Late Pleistocene to Holocene variations of sea surface conditions and intermediate water ventilation in the western Bering Sea

Lars Max (Alfred Wegener Institute for Polar and Marine Research), Jan-Rainer Riethdorf (Leibniz-Institute of Marine Sciences - IFM-GEOMAR), Dirk Nürnberg (Leibniz-Institute of Marine Sciences - IFM-GEOMAR), Ralf Tiedemann (Alfred Wegener Institute for Polar and Marine Research)

The Bering Sea, as a marginal sea of the subarctic North Pacific, acts as a linkage between the open North Pacific and the North Atlantic via the Bering Strait. Due to its location and function as conductor between the subpolar and polar ocean, it is proposed to contribute to changes in Earth´s climate, which are proposed to be driven by changes in meridional overturning and/or atmospheric teleconnections in late Quaternary glacial-interglacial transitions. However, due to corrosive bottom waters limiting carbonate preservation, paleoceanographic conditions in the Bering Sea are less well understood than those of the North Atlantic. Here, we present three sediment records from Shirshov Ridge in the western Bering Sea, obtained well above the shallow carbonate compensation depth (CCD), which provide suitable material for detailed reconstructions of past changes in oceanographic conditions in the Bering Sea during the Late Pleistocene to Holocene. Stable carbon isotopes ($\delta^{13}C$) and stable oxygen isotopes ($\delta^{18}O$) were measured to identify past changes in the formation of intermediate water masses and to provide a core stratigraphy, tied to additional AMS ^{14}C ages. Foraminiferal Mg/Ca, alkenone measurements and $\delta^{18}O$ were applied to reconstruct sea surface temperatures (SST) and to assess sea surface salinities (SSS). Terrigenous fluxes were assessed by combination of sedimentological (percentages of siliciclastics, fine fraction) and shipboard magnetic susceptibility data of core sediments. The sediment records provide the history of surface water conditions from MIS1 to MIS6, ranging from millennial to orbital timescales and reveal patterns of lithological changes within the frequency range of Dansgaard-Oeschger cycles and Heinrich events. During the last glaciation a relative increase in terrigenous matter accumulation is observed in the western Bering Sea, which suggests enhanced terrigenous supply by ice-rafted material (IRD). Alkenone concentrations also diminished, suggesting a perennial sea-ice coverage during glacial times. Negative $\delta^{13}C$-values of epibenthic foraminifera *C.lobatulus,* indicating weak to absent ventilation of intermediate water masses during the last glacial, which slightly increase towards the Holocene. In contrast, the last deglacial to interglacial period is marked by a decrease in IRD and an increase in sea surface temperatures, with a rise of +2.5°C during the late Holocene. This suggests relatively ice-free and warm climatic conditions. Finally, a drop in SST by ca. −1.8°C, observed during the middle to early Holocene, challenges the proposed idea of a SST seesaw pattern between the North Atlantic and North Pacific (Kim et al., 2004).

References

Kim, J.-H., Rimbu, N., Lorenz, S.J., Lohmann, G., Nam, S.-I., Schouten, S., Rühlemann, C. & Schneider, R.R. (2004): North Pacific and North Atlantic sea-surface temperature variability during the Holocene. – *Quaternary Science Reviews* **23**, 2141-2154.