ESA CIRCOL - DATA

PHASE1

INPUT_DATA Synthetic Geostrophic Currents

The Synthetic Altimeter-derived Currents (SAC) are based on Sea Surface Height (SSH) data from the CMEMS MEDSEA_ANALYSIS_FORECAST_PHY_006_013 model. Such daily surface currents are obtained via the geostrophic approximation after computing an optimally interpolated, model-derived, daily Sea Level Anomaly (SLA, centered around zero). This is achieved accounting for the present-day sampling capabilities of the altimeter system in the Mediterranean Area. Before sampling the modelled free-surface, the SLA is obtained with the following formula:

SLA = SSH − (MDT − 0.344)

with the Mean Dynamic Topography (MDT) provided by the CMEMS product. The 0.344 constant allows to center the SLA values on the Mediterranean region during year 2017, so that the spatio-temporal mean of SLA is equal to zero. Then, the modelled SLA is sampled along the actual tracks of the following altimeters: Jason-3, Sentinel 3-A, SARAL/Altika and Cryosat-2. Finally, a gap-free SLA is obtained via space-time optimal interpolation. Such data are provided on regular 1/8° grid, as for the present-day version of the CMEMS Altimeter-derived gridded regional products for the Mediterranean Sea.

Optically Weighted Chl

The Space-based bio-optical oceanic variables as the surface Chlorophyll (Chl) concentration are mostly derived from passive observations by sensors mounted on board polar satellites. Roughly, the principle of the Chl remote sensing is based on measurements of the visible radiation that, after penetrating the first meters of the surface oceanic layer, is scattered back towards the atmosphere in the direction of a satellite sensor. Therefore, the satellite derived Chl represents an integrated quantity over the first meters of the oceanic water column. Since our study constitutes a testbed for applying the optimal reconstruction to satellite-derived data, we evaluated a satellite-derived equivalent surface Chl "Csat" from the CMEMS MEDSEA_ANALYSIS_FORECAST_BIO_006_014 model for the entire year 2017. We relied on the "Csat" expression provided by Morel and Berthon 1989 (https://doi.org/10.4319/lo.1989.34.8.1545):

$$C_{sat} = \frac{\int_0^{z_p} C(z) e^{-2kz} dz}{\int_0^{z_p} e^{-2kz} dz}$$

where "C" is the marine Chl value at the depth "z", "k" is the light attenuation coefficient and "Z_p" is the light penetration depth along the water column. All the quantities appearing in the equation were computed from the CMEMS MEDSEA_ANALYSIS_FORECAST_BIO_006_014 model outputs.

OUPUT_DATA

Optimal currents computed via the method of Piterbarg 2009 (https://doi.org/10.1016/j.apm.2008.12.006)

PHASE2

INPUT_DATA Sat Multisensor Chl L4

OCEANCOLOUR_MED_CHL_L4_NRT_OBSERVATIONS_009_041
from https://marine.copernicus.eu/, remapped on a regular 1/24° grid

2Sat Geostrophic currents

SEALEVEL_MED_PHY_CLIMATE_L4_REP_OBSERVATIONS_008_056 from
https://marine.copernicus.eu/

OUTPUT_DATA

Optimal currents computed via the method of Piterbarg 2009 (https://doi.org/10.1016/j.apm.2008.12.006). During CIRCOL Phase 2, the Optimal Currents are computed relying on a simplified version of the Piterbarg Method, e.g. focusing on the cases in which the surface Chl evolves as a passive tracer. Local degradations can occur with respect to the Altimeter system. Therefore, based on a one year long statistics, we also built an IMPROVEMENT/DEGRADATION mask (CIRCOL_IMPROVE_MASK.nc). This is provided to warn the users whether they are in an improvement or degradation area.