



Simulating the life of post-convective vortices in the Greenland Sea

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Several long-lived subsurface anti-cyclones with weakly stratified cores have recently been observed in the Greenland Sea, typically immediately south-west of the Greenland Fracture Zone (GFZ) and frequently close to 75°N 0°E. These submesoscale coherent vortices (SCVs) appear to be mixed patches formed by buoyancy-driven convection, or their remnants.

In general circulation model simulations presented here, mixed patches are released into a realistic bathymetry density and velocity field for the Greenland Sea at a horizontal resolution of 0.5 km. The mixed patches sink to become a light anomaly at depth while remaining a dense anomaly near the surface. The resulting surface cyclone and deep anticyclonic SCV typically separate quickly. The SCV contains almost the entire initial mixed patch but has little or no surface expression, being neutrally buoyant. Compared with the background circulation, SCVs then move down the isopycnal slope and hence typically away from the gyre centre until they are eventually broken apart by frontal activity near the edge of the gyre. However, SCVs that reach the GFZ are prevented from exiting the gyre by the bathymetric gradient and may remain coherent for several months at least. Here, vorticity constraints within the SCV oppose the background flow. Thus SCVs can remaining stationary, notably immediately downstream of the tip of the GFZ near 75°N 0°E.