A high resolution reanalysis for the Mediterranean Sea

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Abstract

Here we present a new physical reanalysis of the Mediterranean Sea at high resolution, developed in the Copernicus Marine Environment Monitoring Service (CMEMS) framework. The hydrodynamic model is based on NEMO combined with a variational data assimilation scheme (OceanVar).
The model has a horizontal resolution of 1/24◦ and 141 vertical z* levels and provides daily and monthly 3D values of temperature, salinity, sea level and currents. Hourly ECMWF ERA-5 atmospheric fields force the model and daily boundary conditions in the Atlantic are taken from the global CMCC C-GLORS reanalysis. 39 rivers model the freshwater input to the basin plus the Dardanelles. The reanalysis covers 33-years, initialized from SeaDataNet climatology in January 1985, getting to a nominal state after a two-years spin-up and ending in 2019. In-situ data from CTD, ARGO floats and XBT are assimilated into the model in combination with satellite altimetry data.

This reanalysis has been validated and assessed through comparison to in-situ and satellite observations as well as literature climatologies. The results show an overall improvement of the skill and a better representation of the main dynamics of the region compared to the previous, lower resolution (1/16◦) reanalysis. Temperature and salinity RMSE is decreased by respectively 12% and 20%. The deeper biases in salinity of the previous version are corrected and the new reanalysis present a better representation of the deep convection in the Gulf of Lion. Climate signals show continuous increase of the temperature due to climate change but also in salinity.
The new reanalysis will allow the study of physical processes at multi-scales, from the large scale to the transient small mesoscale structures.

Keywords: Mediterranean Sea, reanalysis, high resolution

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