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Vertical fluxes in subpolar eddies from a high-resolution, multiplatform experiment in the Labrador Sea

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Mesoscale structures are key dynamical features of the ocean. They are associated with a variety of short lived and small-scale dynamics linked to physical, biological, and chemical processes at the submesoscale, such as cascading energy, impacting ocean stratification, and guiding ocean carbon and oxygen uptake. In the high latitudes, the spatial extent of the mesoscale is only tens of kilometres, making it challenging to observe the submesoscale processes. In August-September 2022, an extensive submesoscale-resolving multi-platform experiment was conducted across an Irminger Ring in the Labrador Sea. The experiment leveraged two underwater electric gliders equipped with nitrate, microstructure shear, chlorophyll fluorescence, oxygen, and turbidity sensors, operated in concert with a variety of ship operated instruments including underway-CTD's, a moving vessel profiler, Thermosalinograph, ADCPs and a X-band radar system. Observations were acquired both, along the peripheries and within the core of the eddy, and offered insight into submesoscale dynamics of the ring. Making use of nearly concurrent turbulence and nutrients observations, we estimated the vertical flux pattern across the eddy's frontal and interior regions. From the recorded and expected glider vehicle motion a vertical water velocity could be inferred and compared with the nutrient flux pattern. The stability of the ring was tracked with surface drifters, for weeks after the ship and glider survey ended, and a link between the disintegration of the ring and an atmospheric event was investigated.

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