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Baltic Sea wave conditions in a changing climate

N. Groll and B. Hünicke
Helmholtz-Zentrum Geesthacht, Institute of Coastal Research, Geesthacht, Germany

The Baltic Sea is a shallow semi-enclosed sea, characterized by a complex boundary line and bathymetry, presence of sea ice and high variability of wind fields in its different basins. Long-term changes in storm conditions that may be caused by anthropogenic climate change could have significant impact on the coasts, human safety, on- and offshore activities.
Here, we present a first numerical approach to estimate the range and uncertainty of climate induced future changes of the wave climate. For this goal, we derived transient wind wave simulations (1961-2100) with the 3rd generation wave model WAM with a spatial horizontal resolution of about 5.5km*5.5km. The wave model is forced by wind fields simulated by a global/regional model configuration (ECHAM5/MPI-OM and COSMO-CLM, respectively) and sea ice coverage from a regional sea ice model. The simulations encompass two emission scenarios (IPCC A1B and B1) and two different initial conditions of the global model.
As the most potential harm to human lives and to coastal and offshore infrastructure is eventually caused by extreme events, the statistical analysis will be focused on changes in the upper percentiles. Strength and direction of future wind-induced wave changes will be estimated and discussed, along with their range of uncertainty. The climate change signals for wave heights in the Baltic Sea are spatial and temporal heterogeneous. The overall signals show an increase of the future long-term 99 percentile wave height up to 40cm in the south eastern Baltic Sea.