

Sea surface temperature, marine productivity and terrigenous fluxes in the western Bering Sea during the last 150 ka

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

The N-Pacific, Arctic Ocean and N-Atlantic are hydrographically connected via the Bering Strait and the Bering Sea, whose role for Earth's climate change is only poorly understood. Assessment of paleoceanographic changes is limited due to the relatively shallow CCD and corrosive bottom waters prohibiting the preservation of calcareous microfossils within most of the Bering Sea sediments. Here, we present sediment records from Shirshov Ridge, a morphological high in the western Bering Sea between 55-60°N and 169-172°E, recovered during RV Sonne cruise SO201-2 in fall 2009. Selected cores lie on a N-S-transect covering intermediate to deepwater levels and allow to address issues concerning the formation of intermediate water masses in the N-Pacific, the glacial development of Kamchatka, changes in marine productivity, and the hypothesized sea surface temperature seesaw pattern between the N-Pacific and N-Atlantic (KIM ET AL., 2004). High-resolution core stratigraphy is based on AMS¹⁴C-datings, isotope stratigraphy, and magnetostratigraphy. Sea surface temperatures (SST) are reconstructed using planktonic foraminiferal Mg/Ca while sea water salinities are derived from a combined $\delta^{18}\text{O}$ -Mg/Ca-approach. We assess past terrigenous fluxes and marine productivity by XRF-element scanning and by the determination of TOC, CaCO₃ and biogenic opal. The sediment archives cover the last ca. 150 ka. Deglacial and interglacial sediments are typically abundant in diatoms and calcitic foraminifers, pointing to an extremely enhanced marine productivity. A strong increase in TOC, biogenic opal and SST indicates enhanced surface water productivity under temperate climatic conditions. During the last glaciation, low TOC, biogenic opal and CaCO₃ contents suggest low primary productivity in the western Bering Sea possibly due to a perennial sea-ice coverage and/or a strong stratification limiting both, nutrient supply and nutrient utilization. Interestingly, a millennial-scale cyclic pattern of lithological changes within the frequency range of Dansgaard-Oeschger cycles and Heinrich events was detected in the sediments. These results are comparable with previous studies in the adjacent Sea of Okhotsk (NÜRNBERG & TIEDEMANN, 2004), which suggest that environmental changes in that area and in SE Asia are closely related. During full glacial times the Okhotsk Sea records point to a strong Siberian High causing northerly wind directions and the extension of the sea ice cover. Deglacial maxima of terrigenous flux were succeeded by or synchronous to high-productivity events. During interglacials, SE monsoonal winds prevailed, analogous to today's summer situation. Strong freshwater discharge and a seasonally reduced and mobile sea ice cover favored marine productivity and a lowered flux of IRD.

References

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