OBSERVED SOURCES AND VARIABILITY OF NORDIC SEAS OVERFLOW

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The overflows from the Nordic seas maintain the deep branch of the North Atlantic Ocean's thermohaline circulation, an important part of the global climate system. However, the source of these overflows, and of overflow variability, is debated: proposals include open-ocean convection, densewater production on the Arctic shelves and the gradual transformation of Atlantic water as it circulates the periphery of the Nordic seas and the Arctic Ocean. Here we analyse time series of observed ocean temperature and salinity between 1950 and 2005. We find that the progression of thermohaline anomalies on interannual to decadal timescales does not support a systematic response of the overflow properties to convective mixing in the Greenland Sea as has been suggested. Instead, anomalies in temperature and salinity that leave the northern seas at the Denmark Strait have travelled along the rim of the Nordic seas from inflow to overflow. Furthermore, the Faroe-Shetland Channel reflects the variability of an overturning loop within the Norwegian Sea that has not been observed previously. We thus conclude that the Atlantic water circulating in the Nordic seas is the main source for change in the overflow waters.

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