Geophysical Research Abstracts
Vol. 14, EGU2012-1377-2, 2012
EGU General Assembly 2012

Modern seasonal variability of central Arctic Ocean sea-ice cover: Reconstruction based on biomarker ("IP25" and "PIP25") data from sediment trap samples

K. Fahl and R. Stein
Alfred Wegener Institute, Geosciences, Bremerhaven, Germany (kirsten.fahl@awi.de)

During the Polarstern 1995 Expedition, a long-term mooring system with two cone-shaped multi-sampling traps was deployed at the dominantly ice-covered western slope of the southern Lomonosov Ridge (81°04.5'N, 138°54.0'E, 1712 m water depth). One trap was installed at 150 m below the sea surface, the other at 150 m above the bottom at 1550 m depth; material was collected in 20 time intervals between September 1995 and August 1996. For background data see Fahl and Nöthig (2007). Here, we present new biomarker data recording the seasonal variability of sea-ice cover. This type of data representing modern seasonal variability of the sea-ice biomarker proxies, was not available so far from the central Arctic Ocean but may help significantly the interpretation of these proxies to be used in sedimentary records for reconstruction of paleo-sea-ice distributions.

In this study, we have focused on the novel sea ice proxy "IP25", a direct proxy for sea ice coverage (Belt et al., 2007). Furthermore, we used the phytoplankton-IP25 index ("PIP25" Index), a further development of the IP25 index, based on the coupling of the environmental information carried by IP25 (sea ice) and brassicasterol (open-water phytoplankton productivity) (Müller et al., 2011).

The interval November 1995 to June 1996 is characterized by the absence of the sea-ice proxy IP25 (except very minor values for January and April), suggesting a predominantly permanent sea-ice cover at the trap location. During July/August 1996, maximum fluxes of the diatom-specific fatty acids and brassicasterol as well as maximum contents of biogenic opal (Fahl and Nöthig, 2007) indicate increased primary productivity. The marine organic matter (here POC, brassicasterol, and fatty acids) and the IP25 values decrease systematically from 150 to 1550m depth, indicating the typical biogeochemical degradation with increasing water depth. Due to the coincidence of maximum abundances of sea-ice proxies and open-ocean primary productivity proxies during the July/August time interval we propose a ice-edge situation characterized by increased phytoplankton productivity and sea-ice algae input. This interpretation is also supported by the phytoplankton-IP25 index (PIP25 Index), reaching quite high values of 0.5-0.8. It seems to be that in general PIP25 values do not change significantly between the shallow and deep trap, i.e. with increasing water depth, an important observation when thinking about the interpretation of PIP25 sedimentary records. The distinctly reduced September/October values of brassicasterol and fatty acids suggest a decrease in primary productivity, probably related to the start of new-ice formation in late September. This situation is reflected in high IP25 values and high PIP25 ratios. Whereas for October no IP25 was determined in the shallow trap, medium-high IP25 values were determined in the deep trap with maximum PIP25 ratio of about 0.7. This may indicate lateral IP25 input, but also means that in this case the PIP25 ratios should be interpreted with caution.

References:
Belt, S.T., Massé, G., Rowland, S.J., Poulin, M., Michel, C., LeBlanc, B., 2007. Org. Geochem. 38, 16-27.
Fahl, K. and Nöthig, E.-M., 2007. Deep-Sea Res. 54, 1256-1272.
Müller, J., Wagner, A., Fahl, K., Stein, R., Prange, M., and Lohmann, G., 2011. Earth Planet. Sci. Lett. 306, 137-148.