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

REPORT TO SCAR

No. 27 – 2015

Record of activities July 1, 2014 – June 30, 2015

**on behalf of
The Italian National Scientific Commission
for Antarctic Research**

ANT 15/03

Member Country: Italy

National Report to SCAR for year: 2015 (1 July 2014 – 30 June 2015)

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A brief summary of scientific highlights

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.

Marine Biology/CCAMLR – Estimation of toothfish abundance in Ross Sea.

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

Trophic chain at sea – Foraging habit and migration of top- and meso-predators such as Orcinus Orca, Weddell Seal, Pygoscelis Adelie which live at Terra Nova Bay. Killer whales have been followed by implanted satellite transmitters up to north of New Zealand.

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

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

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 crustal deformations detection and assessment of continental drift. Repetitive measurements begun in 1999. The network comprises about 30 stations. VLNDEF is integrated with international networks such as TAMDEF and POLENET. GNSS receivers are progressively put in operation beside the existing GPS stations.

Seismology - In conjunction with the seismic stations at MZS and 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.

Cainozoic 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.

Atmospheric Physics and Meteorology - The ice mass balance in Antarctica is fundamental to 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 studied at Dome-C. 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. Atmosphere monitoring which includes radio-sounding is carried out also at Dome-C.

Glaciology and Climate Studies - Climate of the Antarctic continent has outstanding importance both locally and on a planetary scale. The solar radiation balance and the atmosphere composition at ground level are mandatory inputs 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 mobile 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.

Astronomy at Dome-C - Low levels of atmospheric temperature, humidity and turbidity in addition to darkness in winter, make Concordia Station the ideal place for astronomical observation. The main programmes carried on are IRAIT and BRAIN. In the framework of the International Robotic Antarctic Infrared Telescope (IRAIT), the telescope equipped with the camera AMICA has been set up and obtains 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 is equipped with a bolometric interferometer (QUbic) for the detection of non-uniformities in the microwave component of the cosmic background radiation. The first QUbic module has been installed in 2014. Other projects carried out by French teams, such as Astroconcordia, to be accounted for by the French Report to SCAR.

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 to 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 in winter. Scintillation and Total Electronic Content of the ionosphere (TEC) are monitored at OASI (MZS). SUPERDARN stations installed on the continent (Dome-C) and outside investigate the ionosphere.

Observatories - Italy runs since the '80s a set of observatories for long-term recording of geophysical parameters. A number of physical quantities are 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, geodetic data and mean sea level. Data are used for specific studies as well as an input to international databases. Also in case of a funding delay

and/or funding cuts, attention is paid not to shrink the observatory activities so to avoid a gap in the historical series of data. Accordingly some of the activities listed above enjoy such a privilege. Measurements are carried out at Mario Zucchelli Station (MZS at Terra Nova Bay), Concordia Station (Dome-C) and other locations in the framework of international cooperation.