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Estimating the circulation of the North Atlantic via data syntheses: preliminary testing results

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The geographical pattern of surface warming from climate change scenarios reveals a clear focus of the warming on the high northern latitudes (IPPC report, 2007). Likewise, largest changes in the ocean are expected to happen in the polar region, ultimately impacting on the water mass formation in the subpolar North Atlantic and thus on the thermohaline circulation. For understanding future or ongoing changes in the World Ocean, synthesis methods are necessary that combine dynamical concepts, as formulated by numerical models, with observed data. The German partner of the "Estimating the Circulation and Climate of the Ocean" consortium (GECCO) provided a dynamically consistent estimate of the circulation over the 50-year period 1952-2001 on a 1 degree grid. The objective of the newly started synthesis effort within the framework of the BMBF/CLIVAR project NORDATLANTIK is to achieve regionally higher resolution while additionally accounting for the formerly excluded Arctic Ocean. Further new elements are forcing the model with the atmospheric state via bulk formulae, a sea ice model and the simulation and assimilation of tracers (CFCs).

This work provides first testing results that focus on the comparison of simulations and syntheses from resolutions ranging from 1 degree to a sixth of a degree and on the significance of including the Arctic and a sea ice model. We conclude that some aspects of the improvements that were achieved through data assimilation are covered by forcing via bulk formulae and including the Arctic Ocean.