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# Comparison of 3 coupled models in the North Sea region under todays and future climate conditions

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Most of the common global climate models (coupled ocean/atmosphere ocean models) have too large spatial scales to be suitable in the North Sea area. Therefore either high-resolution global models have to be run or dynamical downscaling of the model-output has to be employed using regional models. Regionalized climate change simulations for the North and Baltic Sea are carried out with coupled ocean atmosphere models in the framework of the research program KLIWAS. The numerical simulations are performed by the Max-Planck Institute for Meteorology (MPI), the Swedish Meteorological and Hydrological Institute (SMHI) and the Institute of Oceanography (IfM Hamburg). Output from the models is analyzed jointly with the Federal Maritime service (BSH) and the German weather service (DWD/SWA). Temperature and sea level evolution in all three models is much more similar than the predicted salinity changes. The spatial patterns of the salinity fields in the North Sea are the result of a complex balance of fresh water input from the rivers, discharge of low salinity waters from the Baltic, inflow of high salinity waters from the Atlantic and input from the atmosphere. The hindcast simulations for this parameter are similar at the basin scale in all three models but are showing different patterns at smaller scales. All models are predicting a salinity decrease towards the end of the 21 century (2070-2099) to (1970-1999), independent of these differences, but it is much more pronounced in the runs of MPIOM/REMO and NEMO/RCA compared to HAMSOM/REMO. All models agree on the fact of a major freshening of the Baltic Outflow, while the magnitude of the freshening and the affected area in the North Sea are represented differently. The models are showing a temperature increase in the order of 2 °C at the end of the 21 century. The areas affected by Atlantic inflow are showing smaller temperature increases due to the lesser warming in the Atlantic. The annual cycle is slightly perturbed by the climate change signal and largest warming is observed in late spring and early winter. The steric component of sea level rise in the North Sea amounts up to 28-30 cm at the end of the 21 century, but for a complete budget similarly large contribution from glacial melt and vertical land movement due to glacial isostatic adjustment have to be added.