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Holocene hydrographic conditions of Ameralik Fjord, SW Greenland

S. Aagaard-Sørensen (1), M.-S. Seidenkrantz (1), A. Kuijpers (2), H. S. Møller (3), H. Ebbesen (2), K.G. Jensen (2), H. Kunzendorf (3)

(1) University of Aarhus, Denmark, (2) GEUS, Geol. Survey of Denmark and Greenland, Denmark, (3) University of Copenhagen, Denmark.

(mss@geo.au.dk / Phone: +45-8942-2624)

Using a multidisciplinary approach, a study was made of marine sediment cores from Ameralik Fjord (Lysefjorden), SW Greenland, in order to determine the Holocene hydrographic history of the fjord and climate development of the region. For that purpose we have studied the sedimentology (colour scans, XRF-intensity, and grain size), benthic foraminifera and diatoms in an 8 m long piston core, a 3.5-m long gravity core, and a short box core from the same station. The chronology of the long cores is based on calibrated AMS ^{14}C-datings, while the box core was ^{210}Pb-dated. Ameralik is a 75-km long, up to 700 m deep multi-basin fjord in the Godthåbsfjord complex near Nuuk (Godthåb), where melt-water rivers from the Inland Ice drains into the fjord, but no glaciers terminate into the fjord at present.

The cores reach back to the early Holocene. The last 4400 cal. years has been studied in detail, while the analysis of the early Holocene section is ongoing. From app. 4400-3200 BP fine-grained sediments with a high Fe content were deposited during a period of high sedimentation rates, representing a proglacial deposit, where large quantities of sediments were washed out under conditions of strong Inland Ice melting. The diatoms indicate stable surface-water conditions with winter sea-ice formation in sheltered areas and with a steady influx of oceanic species associated with subsurface inflow of Labrador Sea water derived from the West Greenland Current (WGC). The benthic foraminifera indicate a high-energy, stable bottom-water environment with normal-marine or only slightly reduced salinities. We believe that this time interval represents the final part of the Holocene Thermal Maximum in this region.

For the last about 3200 years, conditions have been much more unstable. Significantly lower sediment accumulation rates and lower iron contents indicate a reduced output of terrestrial material. This was presumably linked to the general cooling of the area, resulting in a decreased melt-water outflow. The diminished melt-water outflow may have allowed an increased influx of oceanic (sub)surface water from the WGC. However, the largest changes are illustrated in the benthic foraminiferal assemblage. The diverse, calcareous fauna found prior to 3200 BP, is replaced first by the opportunistic *Elphidium excavatum* and later at 2800 BP it disappears altogether, only leaving an assemblage of agglutinated species. This indicates bottom-water conditions, which prevented the formation of calcareous foraminiferal tests, and which was presumably linked to brine formation and reduced subsurface influx of oxygenated, saline WGC water in combination with sea-ice formation. During most of the following about 2000 years, the agglutinated fauna continues to dominate the foraminiferal assemblages.

A new significant change in the hydrographic regime occurred at about 750 BP (AD 1200), possibly linked to the initiation of the Little Ice Age. A decrease in oceanic diatoms and more frequent sea-ice diatoms indicate a significant drop in surface-water temperatures, more extensive sea-ice formation and a decreased influx of WGC surface water. The reintroduction of a calcareous foraminiferal fauna suggests a return to increased fjord ventilation related to enhanced subsurface inflow of saline WGC water (Irminger Sea Water). A low Fe-content from app. 600-250 cal. yr BP (AD 1350-1700) suggests a reduced melt-water outflow and thus lower atmospheric temperatures. After app. 250 BP (AD 1700) increased influxes of benthic diatoms and a higher Fe-content suggest an increased melt-water outflow and thus increasing atmospheric temperatures, while the diatoms suggest enhanced inflow of WGC surface water.