

Atlantic origin of observed and modelled freshwater anomalies in the Nordic Seas

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Between 1965 and 1990, the waters of the Nordic Seas and the subpolar basins of the North Atlantic Ocean freshened substantially. The Arctic Ocean also became less saline over this time, as a consequence of increasing runoff, but it is not clear whether flow from the Arctic Ocean was the main source of the Nordic Seas salinity anomaly. As a region of deep-water formation, the Nordic Seas are central to the Atlantic meridional overturning circulation, but this process is inhibited if the surface salinity is too low. Here we use the instrumental record of Nordic Seas hydrography, along with a global ocean–sea-ice model hindcast simulation, to identify the sources and magnitude of freshwater that has accumulated in the Nordic Seas since 1950. We find that the freshwater anomalies within the Nordic Seas can mostly be explained by less salt entering the southern part of the basin with the relatively saline Atlantic inflow, with seemingly little contribution from the Arctic Ocean. We conclude that hydrographic changes in the Nordic Seas are primarily related to changes in the Atlantic Ocean. We infer that if the Atlantic inflow and Nordic Seas both freshen similarly, this would render the Atlantic meridional overturning circulation relatively insensitive to Nordic Seas freshwater content.

Glessmer, M.S., T. Eldevik, K. Våge, J.E.Ø. Nilsen, and E. Behrens, 2014: [Atlantic origin of observed and modelled freshwater anomalies in the Nordic Seas](#). *Nature Geoscience*, **7**, 801–805.