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The role of open ocean boundary forcing on potential warming in the North and Baltic Seas

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To study uncertainty in the regional model of using temperature boundary conditions from the ocean models covering larger areas at reduced resolution, like GCMs, the EC-Earth CMIP5 Experiments are used to provide lateral boundary forcing for the regional atmospheric model (HIRHAM) and the regional ocean model (HBM) in the North and Baltic Seas. HIRHAM has been extensively used over the European region to downscale variability and climate change signals from the global model, for instance during the PRUDENCE project. The downscaling simulation started from January 1, 1960 and was implemented for the historical period of 1960 to 2009 and for the continuing future period of 2010 to 2100 for the two scenarios RCP8.5 and RCP4.5. The effects of using different prescribed temperature boundary conditions in the northern North Sea and the English Channel borders on potential warming in the North and Baltic Seas are investigated. The lateral transport of heat and the details of density structure of the boundary conditions have relatively large impact in the deeper oceanic regions in the northern North Sea, but little in the southern North Sea. The effect in the Baltic Sea and the transition area between the two regional seas is negligible.