Anomalous aspects of the eddy saturation regime in the Southern Ocean

Yuri Cotroneo (1), Pierpaolo Falco (1), Milena Menna (2), Pierre marie Poulain (2), and Giorgio Budillon (1)

(1) Department of Sciences and Technologies, University of Naples Parthenope and CoNISMa, Italy, (2) National Institute of Oceanography and Experimental Geophysics, Sgonico (Trieste), Italy (mmenna@ogs.trieste.it)

The eddy saturation behaviour is defined as the relative insensitivity of the Antarctic Circumpolar Current (ACC) volume transport to the strong increase of the wind stress field that, on the other hand, induces changes in the eddy field intensity (larger values of the Eddy Kinetic Energy – EKE). Time series of drifter, satellite, XBT and Argo float data describe an ocean state close to the eddy saturation in the Pacific Sector of the Southern Ocean (PSSO) during the periods 1995-2006, 2008, 2010-2011 and 2014-2015. An anomalous behaviour is observed in 2012, when an high ACC transport value occurs at the end of a wind strengthening period, whereas the anomalies of the EKE are positive and a weak transport variation would be expected. Moreover, approximately in the same period, an atypical behaviour is observed also in the time series of the surface meridional Eddy Heat Fluxes (mEHF). In fact, southward increases of mEHF are generally concurrent with El Niño events, but the episode of 2011 is unusually related with a strong La Niña event.

Different causes can generate the anomalous responses observed in the PSSO during the period 2011-2012; they can be related to the local and/or internal variability of the ACC (through positive feedback between the generation of mesoscale eddies, baroclinic instability and the dynamics of the mean circulation). Mesoscale eddy field definitely plays an important role in controlling both the zonal baroclinic transport variability and the poleward heat flux through the ACC fronts. Thus, in this work we focus on the eddy field, quantified in terms of EKE, and on the number and type of eddies inside the entire polar zone (defined by the Northern Subantarctic Front and Polar Front mean positions) and also in correspondence of each ACC front.