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Impact of the North Atlantic circulation on the climate change patterns of North Sea.

Nikesh Narayan (1), Mortiz Mathis (2), Birgit Klein (1), Holger Klein (1), and Uwe Mikolajewicz (2)

(1) Bundesamt Für Seeschifffahrt und Hydrographie, Operational Oceanography, Hamburg, Germany (nikesh.narayan@bsh.de), (2) Max Plank institute for meteorology, Hamburg, Germany

The physical properties of the North Sea are characterized by the exchange of water masses with the North Atlantic at the northern boundary and Baltic Sea to the east. The combined effects of localized forcing, tidal mixing and advection of water masses make the North Sea a challenging study area. Previous investigations indicated a possibility that the variability of the North Atlantic circulation and the strength of the sub-polar gyre (SPG) might influence the physical properties of the North Sea. The assessment of the complex interaction between the North Atlantic and the North Sea in a climate change scenario requires regionally coupled global RCP simulations with enhanced resolution of the North Sea and the North Atlantic. In this study we analyzed result from the regionally coupled ocean-atmosphere-biogeochemistry model system (MPIOM-REMO-HAMOCC) with a hydrodynamic (HD) model. The ocean model has a zoomed grid which provides the highest resolution over the West European Shelf by shifting its poles over Chicago and Central Europe. An index for the intensity of SPG was estimated by averaging the barotropic stream function (ψ) over the North Atlantic. Various threshold values for ψ were tested to define the strength of the SPG. These SPG indices have been correlated with North Sea hydrographic parameters at various levels to identify areas affected by SPG variability. The influence of the Atlantic's eastern boundary current, contributing more saline waters to the North West European shelf area is also investigated.