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The current Copernicus Marine Service global ocean monitoring and forecasting real-time system and the updates planned for the future system

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Since October 19, 2016, and in the framework of Copernicus Marine Environment Monitoring Service (CMEMS), Mercator Ocean delivers in real-time daily services (weekly analyses and daily 10-day forecasts) with a new global 1/12° high resolution (eddy-resolving) system. The model component is the NEMO platform driven at the surface by the IFS ECMWF atmospheric analyses and forecasts. Observations are assimilated by means of a reduced-order Kalman filter with a 3D multivariate modal decomposition of the forecast error. Along track altimeter data, satellite Sea Surface Temperature and in situ temperature and salinity vertical profiles are jointly assimilated to estimate the initial conditions for numerical ocean forecasting. A 3D-VAR scheme provides a correction for the slowly-evolving large-scale biases in temperature and salinity.

An assessment of the current system has been conducted and has highlighted improvements compared to the previous system thanks to the following updates: large-scale and objective correction of atmospheric quantities with satellite data, new freshwater runoff from ice sheets melting, global steric effect added to the model sea level, new Mean Dynamic Topography taking into account the last version of GOCE geoid, new adaptive tuning of some observational errors, new Quality Control on the assimilated temperature and salinity vertical profiles based on dynamic height criteria, assimilation of satellite sea-ice concentration, week constraint imposed on temperature and salinity in the deep ocean (below 2000 m) to prevent drift.

However, some weaknesses of the current system have been identified as for instance the equatorial vertical velocity in the physical simulations with data assimilation and the interaction with the biogeochemistry. To improve our simulations, we are working on the following components: correction of the Mean Dynamic Topography, assimilation of a higher resolution SST L3S data, use of a 4D version of the analysis including a “smoother” capability, update of the NEMO model with the possibility to activate new numerical schemes, update of sea-ice model (from LIM2 to LIM3) and activation of a multivariate sea-ice analysis.

This presentation will focus on the impact of some of these changes in order to quantify the expected improvements on ocean analyses and forecasts for the future system.