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# On the effect of a sill on dense water formation in a marginal sea

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Dense and intermediate water formation in the North Atlantic, in the Nordic and Labrador Seas respectively, contributes to the global ocean's overturning circulation and poleward heat transport. One major difference between these two basins is the due to the Greenland-Scotland Ridge which isolates the deep waters of the Nordic Seas from those of the North Atlantic. In this study, we investigate the role of the sill in setting the properties of the water mass transformed by comparing convection in an idealized, semi-enclosed basin, subject to surface cooling, with and without a sill that separates it from the open-ocean. This study utilizes both numerical and theoretical tools to extend previous studies that addressed this problem in a sill-less basin.

We find that denser (colder) waters are formed in and exported from a marginal sea with a sill compared to an identical basin with no sill. Dynamically, the sill impacts the convective process within the marginal sea both locally, by limiting the advection of heat into the basin (from the open-ocean), and non-locally by affecting the width and depth of the boundary current, which alters the stability of the boundary current as it flows around the marginal sea. While idealized, we believe these experiments capture the basic features of convection in the Nordic Seas and, furthermore, support the distinction between the dense waters formed in the interior of the basin and those exported by the overflows.