Geophysical Research Abstracts
Vol. 17, EGU2015-10527, 2015
EGU General Assembly 2015

Reconstructing palaeo-environmental conditions in the Baltic: A multi-proxy comparison from IODP Site M0059 (Little Belt)

Ulrich Kotthoff (1), Thomas Andrén (2), Thorsten Bauersachs (3), Anne-Sophie Fanget (4), Wojciech Granoszewski (5), Jeroen Groeneveld (6), Nadine Krupinski (7), Odile Peyron (8), Anna Stepanova (9), and Carol Cotterill ()

(1) Hamburg University, Department of Geosciences, Hamburg, Germany (ulrich.kotthoff@uni-hamburg.de), (2) School of Life Sciences, Södertörn University, Sweden; , (3) Christian-Albrechts-University, Kiel, Germany; , (4) Department of Geoscience, Aarhus University, Denmark, (5) Polish Geological Institute-National Research Institute, Krakow, Poland, (6) MARUM, University Bremen, Germany, (7) Department of Geology, Lund University, Sweden, (8) Laboratoire Chrono-Environnement, Université de Franche-Comté, Besançon, France, (9) Oceanography, Texas A&M University, USA, (10) British Geological Survey, Edinburgh, UK

Some of the largest marine environmental impacts from ongoing global climate change are occurring in continental shelf seas and enclosed basins, including severe oxygen depletion, intensifying stratification, and increasing temperatures. In order to predict future changes in water mass conditions, it is essential to reconstruct how these conditions have changed in the past. The brackish Baltic Sea is one of the largest semi-enclosed basins worldwide, and hence provides a unique opportunity to analyse past changes. IODP Expedition 347 recovered a unique set of long sediment cores from the Baltic Sea Basin which allow new high-resolution reconstructions.
The application of existing and development of new proxies in such a setting is complicated, as environmental changes often occur on much faster time scales with much larger variations. Therefore, we present a comparison of commonly used proxies to reconstruct palaeoecosystems, -temperatures, and -salinity from IODP Site M0059 in the Little Belt. The age model for Site M0059 is based on 14C dating and biostratigraphic correlation with neighbouring terrestrial pollen records. The aim of our study is to reconstruct the development of the terrestrial and marine ecosystems in the research area and the related environmental conditions, and to identify potential limitations for specific proxies.
Pollen is used as proxy for vegetation development in the hinterland of the southern Baltic Sea and as land/air-temperature proxies. By comparison with dinoflagellate cysts and green algae remains from the same samples, a direct land-sea comparison is provided. The application of the modern analogues technique to pollen assemblages has previously yielded precise results for late Pleistocene and Holocene datasets including specific information on seasonality, but pollen-based reconstructions for Northern Europe may be hampered by plant migration effects. Chironomid remains are used where possible as indicators for surface water conditions during the warm season. Analyses of palynomorphs and chironomids are complemented with the analysis of lipid palaeothermometers, such as TEX86 and the long chain diol index (LDI), which both allow reconstructing variation in sea surface temperatures (SST) of the Baltic Sea. In addition, the MBT/CBT proxy is used to infer past changes in mean annual air temperatures (MAAT) and the diol index (DI) to determine variation in salinity of the Baltic Sea's surface waters over the investigated time period.
The low salinity (25 psu) of the Little Belt is a potential limitation for several of the used proxies, which could lead to under-estimation of paleo-temperatures. To quantitatively and qualitatively estimate the impact of salinity, δ18O measurements (monospecific) and faunal assemblage analyses are performed on benthic foraminifera as well as ostracod faunal assemblages, which are especially sensitive to bottom water salinity changes.
The results of this inter-comparison study will be useful for the reconstruction of gradients between different settings, e.g. how water column stratification developed, possibly if and how changes in seasonality occurred, and to identify the circumstances under which specific proxies may be affected by secondary impacts.