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Decadal scale benthic foraminiferal record of late-Holocene oceanographic variability from Disko Bugt, West Greenland

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A new decadal resolution benthic foraminiferal record of late-Holocene climate variability and oceanographic changes off West Greenland is presented. The investigated site from southwest Disko Bugt records changes in the relative proportion of cold Arctic sourced vs. warm Atlantic sourced water in the West Greenland Current (WGC). The sediment core 343310-5 (68°38'861N/ 53°49'493W) was taken by the R/V "Maria S. Merian" (cruise: MSM05-03) in 2007. The age model is based on 20 AMS 14C dates and benthic foraminiferal were wet sieved at 63 μm and counted at 4 cm intervals. Based on our age model this equals a resolution of about 12-15 years.
The decrease in chilled Atlantic water species (Cassidulina reniforme), along with increasing abundance of agglutinated Arctic Water species (Cuneata arctica, Spiroplectammina biformis) document a long-term late-Holocene cooling trend, in the basal waters of Disko Bugt. This reflects increasing influence of the East Greenland Current (EGC) on the WGC during the last 3.6 ka BP. In addition, shifts within the benthic foraminiferal assemblage from a predominant calcareous to a predominant agglutinated fauna are likely to reflect oceanographic changes in the WGC source regions (e.g. variability in the relative water mass contribution of the East Greenland Current, EGC and the Irminger Current/North Atlantic Current, IC/NAC). Millennial to centennial scale variability can be identified superimposed on this longer-term cooling trend. If changes in the reservoir age are taken into account the pronounced cold phase centred at c. 2.5 ka BP corresponds - to the '2.7 ka BP cooling-event' recorded in marine and terrestrial archives elsewhere in the North Atlantic region. A warm phase recognized at c. 1.8 ka BP is likely to correspond to the 'Roman Warm Period' and represents the warmest bottom water conditions in Disko Bugt during the last 3.6 ka BP. The time period of the 'Medieval Climate Anomaly' is not observed as a pronounced WGC warming. From 0.9 ka BP we find a prominent rise in abundance of agglutinated (e.g. Cuneata arctica) and calcareous arctic (e.g. Stainforthia feylingi) water species. The culmination of the longer-term cooling trend at c. 0.3 ka BP reflects the 'Little Ice Age'.
Reconstructions from arctic terrestrial archives match, to some extent, the late-Holocene long-term cooling trend identified by our open marine benthic foraminiferal record. The reconstructed increasing influence of the EGC on bottom waters in Disko Bugt during the late-Holocene may also have a strong influence on the flow of the North Atlantic Current, and thus on Subpolar Gyre dynamics via a possible weakening of deep convection in the Labrador Sea. The oceanic changes seem to occur simultaneously to a reorganization of the atmospheric North Atlantic Oscillation system from a +NAO to a predominant -NAO regime.