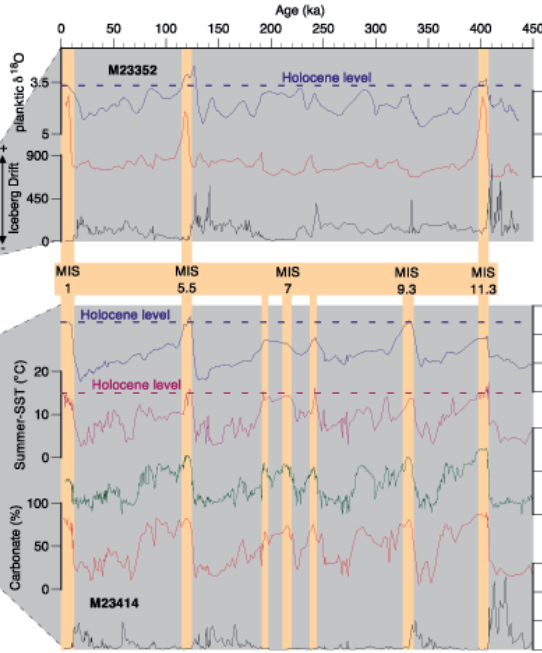
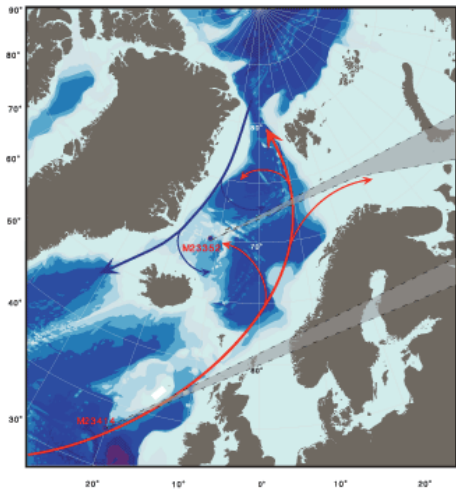


Glacial-interglacial climates of the Pleistocene

Contact: Dr Jan Helmke, Dr. Henning Bauch

Fig. 1

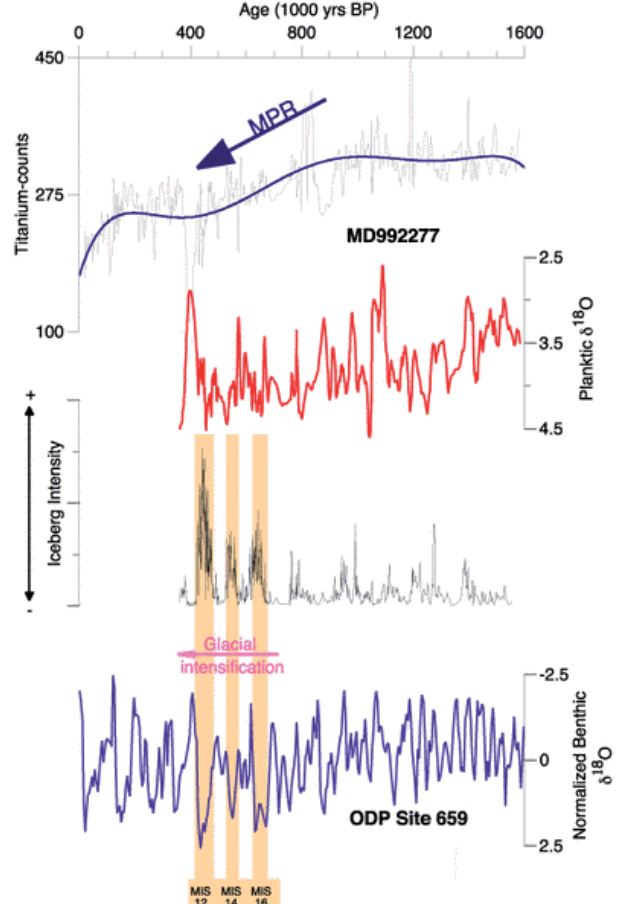


(a) Geographical position of sites M23414 (Rockall-Plateau) and M23352 (Island-Plateau) in the Atlantic. Red arrows indicate inflow of warm Atlantic surface water masses into the polar North Atlantic, blue arrows indicate the outflow of cold Arctic waters into the subpolar North Atlantic. (b) Planktic oxygen isotopes (blue curve), carbonate content (red curve) and intensity of iceberg drift (black curve) for M23352 (top) and M23414 (bottom, in addition sea-surface temperatures (pink curve) and sediment color (green curve) are presented). The data indicate the differences of interglacial conditions in the subpolar and the polar North Atlantic as well as the differences between the Holocene and previous interglaciations.

Since the onset of the Holocene about 10,000 years ago the earth is characterized by warm, so-called interglacial climate conditions with continental ice sheets being limited to the polar regions of both hemispheres. Due to the strong influence of the Gulf Stream Middle and Northern Europe currently show unusually high mean temperatures when compared to the conditions during the past 500,000 years (Fig. 1). During the Pleistocene the global climate was characterized by the rhythmic change between cold glacial and stadial periods with extended ice sheets in the Northern Hemisphere and some warm interglacial climate periods (Fig. 2). The specific environmental conditions of the high northern latitudes during these warm and cold periods were investigated in the framework of several projects funded by the German Science Foundation in order to better characterize glacial-interglacial climate modes.

A number of new insights were obtained: Regional differences of interglacial climate in the subpolar and polar North Atlantic became obvious. During the past 450,000 years the polar sector was characterized by only 3 pronounced warm periods, whereas interglacial climates occurred more frequently in the subpolar regions. Moreover, in the Northern Hemisphere a clear intensification of glacial and interglacial conditions during the course of the so-called mid-Pleistocene Revolution (MPR) is indicated (Fig. 2).

Fig. 2



XRF measurements (gray curve), planktic oxygen isotopes (red curve) and accumulation rates of terrigenous material (black curve) from the polar North Atlantic (MD992277; XRF and isotope data were smoothed to emphasize main trends) as well as benthic oxygen isotopes from the subtropical North Atlantic (ODP Site 659). Mid-Pleistocene changes, especially an intensification of glacial climate, becomes obvious.

Literature

Bauch H.A. and Erlenkeuser H. (2003) Interpreting glacial-interglacial changes in ice volume and climate from subarctic deep water foraminiferal $\delta^{18}O$. In: Earth's Climate and Orbital Eccentricity: The Marine Isotope Stage 11 Question, edited by Droessler A.W., Poore R.Z., Burckle L.H.. American Geophysical Union Monograph Series, Washington, D. C., 137, 87-102.
 Bauch H.A., Erlenkeuser, H., Fahl, K., Spielhagen, R.F., Weinelt, M.S., Andruleit, H. and Henrich, R. (1999) Evidence for a steeper Eemian than Holocene sea surface temperature gradient between Arctic and sub-Arctic regions. Palaeogeography, Palaeoclimatology, Palaeoecology 145, 95-117.
 Bauch H.A., Erlenkeuser H., Helmke J.P. and J. Thiede (2000) A Paleoclimatic Evaluation of Marine Oxygen Isotope Stage 11 in the high-northern North Atlantic (Nordic Seas). Global and Planetary Change, 24 (1), 27-39.
 Helmke J.P. and H.A. Bauch (2002) Glacial-interglacial carbonate preservation records in the Nordic Seas. Global and Planetary Change, 33, 15-28.
 Helmke J.P. and H.A. Bauch (2003) Comparison of conditions between the polar and subpolar North Atlantic region over the last five climate cycles. Paleoceanography, 18 (2), 1036, doi:10.1029/2002PA000794.
 Helmke J.P., Bauch H.A. and H. Erlenkeuser (2003) Development of glacial and interglacial climate conditions in the Nordic seas between 1.5 and 0.35 Ma. Quaternary Science Reviews, 22, 1717-1728.
 Helmke J.P., Bauch H.A., Röhl U. and A. Mazaud (2005) Changes in sedimentation patterns of the Nordic seas region across the Mid-Pleistocene. Marine Geology, 215, 107-122.
 Kandiano E.S. and H.A. Bauch (2003) Surface ocean temperatures in the Northeast Atlantic during the last 500,000 years: Evidence from foraminiferal census data. Terra Nova, 4, 265-271.
 Kandiano E.S., Bauch H.A. and A. Müller (2004) Sea surface temperature variability in the North Atlantic during the last two glacial-interglacial cycles: Comparison of faunal, oxygen isotopic and Mg/Ca-derived records Palaeogeography, Palaeoclimatology, Palaeoecology, 204 (1-2), 145-164.