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Faroese Channel overflows - circulation and mixing

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The hydrographic properties of the dense waters overflowing the Greenland-Scotland Ridge through the Faroese Channels are greatly modified during the transit. In this study we consider conditions both upstream and downstream of the sill, using a combination of hydrographic measurements (CTD, nutrients) and direct velocity measurements (expendable current profilers, lowered acoustic Doppler current profiler) from several repeated lines across the channel system. The purpose is to identify and quantify regions of enhanced mixing and frictional drag. The method of quantification used in both cases is independent of budget calculations and thus lends itself useful for non-steady-state flows. The method appears to be successful in this case as 1) the numbers obtained are non-random, 2) they support the qualitative interpretation of mixing made from water mass analysis, and 3) they are supported by companion log-layer estimates of bottom boundary layer friction. Large buoyancy fluxes were deduced within the dense water masses all along the channel system, also upstream of the sill where the velocities are low. The largest implied mixing was observed roughly 100 km downstream of the sill, where the plume starts to descend. Frictional stress within the water column was also elevated throughout the channel system; the log-layer formulae yielding a drag coefficient for the entire data set of about 4x10-3. The average stress at the sill was roughly 2 Pa.