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Overflow and entrainment of the Arctic shelf water plume – the Storfjorden as the test case.

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In the Arctic Ocean the production of the dense water through the ice formation and brine release in the coastal polynyas and its descending along the slope is the principal mechanism of the deep water formation. Here we discuss the observations done in Storfjorden area, in the western Barents Sea.

Storfjorden is a bay in Svalbard archipelago with maximal depth about 190 m. Ice formation in the coastal polynya leads to formation of the brine–enriched shelf waters (BSW). In winter these waters fill in Storfjorden to 120 m deep sill and occationally spill over it. Then BSW plume reaches the shelf break and starts to descend along the slope, entraining the ambient waters.

The initial salinity and the volume of the BSW vary interannually. The signal of the warmer and saltier waters was observed in the bottom layer of Fram Strait, when the salinity of the BSW in Storfjorden exceeded 35.4 psu.

In the Arctic Ocean the plume of dense water passes through the warm Atlantic Water Layer and entrains it. Hence the plume appears in the bottom layer of Greenland sea rather as maximum of temperature than the minimum of the temperature on the shelf.

CTD casts and time series from moorings were analyzed to study plume dynamic and variability. The balance of gravity, Coriolis acceleration and friction determines descending rate of the plume: vertical displacement per unit distance of its path. The Killworth's scheme for the descending rate was applied using the IBCAO topography in the area of research. From data analysis and relevant theories we obtained the path of the plume and estimated the bulk entrainment rate into it.