1. Introduction

The objective of the project is a high-resolution reconstruction of the variability in surface water characteristics and terrigenous input in the North Pacific and Bering sea using organic geochemical proxies.

Primary targets of the study are:
- Reconstruction of the sea surface temperature (SST) based on alkenones (UK’37)
- Reconstruction of sea-ice cover based on highly-branched isoprenoids (HBIs, IP25)
- Reconstruction of marine productivity using specific biomarkers (Brassicasterol in this study)
- Reconstruction of organic-carbon (OC) sources, input of terrigenous OC using ratios and 

The same geochemical proxies have been measured in three kastencores (highlighted in Figure 1) in order to understand the climatic changes over the last 50 ka.

2. Methodology

3. Surface Sediment Data

The core material studied within this project was collected during RV Sonne cruise 202 (INOPEX) in the (sub-)polar North Pacific and Bering Sea.

In order to reconstruct the sea-ice cover, the newly developed so-called “IP25 Index” was used (Belt et al., 2007; Müller et al., 2009). We found this specific biomarker only in the 3 northernmost surface sediment samples of the INOPEX cruise, which highlights the presence of sea ice in this area. The absence of the IP25 in the rest of the sediment samples may reflect the modern dominantly open water conditions through the year.

Sea Surface Temperature

In order to define the best calibration for this region, UK’37 was converted to temperature according to two different equations. First the alkenone-based calibration, UK’37 ~ 8.05T ~ 0.844, obtained by Stillman et al. (1998) on surface sediments from the global ocean (50°S-50°N) and suitable for temperatures ranging between 11°F and 27°F (UK’37-IP25) was proposed by Sikes et al. (1997) and obtains with alkenones in core-top sediments from Southern Ocean. By comparing the alkenone-based SST and the measured temperature reconstructed from the World Ocean Atlas 2001, we observe that the estimated UK’37 SST has the same latitudinal distribution pattern than the Annual-Mean SST but is a few degrees higher (about 4°C). However, the alkenone-based SST match well with the Summer Mean temperatures, suggesting that the based-alkenone SST mainly reflects surface water temperature in summer.

4. Data from sediment cores: Late Quaternary variability

• SST, TOC, SST, IP25 and PBIP25 in cores SO202-07-6 and SO202-27-6

Coincident with the low SST observed during the Younger Dryas, the concentration of IP25 is high, which may suggest an extension of spring sea-ice coverage in Bering Sea during this period. Between the early and mid- Holocene, the sediment is strongly laminated. The alkenone-based SST shows an increase in temperatures, and the absence of IP25 may be interpreted as open-water conditions. However, only 4 samples from this interval have been studied so far, i.e., further data are needed before a more detailed interpretation is possible. From the mid-Holocene to the last Holocene, we observe an increase in IP25 as well as the IP5-index, which may suggest an advance of the sea ice margin in Bering Sea.

TOC content in this core varies between 0.25 wt% and 1.885 wt%. Highest TOC values are found in the limnetic sediment and refer to an increase of black and brown preservation of the organic carbon. Preliminary age models (based on K-Ar, Gersonde et al., 2011, unpublished).

References

Cruise Report, 57, Gersonde R. et al., 2010. Sonne Cruise SO202-INOPEX.