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Daily sea surface salinity variability in the tropical Pacific Ocean derived from satellite remote sensing data

Joaquim Ballabrera-Poy, Estrella Olmedo, Antonio Turiel, Marcos Portabella, Justino Martinez, and Nina Hoareau

Institute of Marince Sciences (CSIC) Department of Physical Oceanography, Barcelona Expert Center, Barcelona, Spain

In this work, a multifractal data fusion algorithm is used to obtain daily sea surface salinity (SSS) maps from the Soil Moisture and Ocean Salinity (SMOS) Level 2 (L2) data. The L2 SSS retrievals are obtained from the brightness temperature reconstructions at different polarizations and incidence angles along the satellite swath. SMOS L2 data have a spatial resolution of about 43 km and accuracy between 0.6 to 1.7 (in the practical salinity scale). The main goal of the data fusion algorithm is to use the reliable information of the OSTIA sea surface temperature (SST) daily fields to increase the spatial and temporal resolution of the SMOS L2 SSS data.

Our SMOS dataset consists of the European Space Agency (ESA) L2 v620 reprocessed data from January 2010 to May 2015, and of the latest L2 operational data (near real-time) version after May 2015. Salinity anomalies are constructed by removing the five-year average of the L2 salinity data as a function of the geographical position, the overpass orientation (ascending or descending), and the across-track distance to the center of the swath. The SMOS-based climatologies evidence the existence of strong systematic artifacts, especially near the coast and, as such, they allow retrieving some of the systematic errors present in the original L2 data.

The 0.05-degree, daily SST product from OSTIA is used as a template in our scalar fusion algorithm to generate 0.05 degree, daily SSS maps. The resulting SSS maps are less noisy and better define the main geophysical structures as compared to the standard high-level SSS products. Differences against near-surface Argo salinity measurements are reduced by 40% with respect to the standard products.

In order to assess the significance of the extrapolation to the time domain, data from the Global Tropical Moored Buoy Array are used. The results indicate that the small time-scale variability present in the mooring data are not completely reproduced by remote sensing, although data fusion significantly increases the correlation between moored and remote sensing time variability.