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Atlantic Water inflow to Arctic and Subarctic oceans: improving reconstructions of sea surface temperatures

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When investigating natural changes of ocean circulation on longer timescales it is essential to obtain reliable quantitative proxy data. Earlier reconstructions of the inflow of Atlantic Water to Arctic and Subarctic oceans based on foraminiferal proxy data have been obstructed by uncertain quantitative reconstructions of sea surface temperatures below 5ºC. This may partly be due to incomplete modern training sets at high latitudes such as insufficient geographical coverage, poor sample quality (e.g. core tops) and unsuitable sediment preparation. The aim of this study is to obtain surface samples with undisturbed sediment-water interface and correlate modern planktonic foraminifera with in situ measurements of environmental parameters e.g. sea-ice distribution, temperature and salinity. It is also an aim to test different transfer functions in order to identify the best suitable statistical method for reconstruction of quantitative ocean temperatures. Additionally, depth habitats of planktonic foraminifera are variable, and they do not always reflect the upper most surface temperature. This should be taken into account when correlating to environmental parameters and later reconstructing temperatures. The studied size fractions of planktonic foraminifera are also a critical factor. Many studies have investigated the fraction larger than 125 and 150 μm. This may reduce the faunal diversity to near monospecific assemblages and much vital fauna information is left out of the SST reconstructions.

Surface sediment samples from the Fram Strait, Greenland Sea, Norwegian Sea and Barents Sea were retrieved using a multicorer/boxcorer and prepared at the size fractions 10 μm to 1.0 mm. The foraminiferal analyses show how *N. pachyderma* (sin) constitutes 96 - 99 % of the fauna in areas under Arctic and Polar surface water masses. Under Atlantic surface water masses *N. pachyderma* (sin) is reduced with up to 50 %, and other species take over e.g. *T. quinqueloba* and *G. uvula*. The database based on 100 μm show clearly that the latter small species are much more frequent and important for the reconstructions than previously assumed. In addition, when comparing reconstructions of sea surface temperatures a very important implication of this size-related difference is that the sea surface temperatures below 4˚C seem to give too low values when using the larger size fractions.