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MINISTERO DELL'ISTRUZIONE, DELL'UNIVERSITA' E DELLA RICERCA

REPORT TO SCAR

No. 24 – 2012

Record of Activities July 1, 2011 - June 30, 2012

on behalf of
The Italian National Scientific Commission
for Antarctic Research

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MEMBER COUNTRY: National Report to SCAR	ITALY for year 2012	(1 July 2011 - 30 June 2012)				
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A BRIEF SUMMARY OF SCIENTIFIC HIGHLIGHTS

Observatory Activities - Italy runs since the '80s a set of observatories for long-term recording of geophysical parameters. In time the initial set has been enlarged. The following quantities are among those continuously monitored: geomagnetic field, remote and local seismic activity, meteorological data, lower atmosphere composition - special attention being paid to aerosols and ozone - ionosphere and stratosphere parameters, GPS permanent station and mean sea level (tide). Data are used for specific research as well as an input to international databases. Measurements are carried out at Mario Zucchelli Station (MZS, Terra Nova Bay), Concordia Station (Dome-C) and other stations in the framework of international cooperation. As to summer season 2011-12, in spite of some budgetary reduction and delays, attention was paid not to shrink the observatory activities so to avoid a gap in the historical series of data. Measurements of geomagnetism, seismology and meteo parameters are run all year long at Concordia Station. More details in the following.

Biology of the Sea Ice - Seasonal dynamics of the sea-ice, regarded as a huge habitat of microalgae and microfauna, is studied at Terra Nova Bay and Wood Bay with the attention mainly focused on the flux of carbon through the trophic chain.

Fish Biology - Antarctic fishes are sensitive to climatic changes. Life cycle of *Pleuragramma antarcticum* from the egg and larval stage to the adult stage is investigated. Sampling areas are at Gerlache Inlet, Cape Washington, Silverfish Bay.

Marine Biology - Environmental and biological parameters of the marine protected area in front of MZS, ASPA n. 161, are monitored.

Chemistry - Accurate techniques of sampling and analysis allow the study of microcomponent fluxes and geological trackers relevant to climate changes from present to Cenozoic era. Persistent Organic Pollutants (POP) as well as aerosol particle content of the atmosphere are monitored.

Cenozoic Geology - The rifting process that caused the opening of the Ross Sea is studied through the sampling and analysis of the so called xenoliths or nodules from the mantle.

Geodesy - The extensive network VLNDEF (Victoria Land Network for Deformation Control) based on geodetic GPS L1/L2 stations covers an area about 600 km long, 300 km wide. The network aims at the crustal deformation control and the assessment of continental drift. Repetitive measurements begun in 1999. The network comprises about 30 stations. In addition VLNDEF is integrated with international networks such as TAMDEF and POLENET. GNSS receivers are progressively put in operation beside the existing GPS stations. This year GNSS stations have been operated at Mt Baxter, Inexpressible Island, Cape Philippi, Evans Height, Hughes Bluff).

Seismology - In conjunction with the seismic station at MZS and the one at Concordia, the Italian Programme, jointly with the Argentinean Programme, maintains a network of broad-band seismometers. Stations are at Belgrano, Esperanza, San Martin, Jubany, Orcadas.

Meteorology and Climate - Meteorological monitoring is fundamental for climatic studies and for field operation and safety as well. A large network of AWS is maintained in Victoria Land. Additional atmosphere monitoring activity which includes radio-sounding is carried out at Dome-C.

Atmospheric Physics - The ice mass balance in Antarctica is fundamental to monitor the stability of the mean sea level and climate. A contribution to this field is the evaluation of the amount of falling snow, separated from the amount of snow accumulated by the blowing wind. To this purpose a microwave instrument is used. On a bi-polar (Arctic and Antarctic) perspective the Planetary Boundary Layer and the radiative effects of thin clouds and aerosols are both studied at Dome-C.

Glaciology and Climate Studies - Climate of the Antarctic continent has an outstanding importance both locally and on a planetary scale. The solar radiation balance and the atmosphere composition at ground level are the input for any climate model. They are monitored at Dome-C and Terra Nova Bay. At Dome-C, a station of the Baseline Surface Radiation Network (BSRN) is in operation. In addition snow accumulation rate and atmospheric aerosols are monitored also in connection with the paleo-climatic records from EPICA ice core. A new radar detector designed at INGV (Rome), mainly meant for crevasse detection, has allowed an accurate survey of the bedrock at the EPICA drilling site. Also at Dome-C the bidirectional reflectance of snow surfaces is measured in view of the application to remote sensing. At Terra Nova Bay, where aerosols and solar radiation are monitored since decades, an automatic instrument measures sky radiation also in winter. Ablation/accumulation annual rates on snow pack are part of a monitoring programme by means of stake fields at Talos Dome, High Priestley Glacier, Larsen Glacier, Dome-C.

Permafrost - Monitoring activity and studies have continued in Victoria Land along a latitudinal transect which includes Boulder Clay and MZS itself. Research is focused on understanding the system “permafrost + vegetation” and the feedback mechanisms involving the air temperature regime and snow blanket.

Space Weather - A number of scientific instruments are installed in the Antarctic auroral region which allow the study of ionosphere and magnetosphere. They include magnetometers fluxgate at MZS and Concordia Station where measurements of pulsations in the ULF band are carried out. Drift velocity of ionosphere anomalies such as bubbles of high electron density, which would affect GNSS signals, are monitored at Concordia also during the winter period. Scintillation and Total Electronic Content of the ionosphere (TEC) are monitored at OASI (MZS).

Astronomy at Dome-C - Low levels of atmospheric temperature, humidity and turbidity plus darkness in winter, make Concordia Station the ideal place for any kind of astronomical observation. The main programmes carried on this year have been IRAIT and BRAIN. In the framework of the International Robotic Antarctic Infrared Telescope (IRAIT), the telescope equipped with the camera AMICA is being set up and is already obtaining infrared images of sky objects. BRAIN may be seen as the natural continuation of the successful measurement carried out by the balloon-borne telescope (Boomerang, 1998 & 2003). The telescope at Dome-C will be equipped with a bolometric interferometer (QUbic) for the detection of non-uniformities in the microwave component of the cosmic background radiation. Preliminary assessment of effects which may impair the ultimate sensitivity of the system has been conducted (instruments thermal conditioning, precipitable water content). The first QUbic module is to be installed in 2014.
Other projects carried out by French teams, such as Astroconcordia, to be accounted for by the French Report to SCAR.