



Response of the Southern Pacific Ocean to the large scale climatic patterns: two decades of data (1995-2017)

Milena Menna (1), Yuri Cotroneo (2,3), Pierpaolo Falco (2,3), Roberta Di Lemma (2), Pierre-Marie Poulain (1,4), Giannetta Fusco (2,3), Giorgio Budillon (2,3), Enrico Zambianchi (2,3)

(1) OGS, National Institute of Oceanography and Experimental Geophysics, Sgonico (TS), Italy (mmenna@inogs.it), (2) Department of Science and Technology, University of Naples Parthenope, Naples, Italy, (3) CoNISMa, Consorzio Nazionale Interuniversitario per le Scienze del Mare, Rome, Italy, (4) CMRE, Centre for Maritime Research and Experimentation, La Spezia, Italy

Drifter, satellite, XBT and Argo float data are used to study the response of the Pacific Sector of the Southern Ocean (PSSO) to the large-scale climatic patterns in the period 1995-2017. Both the Southern Annular Mode (SAM) and El Niño Southern Oscillation (ENSO) influence the level of Eddy Kinetic Energy (EKE) in the PSSO and then the Antarctic Circumpolar Current (ACC) dynamical balance. The interplay between SAM and ENSO generates different ocean responses, showing positive/negative anomalies of the EKE when positive SAM values coincide with La Niña/El Niño events. The EKE values calculated on the persistent ACC meander located south of New Zealand (between 150°E- 180°W and 50°-66°S) respond to the climatic indices earlier than those calculated for the entire ACC branch of the South Pacific (50°-66°S). The time series of the ACC baroclinic transport, estimated along a transect south of New Zealand, shows a positive trend, with a net strengthening starting from 2007. Transport peaks are associated with periods of EKE weakening over the PSSO. The divergent component of meridional eddy heat fluxes increments both in positive (equatorward) and in negative (poleward) values in presence of positive anomalies of the EKE field. Largest poleward fluxes are observed along the western boundary while largest equatorward fluxes involve the ACC latitudinal band. The ACC acts as a barrier to the poleward advection of heat instead when negative anomalies of the EKE field occur. The variability of the PSSO results also linked to the decadal variability associated with the EKE and baroclinic transport time series. In the first decade (1995-2006) the prevalence of years with significant El Niño events is reflected by a predominance of negative anomalies of EKE an almost constant value in the transport time series. In the second decade (2007-2017), the higher variability of indices and the larger contribution of significant La Niña events are reflected by a predominance of positive anomalies of EKE and by a sharp increase of the transport time series.