

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

REPORT TO SCAR

No. 28 – 2016

Record of activities July 1, 2015 – June 30, 2016

on behalf of
The Scientific National Commission
for Antarctic Research

ANT 2016/03

MEMBER COUNTRY: ITALY

National Report to SCAR For year : 2016

(1 July 2015 - 30 June 2016)

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A brief summary of scientific highlights

Astronomy and astrophysics

Low levels of temperature, humidity and turbidity of the atmosphere, in addition to darkness in winter, make Concordia Station the ideal place for astronomical observation. Main programmes carried on at Concordia are IRAIT and QUBIC. The International Robotic Antarctic Infrared Telescope (IRAIT) obtains images of the sky in the visible and infrared bands. QUBIC is a very sensitive bolometric interferometer. It aims at the detection of non-uniformities in the microwave component of the cosmic background radiation. The project may be seen as the natural continuation of the successful measurements carried out by the balloon-borne telescope (Boomerang, 1998 & 2003). Last summer possible sites for the installation of QUBIC have been carefully compared. The beginning of sky observation is planned for 2017-18. Other projects carried out by French teams, such as Astroconcordia, to be accounted for by the French Report to SCAR.

Oceanography and Hydrography

Apart from a few long-term moorings, which keep standard instrumentation in selected points, Ross Sea is extensively surveyed with the help of drifters, floats, XBT, CTD during most of the time the support vessel (M/N Italica) is in the Antarctic waters. Specific projects address the primary production and the role of iron, ventilation and the cycle of carbon, frazil and pancake ice in seasonal freezing of sea.

New lines of echosounding are the last contribution to the nautical chart 885 (INT 9000), 1:500.000, of the Southern Ross Sea

Geology

Retrieval of Holocenic marine sediments in the area around Cape Hallett allows a better knowledge of the past climate a sub-millennial scale. In order to further exploit the knowledge acquired after the Ross Sea sediment coring a Triassic fossil area at Allan Hills has been surveyed and analysed in the framework of the West Antarctic Rift System dynamics.

Geodesy

The geodetic network VLNDEF (Victoria Land Network for Deformation Control) progressively based on the Global Navigation Satellite System (GNSS) covers an area 600 km long, 300 km wide. The network aims at crustal deformations detection, neotectonics and continental drift investigations. Repetitive measurements begun in 1999. The network comprises about 30 stations. VLNDEF is integrated with international networks such as TAMDEF and POLENET. Boulder Clay moraine is being monitored by geodetic stations where the construction of an air strip on gravel is planned. Geodesy and geophysical surveys (RES) have been carried out in the area of Talos Dome.

Seismology

Seismic Very Broad Band stations at MZS and Concordia are regularly in operation, moreover, the Italian Programme, jointly with the Argentinean Programme, maintains in the area of Scotia Sea a network of 5 broad-band seismic stations (one more planned at Deception Island).

Glaciology

An interdisciplinary project using a local seismic network and radio echo sounding investigated David Glacier's dynamics.

Ice losses due to wind flux are relevant when evaluating the ice cap mass balance: the problem is approached by remote sensing and in situ measurement.

Meteorological and climate studies on the plateau

The geographical position of Dome-C makes Concordia Station a nearly unique observation point for a variety of phenomena in the low, medium and upper atmosphere and the interaction between the atmosphere and the snow or ice. Solar and IR radiation at the surface are detected by a long term station of the Baseline Surface Radiation Network (BSRN). The Super Dual Auroral Radar Network (SuperDARN) for the study of the ionosphere has at Concordia one of the radar stations (recently maintained after a winter failure). A comprehensive set of meteorological and climatic observations and modelling is carried out by several projects which make use of lidar, sodar, standard procedures such as synoptic launch of radio-sondes, columnar ozone detectors, arrays for precipitation retrieval and for the evaluation of the radiative regime. Snowpack is also studied exploiting the sensors installed on the Soil Moisture Ocean Satellite (SMOS). Specific snow sampling aims at mercury, in order to understand cycling and sequestration processes of the metal.

Permafrost

Research is focused on understanding the system "permafrost + vegetation" and the feedback mechanisms involving the air temperature regime and snow blanket. Special attention is paid to the area of Boulder Clay where the construction of an air strip on gravel is planned.

Marine Biology

Due to the location at a Bay (Terra Nova), Mario Zucchelli Station hosts a number of scientific projects in the field of marine biology. Most of them point to a better understanding of the coastal ecosystem, nutrients, trophic chain, population. Special topics such as parasites (elminta) in fishes or oceanic methane production are investigated. Environmental and biological parameters of the marine protected area in front of MZS, ASPA n. 161, are yearly monitored. The Adelie penguin rookery at Edmonson Point is monitored as well. As to the pelagic ecosystems, the biomass, mainly krill, is assessed by electroacoustical methods in conjunction with trawls in Ross Sea, while another project addresses the *Dissosticus Mawsoni's* biology and distribution. In the Arc of Scotia reproduction of several species of nototheniodes is investigated.

Terrestrial Biology

Interest in epilithic and endolithic communities mainly comes from their position at the very limit of the possible life. The interest for the soil biological crusts (Project Whycrust) has the same origin. For the study of microbial life a new instrument based on the laser induced fluorescence has been exploited. Climatic forcing on permafrost and vegetation is studied in South Orkneys Islands.

Observatories

Italy runs since the '80s a set of observatories for long-term recording of geophysical parameters. Scientific planners' attention is constantly paid to avoid gaps in the historical series of data. A number of physical quantities are monitored: geomagnetic field, local and remote seismic activity, meteorological data (see e.g. the large network of AWS in Victoria Land), lower atmosphere composition - including aerosols and ozone - ionosphere and space weather, stratosphere dynamics, geodetic data and mean sea level. The set of moorings in the Ross Sea, continuously measuring oceanographic parameters, are in a sense a marine observatory. A new site for monitoring benthos is being set up in Tethys Bay. Data are used for specific studies as well as an input to international databases. Measurements are carried out at Mario Zucchelli Station, Concordia Station and other locations, mostly in the framework of international cooperation.