Geophysical Research Abstracts
Vol. 17, EGU2015-11988, 2015
EGU General Assembly 2015

Towards an improved understanding of Baltic Sea hypoxia during the Holocene: preliminary results from IODP Expedition 347

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The Baltic Sea is a restricted brackish-marine basin that is highly sensitive to changes in climate and anthropogenic activity. Due to its salinity stratification, the Baltic Sea is particularly vulnerable to hypoxia (oxygen concentrations < 2 ml/L). Besides the modern, human-induced period of hypoxia (since A.D. 1960), there is evidence for two earlier major intervals of hypoxia since the transition of the Baltic Sea from the Ancylus freshwater phase to the Littorina brackish-marine phase. These are the Holocene Thermal Maximum (HTM), ca. 8-4 ka, and the Medieval Climate Anomaly (MCA), ca. 1-0.7 ka (Zillen et al., 2008; Jilbert and Slomp, 2013). While changes in salinity, temperature and the input and recycling of nutrients all may contribute to the development of hypoxia in the Baltic Sea, their relative importance in driving the hypoxia during the MCA and HTM is still incompletely understood.

Here, we use porewater and sediment geochemical data obtained during the IODP Expedition 347: Baltic Sea Paleoenvironment (September 13 – November 1, 2013) to obtain further insight into the role of changes in salinity and phosphorus recycling during the HTM. We focus on three sites along the modern salinity gradient in the Baltic Sea, Sites M0059, M0063 and M0065. Our results indicate that bottom water salinity in the Baltic Proper was higher during the HTM than at present, confirming previous studies that increased salinity stratification may have contributed to the development of hypoxia during the HTM. We also discuss evidence for temporal changes and spatial differences in primary productivity and phosphorus burial and recycling in the Baltic Sea and their potential role in contributing to the development of hypoxia during the HTM and MCA.

References:

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