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Interannual sub-mesoscale mixing processes at the subsurface layer on a sill Fjord. Ilulissat case, Greenland.

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Abstract. In the Ilulissat Ice Fjord and the western sill (Fjord mouth), mixing processes promote an upward transport of diapycnal fluxes of heat and salt from the subsurface to the surface mixing layer. Here we estimate the diapycnal mixing rates from a multi-year oceanographic data from research cruises between 2009 and 2013. By applying fine-scale parametrizations from density inversion methods (such as Thorpe approach), the mixing rates suggest enhanced mixing in the deep water below the sill inside the Fjord, reaching a diapycnal diffusivity value of 1.1 × 10-6 W kg-1. We found highest mixing values on 2013, due to the melting conditions that perturb the internal water structure. The dataset revealed evidence of thermohaline staircases generated by the double-di[U+FB00]usion convection producing salt fingering. Using an empirical flux law, a maximum vertical heat flux of 0.2 Wm-2 within the staircases was obtained. The intrusion of Polar waters, the heat transport and the double-diffusion convection into the Ilulissat Ice Fjord, affect the Jakobshavn Isbræ Glacier stability.