A Global Ocean Eddying Forecasting System at 1/16°

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In the recent years, the ocean forecast community is investing a growing effort towards the prediction of mesoscale processes and day-by-day variability at global scale. New high-resolution global simulations are able to resolve mesoscale structures in large part of the basin. On the other hand, a realistic representation of mesoscale variability is triggered by the capability of the assimilation schemes to efficiently ingest the increasing number of observations available.

At CMCC, we have been developing a Global Ocean Forecasting System at eddy resolving resolution (GOFS16), namely 1/16 degree. A NEMO-LIM2 ocean-sea ice model at 1/16 resolution is employed to solve the hydrostatic, primitive equation of ocean general circulation through a finite difference scheme, a free sea surface and a non-linear equation of state. This is coupled with a 3dvar assimilation system (OceanVar) that works at the same resolution and it is able to assimilate multiple and heterogeneous data sources (insitu, SLA and SST data).
The system is designed for short-term predictions (several days) and runs daily in operational mode since August 2017. Every day, terabytes of data are produced, manipulated and validated, with highly parallelized software designed at CMCC, to provide the three-dimensional status of the global ocean circulation at a hitherto pioneering resolution of roughly 6 km.

In January 2021, GOFS16 has joined the OceanPredict inter-comparison project that gathers and compares different global prediction system at different resolution (https://www.godae-oceanview.org).
In this work we discuss the different components of the systems, validate the capability of GOFS16 to provide surface and subsurface realistic initial-state conditions, performing several error analyses against both assimilated and independent datasets. This will help to discuss its current skill and possible future refinements/developments that can improve the final quality.