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Cross-shelf exchanges between the East Greenland shelf and interior seas

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Increasing freshwater fluxes from the Greenland ice sheet and the Arctic have the potential to lead to a dampening of deep convection in the subpolar north Atlantic by increasing stratification in deep convection regions. In turn, this could affect deep water formation and the Atlantic Meridional Overturning Circulation (AMOC). However, it is unclear where and how much freshwater is exported from the Greenland shelf where it first enters the subpolar north Atlantic, to the interior seas where deep convection occurs. In particular, there is still little understanding of exchange processes east of Greenland, while overturning east of Greenland has been shown to be particularly important for the total subpolar AMOC.

Using drifter data, satellite altimetry data and winds from an atmospheric reanalysis, we identify areas favourable to cross-shelf exchanges and investigate the respective role of winds, eddies and the mean circulation in these exchanges. Using drifters deployed in 2020 and 2021 at the east Greenland shelfbreak, we further investigate exchange processes in two regions: Cape Farewell and the Blosseville Basin. At the Blosseville Basin, drifters are brought off-shelf towards the Iceland Sea and into the interior of the basin. As they flow downstream, they re-enter the shelf and most are driven towards the coast. At Cape Farewell, drifters round the Cape offshore of the shelfbreak, and part of them enter an eddy, but they all re-enter the shelf west of Greenland. How much of the freshwater signature is lost during these exchanges is not clear and will need further study.

Presenter: DUYCK, Elodie (UHH)

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