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Downscaling of climate change A1B scenario projection on North Atlantic - European shelves ocean – atmosphere system

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The prediction of the effect of anthropogenic climate change on the northwest European shelves is recognized to be a challenge for modeling. We present a novel approach to investigate the interactions between the North Atlantic Ocean, the European shelves and the overlying atmosphere using a global ocean model with high horizontal resolution in this area coupled to a regional atmospheric model. Thus, we avoid the shortcomings related to open boundary conditions and the lack of feedback with the larger-scale circulation but retain the necessary high horizontal resolution.
The applied regionally coupled model consists of the regional atmosphere model REMO, the global ocean model MPI-OM with up to 5 km horizontal resolution in the North Sea and the hydrological discharge model HD, which simulates the river runoff. The coupled domain includes Europe, the North-East Atlantic and part of the Arctic Ocean. Lateral atmospheric and upper oceanic boundary conditions outside the coupled domain were prescribed using ECHAM5/MPIOM IPCC A1B scenario data.
Numerical experiments covering the period 2001-2080 were carried out. Future changes in ocean and atmospheric circulation focusing on different regions of North European shelves were analyzed. Additional to the climate warming other processes like regional sea level rise, phase shift and amplitude of river runoff annual cycle and extreme floods corresponding to A1B climate scenario projection were quantified on the regional scale.