



A Holocene multiproxy record of vertical water column structure of the N Iceland shelf: evidence for variable inflow of Atlantic water

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We present a high-resolution Holocene record of vertical water column structure from marine sediment core MD99-2269 (66 37.53 N, 23 51.16 W). The core's overall chronology is constrained by tephrochronology and 24 radiocarbon dates, augmented by 20 dates from core MD99-2322 (E Greenland shelf, 67 08.18 N, 30 49.67 W) correlated in depth by paleomagnetic secular variation. A multiproxy comparison (foraminiferal $\delta 18\text{O}$, Mg/Ca, grain size, magnetic susceptibility, carbonate content, IRD content, and various assemblage data) shows that Atlantic water of the Irminger Current fluctuates between being a bottom water or intermediate water mass on the North Iceland shelf, indicating that the strength of Atlantic water inflow has varied over time. Early Preboreal conditions at site 2269 were influenced by deposition of ice rafted debris and meltwater with Holocene warming starting just prior to the deposition of the Saksunarvatn tephra, at c. 10.5 cal kyr BP with strong, seasonal pulses of Atlantic water influx. More stable Holocene conditions were established after the deposition of the Saksunarvatn tephra at c. 10.2 cal kyr BP. The warmest bottom-water temperature (c. 6°C) reconstructed falls between c. 10 and 9.3 cal kyr BP, coinciding with warmer surface water conditions. Bottom water and surface water conditions

cooled slightly until Arctic temperature conditions were reached in bottom-water temperature around 8 cal kyr BP. Strong water column stratification with a thick layer of Arctic surface water overlapping a constant influx of Atlantic bottom water was observed during mid Holocene. This influx then became an intermediate water mass in late Holocene as evident from bottom water temperatures below Atlantic water temperature and an increase in ocean reservoir age associated with the colder and older Arctic water. The millennial scale temperature fluctuations in core MD99-2269 appear to be in phase with observed Holocene fluctuations in THC at site 980 on the Feni Drift.