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West Greenland Current variability south of Davis Strait (64°N) during the Holocene

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The Holocene climate development of central West Greenland closely links to broader scale climatic variations in the Northern Hemisphere. To improve our understanding of these changes, high-resolution reconstructions of oceanic properties, i.e. distribution of cold/fresh and warm/saline water masses in the North Atlantic Ocean is needed. Investigations of marine sediments from the West Greenland shelf, underlying the West Greenland Current (WGC), offer the possibility to perform such studies. The WGC constitutes a mixture of (mainly subsurface) Atlantic-sourced relatively warm and saline water from the Irminger Current (IC - an offshoot of the North Atlantic Current) and Arctic-sourced cold, low-salinity water from the East Greenland Current (EGC). Here, we present new planktic and benthic foraminiferal assemblage data, from the shelf off Nuuk (64°N), south of Davis Strait, which reveal distinct centennial to millennial-scale oceanographic variability that relate to climatic changes during the Holocene (last c. 11 ka BP). Our data document a reduced influence of the retreating Greenland Ice Sheet by c. 8.5 ka BP on marine conditions. High abundance of Atlantic Water indicator Cassidulina neoteretis indicates a warm and strong WGC from c. 6.5 to 4 ka BP and marks Holocene Thermal Optimum conditions on the shelf. This accompanies relatively warm surface water conditions as inferred from the occurrence of planktic foraminifera such as Turborotalita quinqueloba, Globigerinita glutinata and Neogloboquadrina incompta. From c. 4 ka BP onwards, we find a cooling and gradual freshening of surface and subsurface water conditions, which we associate with a weakening of the WGC. Our findings show that from this time onwards the contribution of warm/saline IC waters to the WGC was considerably reduced at 64°N. This suggests an overall reduced late Holocene heat advection into the eastern subpolar North Atlantic Ocean, except for the time of the Roman Warm Period (around 2 ka BP), when our data reveal a renewed surface and subsurface warming and thus strengthened WGC.