EGU24-14777, updated on 19 May 2024
https://doi.org/10.5194/egusphere-egu24-14777
EGU General Assembly 2024
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Holocene to Eemian sea ice and terrigenous influx variations in Baffin Bay – a lipid biomarker study

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Sea ice and ice sheets are highly sensitive to climate change in the Arctic, which shows an amplified response to global warming. To better understand the environmental changes and feedback processes associated with Arctic sea-ice decline and continental ice mass loss in a warmer-than-present world, it is urgent to investigate records of past warm periods.

Here, we present the first results of two sediment cores from the Baffin Bay recovered during the Expedition MSM111 in 2022. A 43-cm-long multicore on top of a 17-m-long gravity core (GeoB25212-1 and -3) was recovered from the continental slope west of Greenland (68°47.621', 59°59.426', water depth: 1505 m). According to a first stratigraphic interpretation, these cores contain a Holocene sediment succession and a high-resolution record of the last glacial cycle including Marine Isotope Stage 5e (MIS 5e) (Kucera et al., 2023).

Sediment samples taken from the mentioned cores are investigated for lipid biomarkers. Variations in the concentration of IP25, a well-established proxy for seasonal sea ice in the Arctic Ocean (Belt et al., 2007), point to distinct changes in the presence of sea ice in Baffin Bay. The joint analysis of IP25 and open-ocean biomarkers, such as brassicasterol and dinosterol, allows to draw more quantitative conclusions on paleo sea-ice conditions (Müller et al., 2011). Furthermore, alkenones and glycerol dialkyl glycerol tetraethers enable the reconstruction of sea-surface temperatures, while changes in terrestrial influx are deduced from biomarkers such as *n*-alkanes, ß-sitosterol, and campesterol. The terrigenous biomarker data will be complemented by mineralogical investigations to gain more information on the provenance of the sediments. X-ray fluorescence scanning data further provides additional information on paleoproductivity changes, biogeochemical processes, etc.

The first results of our investigations show that sea-ice conditions were highly variable. Throughout the Holocene, the presence of IP25 demonstrates that seasonal sea ice was present in Baffin Bay. However, intervals with low open-water biomarker concentrations indicate that the relatively stable climate conditions were disrupted by three cold events leading to more severe sea-ice conditions. Most interestingly, we observe elevated IP25 and sterol concentrations during the stratigraphic youngest Baffin Bay Detrital Carbonate (BBDC) event, probably BBDC 0, that was identified based on elevated calcium, dolomite, and calcite contents. By contrast, the following

BBDC layer, probably BBDC 1, does not show significant changes in biomarker concentrations, leading to the conclusion that conditions during BBDC 0 were special.

Ongoing analyses focus on the last interglacial (MIS 5e) and will provide information on similarities and differences in the sea-ice conditions compared to the Holocene warming.

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