Pacific Sub-tropical Cells Variability in CMCC Ocean reanalysis and SODA 2.2.6 from 1979 to 2009

Chunxue Yang[a], Andrea Storto[a], Simona Masina[a], Benjamin Giese[b]

[a] *Centro Euro-Mediterraneo sui Cambiamenti Climatici, Bologna, Italy,*
chunxue.yang@cmcc.it,
[b] *Department of Oceanography, Texas A&M University, USA*

Variability of the Pacific Sub-tropical Cells (STCs) from 1979 to 2009 is analyzed in this study by using the CMCC global ocean reanalysis system (C-GLORS) and ensemble runs of Simple Ocean Data Assimilation (SODA 2.2.6). C-GLORS, which covers the period from 1979 to 2011, consists of a weekly three-dimensional variational analysis (3DVAR), followed by a 1-week integration of the Ocean General Circulation Model NEMO coupled with the LIM2 sea-ice model. The resolution of the model is 0.5 degree on the horizontal with 50 vertical levels. The atmospheric forcing is provided by the ECMWF ERA-Interim atmospheric reanalysis, with a further correction of precipitation and radiative fluxes by using the climatology of Remss/PMWC and GEWEX/SRB data, respectively. All the hydrographic data (XBT, CTD, moorings and Argo floats) and sea-level altimetric observations (1992 - onwards) are assimilated into C-GLORS.

SODA 2.2.6 covers the period from 1871 to 2009 and the ocean model is based on the Parallel Ocean Program (POP) ocean model with a horizontal resolution that is on average 0.4^{o} x 0.25^{o} and with 40 levels in the vertical. The ocean model surface boundary conditions are provided from eight ensemble members from atmospheric reanalysis 20^{th} century reanalysis version 2 (20CRv2). SST observations from ICOADS 2.5 are assimilated using the SODA software package. Hydrographic data is not assimilated in SODA 2.2.6, but is assimilated in C-GLORS.

We calculated the transport at 9°S/9°N to analyze the interannual variability of the STC. The STCs consist of equatorial upwelling, Ekman transport, extra-tropical subduction and pycnocline transport from the subtropical to the tropical region. The change of the STC may affect tropical Pacific SST, especially ENSO variability. The correlation between transports of the STC and tropical Pacific SST is calculated. Variability of tropical Pacific wind stress, subsurface temperature and the equatorial undercurrent (EUC) are also analyzed to help understand the change of the STC. The comparison of the variability of the STC between C-GLORS and SODA 2.2.6 is conducted in order to verify the influence of different assimilation schemes, atmospheric forcing and the impact of hydrographic data versus SST only.