

# **Application of the Ensemble Optimum Interpolation in a North/Baltic Sea model: assimilating temperature and salinity profiles**

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This paper describes the implementation of the Ensemble Optimum Interpolation (EnOI) in a two-way nested North/Baltic Sea model for assimilating the temperature and salinity profiles. In the EnOI, the state vector is extended to include variables from both the fine and coarse resolution models. In the stationary ensemble, the annual and semi-annual cycles in temperature and sea level are removed to avoid the spurious long-distance correlations. It is shown that the sample ensemble is able to reproduce the spatial correlations coherent with the known dynamics of the North/Baltic Sea. The flow-dependent features are manifested for temperature and salinity in a few areas, e.g., the central part of the North Sea and in the upstream of the Skagerrak.

The assimilation experiments are carried out from January 8 2005 to April 25 of 2005 with an operational forecasting model. The impact of assimilating ocean profile observations is verified by comparison with observations. The results indicate that the assimilation of temperature and salinity profiles can significantly improve the oceanic forecasting. The sea surface temperature is greatly improved along the Norwegian coast and in the Skagerrak. The pronounced salinity front in the Northern Kattegat, which is difficult to model, is also improved. The root mean square differences between the forecasts and observations for temperature and salinity have been reduced by 25% and 32% in the experiment period, respectively. Moreover, it is also found that the initial state with the profiles assimilated helps to produce better forecasts than that without assimilation. The effect of the re-initialization can persist for more than 3 weeks.

**Key words:** EnOI, North Sea and Baltic Sea, temperature and salinity profiles, assimilation

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