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Holocene Variability of Bottom Water Temperatures on the Western Svalbard Margin, Arctic Gateway – First Results and Open Questions

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During the past decades Mg/Ca ratios have been increasingly used in order to calculate past temperature variations independent from faunal assemblages. Especially in the Fram Strait, the main pathway of heat flux to the Arctic, new temperature estimation tools are urgently needed to better understand past complex interaction of different water masses and the extent of Atlantic Water advection to the Arctic Ocean.
The Holocene section of a sediment core from the western Svalbard margin has been studied at high-resolution for benthic proxy indicators to reconstruct deepwater sources and mixing in the Arctic Gateway since the last ca 10,000 years. Benthic stable isotope values and sortable silt mean grain size data are compared to a first, preliminary data set of Mg/Ca paleotemperatures established from the benthic foraminifer species Cibicidoides wuellerstorfi in the eastern Fram Strait. When compared to planktic proxy indicators, this reconstruction of past bottom water temperatures at a northernmost site allows to estimate the linkage between deepwater inflow and AW advection within the West Spitsbergen Current. Furthermore, benthic Mg/Ca temperatures can help unravelling the local impact (e.g., by brine-enriched waters) from general trends in bottom water circulation. Short-lived decreases in benthic carbon isotope values seem to correlate to cold surface water events in the area such as the 8.2 ka event. Similarly, decreases in benthic carbon isotope values in the Nordic Seas around 8 ka have been assigned to decreased bottom water ventilation possibly due to an entrainment of relatively fresh water into the thermohaline system (Bauch et al., 2001). While sluggish bottom current speeds have been found for the 8.2 ka event north of our site on the Yermak Plateau (Hass, 2002), during colder events on the Western Svalbard margin sediment data seem to anticorrelate to benthic carbon isotope data either suggesting a rather unexpected increase in bottom current velocity or an impact of brine-enriched winter waters from the fjord/trough system which might have generated increased lateral coarser-grained sediment injections (Sarnthein et al., 2003). A Late Holocene trend towards significantly higher benthic oxygen isotopes may be either related to a cooling or increasing salinity in bottom waters. Higher salinity of bottom waters may be again caused by dense water formation during winter sea-ice formation in southern and western Svalbard fjords (e.g., Quadfasel et al., 1988; Rudels et al., 2005).

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