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Turbulence measurements and estimates of entrainment in the Denmark Strait overflow plume

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To examine processes controlling the entrainment of ambient water into the Denmark Strait overflow (DSO) plume/gravity current, measurements of turbulence dissipation rate were carried out by a quasi free-falling (tethered) microstructure sounde (MSS).The MSS was specifically designed to collect data on dissipation-scale turbulence and fine thermohaline stratification in any ocean layer to depth of 3.5 km. The task was to perform microctructure measurements in the DSO plume in lower 300 m depth interval including bottom mixed layer and interfacial layer below the non-turbulent ambient water. MSS was attached to Rosette water sampler equipped with SeaBird CTD and LADCP, the tether's end fastened to the rack, for delivery MSS to the chosen depth where it was remotely released from the rack for performing measurements in free-falling mode.
Using the measured vertical profiles of turbulence dissipation rate and flow velocity, the entrainment ratio, and bottom and interfacial stresses were estimated in the DSO plume at sea depth to 1800 m. In the interfacial layer, the overturning scale extracted from conventional CTD data (the Thorpe scale) was found to be proportional to the Ozmidov scale calculated from turbulence dissipation rate and buoyancy frequency, with the proportionality constant of 1.1 ± 0.7 and the correlation of 0.77.