



## Major upgrade of the global Mercator Océan analysis and forecasting high resolution system

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Mercator Océan, the French ocean forecast service provider, was setup about ten years ago by all the French organizations holding stakes in ocean forecasting. It has been since then constantly developed and is currently operating operational ocean analysis and forecasting systems based on state-of-the-art Ocean General Circulation Models. The mandate of Mercator Océan is to cover the global ocean at eddy resolving resolution. To achieve this goal, Mercator Océan is strongly connected to the ocean modeling and data assimilation research communities, at French, European and international levels.

Mercator Océan is engaged in the Global Monitoring for Environment and Security (GMES) European initiative and is currently coordinating a European consortium (~60 partners) gathering all European skills in ocean monitoring and forecasting to build the Marine forecast component of the GMES service. This is currently done in the MyOcean2 European funded project which started in 2012.

In this context, we have recently performed a major upgrade of the global high resolution system operated at Mercator Océan. This new system now delivers weekly and daily services, and includes numerous improvements related to the ocean/sea-ice model and the assimilation scheme. The previous global system did not benefit from these improvements that were implemented for most of them only in the regional system. Consistency between Mercator Océan systems is thereby ensured by the use of a common basis for all Mercator Océan analysis and forecasting systems.

Observations are assimilated by means of a reduced-order Kalman filter with a 3D multivariate modal decomposition of the forecast error. It includes an adaptive-error estimate and a localization algorithm. 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. In addition to the quality control performed by data producers, the system carries out a proper quality control on temperature and salinity vertical profiles in order to minimize the risk of erroneous observed profiles being assimilated in the model.

The presentation is focused on product quality improvements, highlighting the high level of performance and the stability of the new system compared to the previous one. The new system is closer to altimetric observations with a forecast RMS difference of 6 cm. The update of the Mean Dynamic Topography corrects local biases in the Indonesian throughflow and in the western Tropical Pacific. This improves also the subsurface currents at the Equator. The new system gives a more accurate description of water masses almost everywhere. Between 0 and 500 m, departures from in situ observations rarely exceed 1 °C and 0.2 psu. Lastly, the assimilation of an improved Sea Surface Temperature product aims to better represent the sea-ice edge during summertime.