Influence of temperature and salinity data assimilation on an operational forecast model for the North and Baltic Seas

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Abstract

The forecasting of physical and biogeochemical variables has always proven to be a challenge in marginal and coastal seas. Over the years, data assimilation has played a significant role in improving model accuracy for operational forecasting. In this study, we assess the impact of assimilating satellite sea surface temperature (SST) and in-situ profile data of temperature and salinity into an operational forecast model to improve the forecast of ocean variables in the North and Baltic Seas. We present a detailed comparison of the assimilation results obtained from two different experiments: one where only the satellite SST data are assimilated and the other where the satellite SST and the station temperature and salinity data are assimilated for one year, October 2018 to September 2019.

After the assimilation, there is a 27% error reduction in the coarse grid SST for the satellite SST assimilation and a 47% error reduction in the combined data assimilation calculated with regard to the station temperature data. The improvement is observed in all the North Sea stations where the station data is primarily focused in the coastal regions of the southern North Sea. In the Baltic Sea, where the station data is more evenly distributed, the improvement is higher in the coastal stations than in the stations away from the coast. This study shows that the assimilation of in-situ station datasets and satellite SST data improves the model forecasts. In detail, the study will discuss and quantify the effects of the data assimilation on the oceanographic and biogeochemical variables in the model and on the coupled interaction of ocean physics and biogeochemistry.