Large scale transformation

Profiles from the different regions of the Nordic Seas illustrate the water mass transformation in the boundary current – from the inflow near Scotland to the deep overflow. The important processes are cooling through heat fluxes to the atmosphere, freshening through precipitation, river run-off and ice melt, and mixing with waters from the convective gyres.

Convection in the gyres

In recent years winter convection in the Greenland Sea only reached intermediate depths. About half of the heat loss to the atmosphere in winter is gained through radiative fluxes during summer. The other half is supplied by the warm Atlantic Water entering the gyre at intermediate depths. Summer stratification is enhanced through lateral input of freshwater from the East Greenland Current.

Exchanges with boundary current

The rim current surrounding the convectively mixed patch breaks up into meso-scale eddies that carry the newly formed waters away from the gyre centre and eventually to the boundary current. Eddies also supply heat and freshwater in the opposite direction towards the gyre centre.

Long-term variability and export

The amplified hydrological cycle has increased the freshwater input to the Greenland Sea and consequently convection has ceased over the past decades. Superimposed on this general trend are inter-annual variations of water formation that are reflected in the characteristics of water masses in the boundary current and in the inflows.