bologna, Roma and Lecce; the other four sections have five or less researchers/technologists. Moreover, the Lamezia Terme section has the responsibility to manage a GAW-WMO regional station with only two researchers/technologists in the staff. Since four sections are involved, new staff recruitment would take too long to solve the problem and panellists recommend to reinforce collaboration among ISAC sections and to promote internal short-term mobility of staff. A short-term mobility from sections with larger number of researchers and technologists towards smaller sections could reduce the disparity of

researcher/technologist staff among sections and ensure a better operation of the research infrastructures managed by the Institute

Assessment

Criteria	Max points	Points assigned
Production	90	78
Societal impact	20	16
Formation HPQ	10	9
Management/Environment	10	9
Total	130	112
Category	(1) <u>World class (90+)</u> (2) Excellent (80-89) (3) Very good (70-79) (4) Improvements required (60-69) (5) major issues to be addressed (59 or less)	

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ISAC is one of the largest Institutes of the Department of Earth System Science and Environmental Technologies with many geographical sections within a strongly distributed structure. The mission of ISAC is deepening the integrated understanding of the atmosphere at all scales and it is pursued with multi/inter-disciplinary approaches. ISAC has developed a dense network of national and international collaborations, with a clear international recognition and coordination of many international initiatives

The panel has acquired all information required for the assessment by the available documentation and through an interview with the Director. ISAC has top level highly-instrumented research infrastructures and facilities, including two out of the twenty global stations of the Global Atmospheric Watch of the World Meteorological Organisation. ISAC shows in the time frame 2011-2014 a good scientific production, both quantitatively and qualitatively, with an average IF for the selected publications among the highest for the Department, important components both of interdisciplinary research and of joint research activities. ISAC also shows a strong attractiveness for both competitive international projects and projects with the industry sector. Moreover, ISAC researchers are involved and have responsibilities in many different International Organisation and Initiatives in the field of atmospheric sciences and ecosystems.

ISAC research activity has areas of overlapping but also complementarity with other Institutes of the Department of Earth System Science and Environmental Technologies, particularly with IIA, IMAA, IDPA and, for marine science, ISMAR. It doesn't look to be a problem but it is important reinforce the collaboration among Institutes.

ISAC has most of its research staff concentrated in three sections, Bologna, Roma and Lecce, and the other four sections with five or less researchers/technologists but, in some cases, the responsibility of managing main infrastructural components, e.g. the GAW-WMO regional station of Lamezia Terme. Actions aimed at reducing fragmentation and improving coordination among research groups, in part already implemented by the ISAC management, need to be further encouraged, e.g. also promoting internal short-term mobility among sections.

Considering all aspects under evaluation, ISAC is one of the top-level Institutes of the Department of Earth System Science and Environmental Technologies and the panel has assessed it as World-Class.