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Time-Slice Reconstructions of Ocean Circulation Changes at the Continental Margins of the Nordic and Barents Seas through the last 16 cal kyr B.P.

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The changes in ocean circulation along the continental margins of the Nordic and Barents Seas through the last 16 cal kyr B.P. have been investigated. The purpose is to gain a better understanding of the inflow of Atlantic Water to the Nordic seas and the Arctic Ocean in relation to climate in the past. Previously published data from the shelves of Iceland, East Greenland, the northern North Sea, the southeast Barents Sea, Svalbard and the northern Barents Sea/northern Kara Sea has been compiled. All chosen sites underlie the present flow of the warm and saline Atlantic water (AW) or Atlantic intermediate water (AIW), and therefore, are considered to be potentially sensitive to changes in the ocean circulation. The AW that flows along the Nordic and Barents Seas shelves is considered to be the main pathway for both heat and water volume transport to the Arctic Ocean. Additionally, all sites are located in the proximity of an oceanic front and thus, should record its location.

We have selected three time-slices from the late glacial/deglaciation period: (1) 16-15 cal kyr B.P. representing the late glacial, (2) 14.5-13.5 cal kyr B.P. corresponding to the Bølling-Allerød warm interstadials, and (3) 12.5-11.5 cal yr B.P. corresponding to the cold Younger Dryas. Two time-slices from the Holocene period were selected: (4) 9.5-7.5 cal kyr B.P. representing the early Holocene and the Holocene Climate Maximum, and (5) 4.0-2.0 cal kyr B.P. corresponding to the late Holocene and the

neoglacial cooling. In our time-slice reconstructions we used benthic foraminifera. Benthic foraminifera are very common on the shelf and their distribution pattern is dependent of oceanographical parameters such as salinity, temperature, water mixing, hydrodynamic activity and food supply. It is expected that the benthic foraminifera respond to the changes in these parameters, and in turn gives a significant climatic and oceanographic signal. The concentrations of IRD at the shelves of the Nordic and Barents Seas have also been mapped.

The extent of the Svalbard-Barents Sea, Fennoscandian, Greenland and Iceland ice sheets had a very significant influence on the paleoceanographic development in the Nordic and Barents Seas region. During the time interval 16-15 cal kyr B.P., glaciomarine conditions prevailed in the region with intense ice rafting from melting icebergs. During the Bølling-Allerød interstadials, warming of the bottom water masses occurred along the eastern Nordic Seas shelf, whereas rather deteriorated conditions and proximity of the Polar Front were recorded at the Iceland and East Greenland shelves. A sea ice free corridor along the western European continental margin allowed for a narrow and fast flowing inflow of Atlantic water into the Nordic Seas, which continued as a sub-surface current along the western and northern Barents Sea shelf and probably into the Arctic Ocean. The quasi-permanent sea ice cover over the western and northern Barents Sea and around Svalbard behaved as a lid preventing heat loss from the Atlantic water. A reverse oceanographic situation seems to occur during the YD. The bottom waters along the European shelves experienced cooling, freshening and the approach of the Polar/Arctic Fronts, whereas the Iceland and East Greenland shelves were strongly influenced by the warmer AW. An increased influx of meltwater occurred in the entire Nordic and Barents Seas region, and is suggested to be a possible cause for the climate instability during the YD. The results from the early Holocene show a general warming of the bottom and surface waters in the entire Nordic and Barents Seas region and a strong inflow of AW to all study sites. During the time interval 4.0-2.0 cal kyr B.P., the inflow of Atlantic water at the continental margins of the Nordic and Barents Seas was reduced. The data indicates cooling, freshening and unstable bottom water conditions, and increased ice rafting. A weaker inflow of AW and AIW also occurred at the northern Iceland and East Greenland shelves, respectively.