

Holocene water mass history off NE Greenland - A first high-resolution sediment record from the western Fram Strait

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While the Holocene history of the eastern Fram Strait seems well investigated, no high-resolution paleoenvironmental records were available from the western Fram Strait so far. A new sedimentary record, obtained during expedition PS93.1 (2015) of RV Polarstern on the outermost NE Greenland shelf, allows for the first time to reconstruct Holocene changes in near-surface salinities, temperature, stratification and water masses (polar waters vs. Atlantic Water), potentially related to variations of the freshwater and sea ice export from the Arctic Ocean.

The 260 cm long sedimentary record from site PS93/025 (80.5°N, 8.5°W) was investigated for sediment composition, foraminifer contents, grain size variations (sortable silt) and the isotopic composition of planktic foraminifers. Radiocarbon datings reveal an age of 10.2 cal-ka for the core base and continuous sedimentation throughout most of the Holocene.

The sediments are generally very fine-grained (<2% sand). The grain size record reveals a fining-upwards trend and sediments from <6.5 cal-ka consist of <0.5% coarse fraction. A comparison of foraminifer and coarse fraction abundances shows strong similarities. Apparently the contribution of coarse terrestrial material from iceberg transport was extremely low throughout the last 10.2 cal-ka. Foraminifer abundances (both planktic and benthic) are high in Early Holocene sediments until ca. 7 cal-ka and decrease rapidly thereafter. This is interpreted to reflect a relatively strong advection of Atlantic Water to the NW Fram Strait, which correlates well with similar findings on the eastern side of the Arctic Gateway. Sortable silt grain sizes are high (27-32 μm) in the older part of the record and gradually decrease between 7 cal-ka and 4 cal-ka. After ca. 4 cal-ka, sortable silt shows values of 20-22 μm and little variation. Considering also the grain-size distribution curves, we propose a decline of bottom current velocities on the outer NE Greenland shelf after 7 cal-ka, related to a decrease of Atlantic Water advection. These preliminary results reveal a strong coupling of Holocene environments on both sides of the Fram Strait.