

**THE SOUTHERN OCEAN PRIMARY PRODUCTIVITY ESTIMATION BY LIDAR FLUOROSENSOR AND SATELLITE RADIOMETER INTEGRATION APPROACH**

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Bio-optical properties of SO (Southern Ocean) have been poorly described, nevertheless this knowledge is essential for ecological studies of the pelagic system. In particular, for understanding the processes of carbon exchange between ocean and atmosphere thus involving primary productivity of particulate (phytoplankton) and dissolved organic matter (DOM). Since 1997 an Italian group of researchers participated to oceanographic campaigns in Antarctica with the ENEA Lidar Fluorosensor (ELF), onboard the Research Vessel *Italica*, for remote ship-based measurements of surface Chl-a and DOM concentrations completed by detailed bio-optical characterization of photic water column: absorption, attenuation, fluorescence, up and down-welling radiance, algal and non algal components of particulate absorption spectra and phytoplankton pigments concentration. Nearly at the same time, several satellite-based instruments began their operations. Bio-optical algorithms used in remote instruments for estimation of Chl-a concentrations are intended for midlatitudes and are far from excellence. Thus their outputs need to be validated and corrected according to SO specific taxonomic compositions. Satellite data are compared with the in situ data gathered by ELF representing, in some sense, the sea truth after proper calibration. With respect to usual match up analysis of satellite versus in situ Chl-a values, where a sample represents only one point of a pixel, ELF data cover a wider zone because they are distributed along a track crossing the pixel: ELF emits laser pulse every 0.1 s and acquires thousands of signals during the time taken by the ship to span a radiometer pixel. Six austral summers, starting from '97 upto '03, are analysed in the crossed Ross Sea and SO seawaters up to New Zealand. In particular, the regions of Cape Adare, Ross Gyre and Terra Nova Bay are deeply investigated. Our results show that standard model of primary production should be reviewed, from the other hand, they demonstrate that the Chl-a and CDOM algorithm have to be locally calibrated in each oceanographic province in order to provide accurate data.