

Regional coupled climate modelling in the North Sea/Baltic Sea region - On the choice of the ocean model component

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As part of the “German Strategy for Adaptation to Climate Change” (DAS) it is planned to establish an operational forecasting and projection service for climate, extreme weather and coastal and inland waterbodies. As a further step towards this permanent service the pilot project „Projection Service for Waterways and Shipping“ (ProWaS) of the German Federal Agencies (BAW, BfG, BSH and DWD) is supposed to prepare an operational regional coupled climate model, carry out case studies and prepare preliminary assessments concerning the impact of the global climate change on German coastal regions.

The target region is the North Sea and Baltic Sea with focus on the German coastal region and its estuaries. The large differences in the physical properties of both marginal seas propose a considerable challenge in combined North Sea/Baltic Sea modelling. With the aim of finding the most suitable ocean component for a coupled model system three 20-year hindcast simulations covering the North Sea/Baltic Sea region are performed. Different ocean model codes and setups (NEMO NORDIC v3.3, NEMO GCOAST v3.6, HBM) are considered and run with identical prescribed atmospheric forcing from COSMO-REA6 (Bollmeyer et al., 2015). Important model output variables such as sea level, sea surface temperature, salinity and ice cover are compared and validated against available observations.

Preliminary results show that all three ocean models (model=code+setup) might be a reasonable choice for a coupled model system, but that due to model specifics each model has its own advantages in application: HBM, e.g., has stronger focus on shallow coastal regions with wetting and drying and grid-nesting being implemented, whereas NEMO comes with a more sophisticated ice model and is much more flexible in use.

The presented scientific as well as technical considerations will help to determine the optimal ocean model to be used in the coupled configuration with the atmospheric model COSMO and ICON. This coupled model will be the basis for the intended operational model system to be provided by ProWaS.