Towards uncertainty estimation for operational forecast products - a multi-model-ensemble approach for the North Sea and the Baltic Sea

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Abstract

Several independent operational ocean models provide forecasts of the ocean state (e.g. sea level, temperature, salinity and ice cover) in the North Sea and the Baltic Sea on a daily basis. These forecasts are the primary source of information for a variety of information and emergency response systems used e.g. to issue sea level warnings or carry out oil drift forecast. The forecasts are of course highly valuable as such, but often suffer from a lack of information on their uncertainty.

With the aim of augmenting the existing operational ocean forecasts in the North Sea and the Baltic Sea by a measure of uncertainty a multi-model-ensemble (MME) system for sea surface temperature (SST), sea surface salinity (SSS) and water transports has been set up in the framework of the MyOcean-2 project. Members of MyOcean-2, the NOOS[2] and HIROMB/BOOS[3] communities provide 48h-forecasts serving as inputs. Different variables are processed separately due to their different physical characteristics. Based on the so far collected daily MME products of SST and SSS, a statistical method, Empirical Orthogonal Function (EOF) analysis is applied to assess their spatial and temporal variability. For sea surface currents, progressive vector diagrams at specific points are consulted to estimate the performance of the circulation models especially in hydrodynamic important areas, e.g. inflow/outflow of the Baltic Sea, Norwegian trench and English Channel. For further versions of the MME system, it is planned to extend the MME to other variables like e.g. sea level, ocean currents or ice cover based on the needs of the model providers and their customers. It is also planned to include in-situ data to augment the uncertainty information and for validation purposes. Additionally, weighting methods will be implemented into the MME system to develop more complex uncertainty measures.

The methodology used to create the MME will be outlined and different ensemble products will be presented. In addition, some preliminary results based on the statistical analysis of the uncertainty measures provide first estimates of the regional and temporal performance of the ocean models for each parameter.

[2]Northwest European Shelf Operational Oceanography System
[3]High-resolution Operational Model of the Baltic / Baltic Operational Oceanographic System