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Impact of spatial resolution of ocean models in depicting climate change patterns of the North Sea.

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The impact of enhanced spatial resolution of models in simulating large scale climate change has been of interest for the modeling community for quite some time. It has been noticed in previous studies that the pattern of Sea Surface Temperature anomalies are better captured by higher resolution models. Significant changes in simulating sea-ice loss associated with global warming was also noticed when the spatial resolution of climate models were enhanced. Spatial resolution is a particular important issue in climate change scenarios of shelf seas such as the North Sea. The North Sea is strongly influenced by its water mass exchanges with North Atlantic to the west and north and Baltic Sea to east. Furthermore, local forcing and changes in advected water masses significantly affect the thermodynamics and stratification patterns in the North Sea, making it a challenging area to study. Under the newly started RACE2 project we are looking at global simulations of Representative Concentration Pathway (RCP) scenarios 4.5 and 8.5 at lower and higher resolutions, performed using the Max Planck Institute Earth System Model (MPIESM). The model resolution is non uniform and achieves the highest resolution over the European Seas by shifting the model poles over Chicago and Central Europe. In the high resolution run, the grid reaches up to a spatial resolution of up to 4 km in part of the German Bight and close to 20 km in the Northern part of North Sea. The placement of model poles at specific locations enables the global model to obtain higher resolution at regional scales (North Sea), without the inherent complications of open boundary conditions. High and low resolution simulations will be compared to determine differences in spatial and temporal pattern of temperature anomalies, fresh water intrusion from the Baltic Sea to North Sea etc. Also taken into consideration will be the changes in simulating local sea level change and response to basin scale oscillations like NAO.