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Linking glacier and oceanic variability in northern Spitsbergen during the last deglaciation

Martin Bartels (1), Claude Hillaire-Marcel (2), Kirsten Fahl (3), Jürgen Titschack (1), Rüdiger Stein (3), and Dierk Hebbeln (3)

(1) MARUM, University of Bremen, Bremen, Germany (mbartels@marum.de), (2) GEOTOP, Université du Québec à Montréal (UQÀM), Montréal, Canada, (3) Alfred-Wegener-Institut - Helmholtz-Zentrum für Polar- und Meeresforschung, Germany

Paleoceanographic records from the Svalbard area provide important information for the documentation of heat transfer from the North Atlantic into the Arctic Ocean. The archipelago stands at the northernmost surface occurrence of warm Atlantic Water (AW). Here, we pay specific attention to the Holocene variability of AW advection as far as northern Svalbard. The study is based on sediment core GeoB10817-4 from the mouth of Woodfjorden, northern Spitsbergen. Assemblages and isotopic compositions of benthic foraminifera as well as sedimentological features (e.g. ice rafted debris) are used to document the interplay between oceanographic conditions and glacier variability.

Data from the highly resolved early deglacial interval from the lower part of the core illustrate the penetration of chilled AW into the fjord during the Bølling-Allerød. However, the disintegration of the Svalbard-Barents Sea Ice Sheet in the vicinity of the site maintained turbulent and cold bottom waters until the end of the Younger Dryas, i.e. when the glacier front finally retreated to an inner fjord position. During the early Holocene, the Arctic Front moved towards the site, bringing a high amount of nutrients enhancing productivity and foraminifera production. These improved conditions were shortly interrupted, at ca. 11,000 calibrated years BP, during a “Preboreal Oscillation”. At the same time sedimentological parameters as well as the faunal composition signify an increasing (seasonal) sea ice cover as far as the fjord outlet. Data so far indicate intricate influences of large scale changes in ocean surface currents, local glacier margin fluctuations, primary productivity, and tipping point sea-ice spreading occurrences, thus requiring the use of a large array of proxies to decipher the specific role of each of these boundary conditions.