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Asymmetry in convection and restratification in the Nordic Seas: an idealized model study

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The Nordic Seas are an important production region for dense water masses that feed the lower limb of the Atlantic Meridional Overturning Circulation. They display a pronounced hydrographic asymmetry, with a warm eastern basin, and a cold western basin. Previous studies have shown that this asymmetry is set by the interplay between large eddies shed near the coast of Norway where the continental slope steepens, and the Mohn-Knipovich ridge that separates the Lofoten Basin in the east from the Greenland Basin in the west. While it is known from earlier studies that eddies play a crucial role for the yearly cycle of wintertime convection and summertime restratification in marginal seas like the Labrador Sea, the situation in the Nordic Seas is different as the large eddies can only restratify the eastern part of the Nordic Seas due to the presence of the ridge.

Possibly due to this asymmetry in eddy activity and a weaker stratification as a result, the western basin is more sensitive for intense deep convection. The question remains how this area is restratified after a deep convection event in the absence of large eddies and how the dense water is able to leave the basin.

An high resolution, idealized model configuration of the MITgcm is used that reproduces the main characteristics of the Nordic Seas, including a warm cyclonic boundary current, a strong eddy field in the east and the hydrographic asymmetry between east and west. The idealized approach enables multiple sensitivity studies to changes in the eddy field and the boundary current and provides the possibility to investigate cause and effect, while keeping the set-up simple. We will present results of tracer studies where the sensitivity of the spreading and the restratification of dense water to the formation location in both basins is studied.