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Evolution of Denmark Strait Overflow over the Eemian and last glacial inception

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The Overflow of dense water through the Denmark Strait and Faroe–Shetland Channel governs the strength of North Atlantic Thermohaline Circulation (THC) and in turn sustains the meridional heat transport to northern high latitudes, the „European heat pump“. During the last glacial this system was highly sensitive to meltwater perturbances, causing rapid switches between mild and extremely cold climates in Europe. In contrast, interglacial periods are considered as more stable. The variability of Overflow intensity at the end of the last interglacial period, the Eemian, may provide a better understanding of (i) potential feedbacks between overflow intensity and the rapid last Glacial inception, and (ii) the critical limits of interglacial THC stability.

We established multi-centennial-resolution records of Mg/Ca and stable isotope records of the benthic foraminifer *C. wuellerstorfi* in sediment core GIK 23519-5 (64.48 N; 29.36 W, 1893 m waterdepth) to trace the evolution of THC over Marine Isotope stage (MIS) 5.5, and subsequent transition into the last glacial, with the age control derived from the benthic δ^{18}O record. These records monitor temperature and density changes of Upper North Atlantic Deep Water (UNADW) water near the southern outlet of Denmark Strait. In addition, sea surface and subsurface temperatures were reconstructed from both, planktonic foraminifera census with SIMMAX transfer function and Mg/Ca ratios of the thermocline dweller *N. pachyderma* sin., to monitor changes in northward heat transport in the Irminger Current (IC) and in thermocline depth.

Accordingly, the warm water transport in the IC only started in the second half of MIS 5.5 remaining fairly unstable, wheras thermocline depth progressively shoaled. An

abrupt temperature drop by 3˚C marked the onset of semiglacial conditions at 116 ka. The benthic temperature record shows that this glacial inception was preceeded by a gradual but steady cooling of the deepwater (by 4˚C) spanning the entire interglacial. A parallel decrease in reconstructed δ^{18}Owater values (by 0.3‰) suggests that the deepwater simultaneously freshened and THC weakened. Coeval with the cease of warm water transport in the IC the, deepwater abruptly warmed, which probably reflected a sudden southward shift of deepwater sources and an Overflow reversal.

These trends suggest a response to a long-term orbital and freshwater forcing affecting the density structure of the subpolar North Atlantic.