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Modeling anthropogenic Climate Change of the northwest European Shelves and the northeast Atlantic

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The global general circulation models involved in IPCC simulations are usually too coarse to reproduce many regional processes, which could have an impact on the future climate change in regions such as the North Sea and Baltic Sea. We present a novel approach to downscale climate change scenarios and to investigate the interactions between the North Atlantic Ocean and the European shelves as well as their impact on the North Atlantic climate. A global ocean ¡V sea ice ¡V marine biogeochemistry model with regionally high horizontal resolution is coupled to an atmospheric regional model and global terrestrial hydrology model. The model approach and the results of downscaled A1B scenario for the North Atlantic and North European shelves are presented.

The applied regionally coupled model comprises the regional atmosphere model REMO, the global ocean model MPIOM with up to 5 km horizontal resolution in the North Sea, the marine biogeochemistry model HAMOCC and the hydrological discharge model HD. The coupled domain includes Europe, the North Atlantic and part of the Arctic Ocean. The lateral atmospheric and the surface ocean boundary conditions outside the coupled domain were prescribed using data from an A1B scenario simulation with the global ECHAM5/MPIOM model.

Numerical experiments covering the period 1920-2100 were carried out. Future changes in ocean and atmospheric circulation focusing on different regions of North Atlantic and North European shelves were analyzed. In addition to the climate warming, other processes like northward shift of the Gulf Stream position, Atlantic MOC weakening, decrease of biological production in North Sea region, regional sea level rise, extreme floods and changes in amplitude and phase of the seasonal cycle of river runoff were estimated.