Controls on anoxia in the Baltic Sea

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The Baltic Sea is currently one of the most polluted seas in the world and one of the main disturbances is anoxia, which has increased dramatically since about 1960 [1]. However, anoxic events have been occurring in the Baltic Sea for the past 8,000 years and the controls are not well understood. With this study we investigate environmental conditions during anoxic events in the past to better understand present day anoxia in the Baltic Sea. To do this we examined three cores from the Baltic Sea, one core from the central Baltic Sea in the Gotland Basin was analysed in high resolution for sea surface temperature (SST) using the TEX_{86}-proxy and total organic carbon accumulation (TOC) and the two cores from the Arkona Basin were analysed for alkenones because of their closer proximity to the ocean.

During the Holocene brackish period (the last 7,500 kyrs) in the Gotland Basin higher reconstructed temperatures correlate with periods of increased organic carbon accumulation, which is linked to anoxia, while colder temperatures correlate to periods of low organic carbon accumulation and oxic conditions. After the increase in salinity brought about by a re-established connection to the ocean, anoxia thus appears to have been controlled by climate, demonstrating that hydrology and climate both play major roles in the establishment of anoxic conditions in the Baltic Sea. These results leads us to believe that even though anoxic episodes are a natural feature of the Baltic Sea over the Holocene, they could be exasperated by future anthropogenic global warming. Both Arkona cores show an increase in $C_{37:3}$ and $C_{37:2}$ alkenones and a decrease in $\%C_{37:4}$ indicating increased marine input and higher salinity conditions [2] occurred at the same time as the onset of a decrease in the branched isoprenoid tetraether (BIT) index, also indicative of increased marine influence [3]. The alkenone record from the Arkona cores along with the BIT index from all three cores shows that the transition from a freshwater lake to a brackish sea that occurred during the Holocene was clearly captured by the distribution of biological markers.

[1] Karlson, et al. (2002) *Oceanogr Mar Biol*: **40**, 427-489. [2] Blanz et al. (2005) *Geochim Cosmochim Ac*: **69**, 2589-3600. [3] Hopmans (2004) *Earth Planet Sc Lett*: **224**, 107-116.