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Annual and seasonal dynamics of benthic foraminifera and their sensitivity to environmental changes in an Arctic fjord

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Benthic foraminifera are widely used as climatic and environmental proxy in marine records. Their usefulness as proxy of past environmental conditions, however, depends entirely on how well they are calibrated to their biological, chemical, and physical surroundings. From the Arctic regions there is still limited knowledge on how the benthic foraminifera relate to the present polar conditions. In this study we investigate how the benthic foraminifera relate to the present environment, and in particular how rapidly they respond to the changes in the flow of warm and saline Atlantic water into the Arctic.

Kongsfjorden (Svalbard, Europen Arctic) is a glaciated Arctic fjord characterized by the presence of Arctic and Atlantic waters. Tidewater glaciers at the head of the fjord discharge freshwater and suspended sediment into the inner parts of the fjord, whereas predominantly marine conditions prevail at the fjord mouth. In summer, frontal instabilities at the outer and inner parts of Kongsfjorden result in the intrusion of warm and saline Atlantic waters into the fjord. The volume of such intrusions varies interannually, and in the 2006 and 2007 they have been significant. Concurrent with CTD measurements we sampled multicore samples annually (years 2005-2007) in a transect from the mouth of the fjord to the inner part of fjord and analysed the content of living (Rosa Bengal stained) benthic foraminifera.

The recent alterations in Kongsfjorden hydrology shifting from ”cold” (2005) to ‘’warm” (2006-2007) years resulted in changes in the relative composition of the benthic fauna. Two common species E. excavatum and C. reniforme known as co-dominant species in harsh glaciomarine enviroment decrease in abundance during the warmer years in the entire Kongsfjord area.

We have also multicore samples from spring (April 2008) and summer (August 2007) that allows for preliminary investigations of the seasonal faunal changes. Comparing spring (April 2008) and summer (August 2007) shows that some species mainly occur during spring which probably is related to different stages of primary production in the fjord. In the early spring one species Silicosigmoilina groenlandica show much higher abundance than during summer, suggesting it is exploiting the early spring bloom and is then successively replaced by other species during the summer.