



Observing mass exchange with the Lofoten Basin using surface drifters

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The Lofoten Basin in the Nordic Seas plays a central role in the global overturning circulation, acting as a reservoir for northward-flowing Atlantic water. Substantial heat loss occurs here, permitting the waters to become denser and eventually sink nearer the Arctic. Idealized modeling studies and theoretical arguments suggest the warm water enters the Lofoten Basin via eddy transport from the boundary current over the adjacent continental slope. But there is no observational evidence that this is the major contribution to mass exchange between the warm Atlantic Current and the Basin. How the basin waters exit also remains a mystery.

Surface drifters offer an unique possibility to study the pathways of the boundary-basin exchange of mass and heat. We thereby examine trajectories of surface drifters released in the Nordic Seas in the POLEWARD and PROVULO experiments, and supplemented by historical data from the Global Drifter Array. Contrary to the idea that the boundary current eddies are the main source, the results suggest that fluid is entering the Lofoten Basin from all sides. However, the drifters exit preferentially in the northeast corner of the basin. This asymmetry likely contributes to the extended residence times of the warm Atlantic waters in the Lofoten Basin. We consider various measures to quantify the effect, and test whether this is captured in a high resolution numerical model.