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North Atlantic climate in FESOM2-ECHAM

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Existing CMIP-type climate scenario simulations are known to be vulnerable to model errors which are most noticeable in the North Atlantic. These errors are generally attributed to the imperfectness of parameterizations and the lack of ocean model resolution. However, resolving ocean mesoscales globally requires high computational resources. An alternative is to use climate models operating on unstructured meshes, allowing one to vary spatial model resolution in a way that ocean eddy dynamics is explicitly resolved only in most energetically important places.

The FESOM-ECHAM climate setup offers this variable mesh functionality for the ocean. The successor version of the Finite-volumE Sea ice–Ocean circulation Model (FESOM v.2.0) has been recently released and is based on the finite volume approach with the cell centered placement of horizontal velocities (quasi-B-grid). It ensures a significant improvement in the computational performance of the ocean component (by a factor of 3 compared to the previous version).

In the current work we validate the FESOM2-ECHAM climate setup using HighResMIP protocol and different ocean resolutions in the otherwise unchanged climate configurations. In particular we compare coarse and eddy-resolving ocean setups and analyze the related differences in the simulated North Atlantic climate.