Atlantic inflow and the erosional input into the Nordic Seas during the Late Plio- and Pleistocene

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Deep and intermediate waters formed in the Labrador Sea, Nordic Seas and North Atlantic Ocean have strongly affected the Atlantic Meridional Overturning Circulation (AMOC), which has been responsible for the ventilation of the entire Atlantic Ocean and which has also exerted control on global climate.

In this study we reconstruct past intermediate and deep water mass mixing and erosional inputs in the Nordic Seas and the North Atlantic Ocean from neodymium (Nd), lead (Pb) and strontium (Sr) isotope compositions of seawater-derived ferromanganese coatings on bulk sediment particles, as well as from the detrital fraction serving as an indicator for changes in sediment input sources over the past 3 million years. Data were obtained from ODP/IODP sites in the Nordic Seas on the Svalbard shelf (Site 986) and on the Vøring Plateau (Site 644), and in the North Atlantic Ocean on the Rockall Plateau (Site 982). At the two sites in the Nordic Seas we observe a very strong influence of changes in local erosional inputs on the water mass compositions linked to the onset of Northern Hemisphere Glaciation (NHG). These Nordic Seas sites have most of the time been influenced by Norwegian Sea Deep Water and Arctic Intermediate Water, whereas the Rockall Plateau Site has been dominated by overflow waters from the Nordic Seas and the Labrador Sea. Furthermore, we were able to identify periods of distinct changes of the Atlantic inflow into the Nordic Seas. Between 2.2 and 1.5 Ma a warmer climate and moderate glacial conditions prevailed resulting in enhanced inflow of warm Atlantic waters reflected by similar Nd isotope compositions of deep waters at all sites. In contrast, at the beginning of the MPT at 1.5 – 1.2 Ma a significant reduction of the Atlantic inflow occurred, expressed by markedly distinct deep water Nd isotope compositions in the Nordic Seas and the North Atlantic Ocean.