Assimilation of sea surface temperature in BSH operational circulation model for the North Sea and Baltic Sea

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Within the framework of the Copernicus Marine Environment Monitoring Service (CMEMS), an ensemble data assimilation (DA) system has been implemented for the operational circulation model HBM (HIROMB-BOOS Model) of German Federal Maritime and Hydrographic Agency (BSH) in order to improve the forecast skill of hydrographic characteristics in the North and Baltic Seas. The DA system uses the Local Error Subspace Kalman Transform Filter (LESKTF) algorithm in the Parallel Data Assimilation Framework PDAF (http://pdaf.awi.de). Currently, sea surface temperature (SST) from the Advanced Very High Resolution Radiometer (AVHRR) is assimilated every 12 hour on a pre-operational basis. Significant improvement of the forecast quality of SST has been shown on the daily operational validation system. However, the comparison of the free model runs and the runs including SST assimilation shows that obvious changes in temperature and salinity can be found not only at the surface but also in the deepwater, where the ensemble spreads are larger. To damp the spurious correlations in the flow-dependent background error covariance matrix, a linear vertical localization function has been further implemented and tested in the DA system. The results suggested that the LESKTF analysis is sensitive to the choice of the vertical localization scales. With choosing half depth of the whole water column as the vertical localization scale, the improvement of vertical temperature and salinity structure has been shown in the validation of the results with independent CMEMS in-situ Observations.