



Fjord sediments in southern Greenland reveal Holocene glacial activity and organic carbon sequestration dynamics

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Sediments accumulating in Greenlandic fjords, situated between the ice sheet and the ocean, offer an excellent opportunity for investigating the environmental response to past climate variability and associated organic carbon sequestration processes.

Our study focuses on a multiproxy approach of an almost undisturbed sedimentary record from Narsaq Sound in southern Greenland. A ~30-cm long multicore was collected on top of a ~11-m long gravity core during the MSM111 expedition in September 2022. Radiocarbon dating indicates a maximum age of approximately 12,000 years and a relatively constant sedimentation rate of ~1 m/kyr.

A suite of whole-core analytical techniques was applied, including magnetic susceptibility measurements, X-ray fluorescence, and computer tomography scanning. Sediment samples were taken at intervals of 5–10 cm from the gravity core and at 1 cm intervals from the multicore. These samples were analyzed for total organic carbon, total nitrogen, stable isotopes of organic carbon and nitrogen, biomarkers (e.g., IP25), and organic carbon lability. Additionally, the elemental composition and dissolved organic carbon content of sediment pore-waters were assessed.

Preliminary results show that sedimentological features such as IRD and bioturbation, as well as the elemental composition of the Narsaq record, reveal major changes related to the position of nearby glaciers and main climatic changes during the Holocene. Moreover, we found that the rather unusual element Niobium, derived from the surrounding drainage area, appears as a promising indicator of terrigenous sediment supply and past environmental change. Besides a clear change from predominantly terrestrial to more marine organic carbon during the transition

from deglaciation to the thermal maximum era, the organic carbon is predominantly marine in origin during the entire Holocene.

Our first results show that the investigated sediment cores from southern Greenland provide an excellent sedimentological and geochemical record reflecting past glacial activity and the impact of large scale climatic variability on local environmental changes since the last deglaciation.