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Paleoceanographic development of the last two millennia in the Arctic, evidence from Hinlopen Strait, Northern Svalbard

D. Klitgaard-Kristensen and N. Koc

Norwegian Polar Institute, Polar Environmental Centre, Tromsoe, 9296 Norway (dorthe@npolar.no)

Detailed reconstructions of the paleoceanographic development in the Arctic during the Holocene are still poorly constrained in terms of the variability of the advection of Atlantic Water. Owing to the Atlantic Water as a major regulator of the climate and environmental changes in the Arctic it is important to investigate how this has changed spatially and temporally. In order to resolve the paleoceanographic development of the last two millennia in great detail we have investigated sediment cores (NP94-51) from a high accumulation area on the continental shelf, i.e. the Hinlopen Strait. This site has been chosen due to its present location within the inflow of Atlantic Water into the Arctic Ocean. The cores investigated are one box core and a gravity core. The composite record consists of c. 125 cm, yielding a time resolution between 10-30 years for the last 2 Ka. The age model is based on seven radiocarbon dates. The paleoceanographic reconstructions are inferred from the content of benthic and planktic foraminifera and IRD. The most striking result we find during the past two millennia is an overall decrease of Elphidium excavatum and Cassidulina reniforme concurrent with increases of Buccella spp. and Islandiella norcrossi/helenae and Melonis barleeanum. The high percent abundance (more than 30 percent) of Elphidium excavatum prevailing from c. 0-900 AD is interpreted as extensive sea ice cover prevailing throughout the year. The gradual decrease from c. 1000 AD and towards present in Elphidium excacatum indicates that sea ice cover diminished in this period. This interpretation is based on the modern occurrence of Elphidium excavatum in the Barents Sea. The co-occurrence of Buccella spp. and Islandiella norcrossi/helenae is somewhat similar to the modern fauna found in the south-eastern Barents Sea in surface sediment samples. This fauna thrives in an area characterised by seasonal sea-ice cover, with an ice-edge produc-

tivity bloom during spring/summer. The increase of Melonis barleeanum during the past two millennia may reflect stronger influence of Atlantic water since its modern distribution in the Barents Sea suggests it is indicative of increased influx of chilled Atlantic derived water. This species, however, also prevail in environments characterised by increased fluxes of organic matter to the sea bottom and fine-grained sediments. The increase of Melonis barleeanum could therefore reflect a combination of increased organic matter to the sea bottom and enhanced influence of Atlantic Water.

Seasonally open waters are expected to enhance productivity. However, this is not the case in the Hinlopen core as observed from the general decrease in the content of benthic foraminifera specimens/g through the last two millennia.

The timing of the changes we find north of Svalbard is similar to those found further south in the Nordic Seas. The inferred temperature changes are, however, opposite the pattern observed in the southern part of the Norwegian Sea over the past millennia.