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Ocean and climate conditions in SW Greenland during the last 2 000 years

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This study presents multi-proxy data from a high-resolution marine sediment core from the SW Greenland shelf. This climatically sensitive region is influenced by warm water inflows from the Atlantic Ocean and cold water inflows from the Arctic Ocean, as well as meltwater release and ice discharge from the Greenland Ice Sheet. Variations in the ocean surface temperatures and sea ice conditions in this region have a significant implications to the North Atlantic Deep Water Formation and Atlantic Meridional Overturning Circulation. The aim of this study is to reconstruct ocean surface conditions (sea surface temperatures; SST and sea ice conditions; SIC) and identify iceberg and meltwater discharge from the Greenland ice sheet during the last 2 000 years using microfossil assemblages (diatoms, dinocysts and benthic foraminiferas) and sedimentological proxies (XRF-scan, sediment grain size and IRD). The results of this study are compared with other temperature reconstructions from the Southeast Greenland, subpolar North Atlantic and the Norwegian Sea to identify possible temperature seesaw-pattern linked to the atmospheric forcing of the North Atlantic Oscillation (NAO) and to investigate variations in the strength of Atlantic-sourced warm water inflows.
The results reveal fluctuations in sea surface temperatures on a centennial and decadal timescales. The temperature record shows that cooler oceanic conditions prevailed over the Medieval Climate Anomaly (from ca. 1000 CE to 1500 CE), whereas warmer conditions prevailed over the Little Ice Age (from ca. 1500 CE to 1800 CE). Similar temperature trend was discovered in the subpolar North Atlantic while the opposite temperature trend prevailed in the Norwegian Sea region. This seesaw pattern is likely to be linked to the atmospheric forcing of the NAO, which regulates the strength of the Irminger Current carrying warm Atlantic waters to northwest North Atlantic. The relative percentage of the coarse grain material in the sediment (>63 μm) indicates decreasing amount of iceberg rafting during the last 2000 years, whereas sea ice proxies imply increasing sea conditions towards the present day.