Final project report

Project ID: 2002/8.3
Title: ARES - Active and passive remote sensing of the Southern Ocean for the monitoring of the biological parameters

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Duration: 2 years
Assigned funding: € 50.000,00

Activities and results

The main aim of ARES project is to build up thematic maps merging active and passive remote sensing data collected during Italian Antarctic expeditions in order to improve our understanding of Southern Ocean (SO) and Ross Sea (RS) ecosystems, with a particular concern to the evolution of phytoplankton classes and dissolved organic matter over a large scale and in the polynya areas.

The study has been carried on with the optical remote sensing instruments, a lidar fluorosensor, already developed in the frame of the Technological Sector of PNRA, operated on board of the R/V Italica ship during the XVIII Antarctic expeditions (January – February 2003), and passive satellite radiance data, over the same area, and local sampling techniques, the latter for calibration and integration purposes.

The spectrally resolved Lidar data, continuously collected during the XVIII campaign, have been released in form of thematic maps of the investigated area thus allowing to distinguish contributions from natural chromophoric groups in the dissolved organic matter (CDOM), to identify algal pigments peculiar of different phytoplankton classes and differently involved in photosynthesis (i.e. phycoerythrin, phycocyanin, chlorophyll-a; Chl-a). The fluorescent database, after proper calibration with in-situ samples, have been employed to develop regional bio-optical algorithms for radiance satellite frames of the same area, in particular ocean color SeaWiFS images.

As results, weekly based lidar calibrated thematic maps of the CDOM and Chl-a, in the SO and RS area, have been obtained thus allowing to follow the dynamical process during the 2003 Antarctic summertime (phytoplankton blooms evolutions).

Successively, merging the main satellite physical (Sea Surface Temperature, ice coverage) and lidar biological (CDOM, Chl-a) parameters, a primary productivity model have been implemented for the RS. The model has been extended with historical data, stored in previous oceanographic campaigns, thus to retrieve monthly and annual based primary productivity, disentangled in off-shore and polynya areas.

Products

A – papers in scientific magazines


B – book chapters


C - proceedings of international conferences


Programma Nazionale di Ricerche in Antartide (PNRA)


D – proceedings of national meetings and conferences


E – thematic maps

Different Chl-a, CDOM and primary productivity distribution thematic maps, weekly, monthly and yearly based in the SO, RS, for the 2003 summer Antarctic season and previously from 1997.

F – patents, prototypes and data bases

Lidar fluorosensor database collected in the XVIII expedition and satellite images.

G – exhibits, organization of conferences, editing and similar

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H - formation (PhD thesis, research fellowships, etc.)

Thesis on Naturepreservation and management (Florence University, Science Faculty) Innocenti Andrea, Bio-optical characterization of the Ross Sea during the 2003 austral summer.

Fellowship position, annual base, Cecilia Gallo "Spectral variations and optical properties of the autotrophic communities in Southern Ocean"
The following activity reports have been also obtained: