Geophysical Research Abstracts, Vol. 9, 07427, 2007
SRef-ID: 1607-7962/gra/EGU2007-A-07427

The last interglacial Arctic Ocean – intrabasinal sediment and faunal records support much reduced sea ice concentrations

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In context to the rapid changes of the Arctic Ocean environment seen over the last decades, this presentation concentrates on former natural extreme states of the Arctic Ocean environment north of Greenland. The area stands out as largely unexplored, being characterised by some of the toughest ice conditions of the Arctic Ocean. Sediment cores and single channel seismic data retrieved from the GreenICE camp over the southernmost part of the Lomonosov Ridge in 2004, contribute important data to the reconstruction of Arctic Ocean circulation, degree of ice cover, sediment provenance/dispersal, and climate connections during the last two glacial-interglacial cycles (200 ka). The GreenICE sediment cores are characterised by high background calcium carbonate contents and calcareous microfossils are almost ubiquitous (as opposed to most other parts of the Arctic Ocean). The chronostratigraphic framework for Quaternary Arctic Ocean records recently underwent a major revision. Thereby correlation of the GreenICE record to key sediment cores from the Eurasian and the Amerasian Basin of the Arctic Ocean has been made possible. The study of the planktic foraminifera fauna >63 μm in the GreenICE record reveals highly interesting results. The section representing the last interglacial warm period (MIS 5e) is characterised by abundant small subpolar foraminifera *T. quinqueloba*. At present, this species occurs abundantly in subsurface Atlantic Waters close to the sea ice margin north of Svalbard and in the Barents Sea Branch. However, only a small percentage of subpolar specimens reach the interior Arctic Ocean as evidenced by living assemblages in the water column and late Holocene surface sediment samples from interior Arctic sites. The oxygen isotope values of *T. quinqueloba* and polar species *N. pachyderma* (s) in the GreenICE MIS 5e interval are quite similar supporting that both species reflect local

conditions. We therefore assume that sea ice conditions near the GreenICE site must have been much reduced during at least a part of the last interglacial period. A few other studies of interior Arctic Ocean records that also included planktic foraminifera assemblages of the fine fraction 63-125μm, indeed reveal intervals with raised abundances of subpolar species. Using the revised chronostratigraphic framework for late Quaternary Arctic Ocean records, we show that one of these 'warm' intervals represents MIS 5e. Based on these data, we propose that the extent of sea ice cover during the last interglacial period was generally reduced over most parts of the Arctic Ocean compared to the present day pattern. We suggest that natural changes of the Arctic Ocean sea ice system during interglacial periods may be larger than hitherto anticipated. Modelling studies of future scenarios of a partly ice free Arctic Ocean may therefore be constrained by detailed studies of former warm period records. Such studies should also include interior Arctic sites.