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Ocean Dynamics in the Key Regions of North Atlantic-Arctic Exchanges: Comparison of Global FESOM and INMCM Model Simulations with Long-Term Observations

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Enhancing the fidelity of climate models in the Arctic and North Atlantic in order to improve Arctic predictions requires better understanding of the underlying causes of common biases. The main focus of the ERA.Net project NAtMAP (Amending North Atlantic Model Biases to Improve Arctic Predictions) is on the dynamics of the key regions connecting the Arctic and the North Atlantic domains. The study aims not only at increased model realism, but also at a deeper understanding of North Atlantic-Arctic links and their contribution to Arctic predictability. Two complementary approaches, employing the multiresolution ocean-ice FESOM2.0 model and global coupled INMCM5 model, were adopted.

Using long-term in situ and satellite observations and available climatologies we attempt to evaluate to what extent a higher resolution, allowing the explicit representation of eddies and narrow boundary currents in the North Atlantic and Nordic Seas, can alleviate the common model errors. Resolving the eddy field in the Greenland Sea is assessed in terms of reducing the deep thermocline bias. The impact of increased resolution on the modeled characteristics of Atlantic water transport into the Arctic is examined with a special focus on separation of Atlantic inflow between Fram Strait and the Barents Sea, lateral exchanges in the Nordic Seas, and a role of eddies in modulating the poleward flow of Atlantic water. We also explore the effects of resolving boundary currents in the Arctic basin on the representation of the adjacent sea ice.