Geophysical Research Abstracts
Vol. 14, EGU2012-6825, 2012
EGU General Assembly 2012


# Proxies for Redox Conditions during early Aptian Ocean Anoxic Event 1a

S.C. Brassell
Indiana University, Geological Sciences, Bloomington, United States (simon@indiana.edu, +1 812 855-3786)

Reports of higher concentrations of biomarkers for photic zone anoxia, namely isorenieratane and chlorobactane, in sediments that correspond to warmer episodes during the Cenomanian-Turonian oceanic anoxic event (OAE2) prompts consideration of the potential association of ocean stratification and anoxia with enhanced temperatures during other Ocean Anoxic Events (OAE). Recognition of temperature variations based on the TEX86 proxy for a sediment sequence rich in organic matter from Shatsky Rise (ODP Site 1207) corresponding to OAE1a (early Aptian) affords the opportunity for such an investigation. Moreover, the 50 cm continuous section of this OAE1a interval that was recovered enabled sampling to examine detailed stratigraphic variations in the abundances and compositions of a range of geochemical characteristics, both molecular and elemental, including possible biological responses to temperature fluctuations and other palaeoenvironmental conditions, notably the levels of oxygenation of the depositional setting. The temperature-dependent variations in biomarkers and other geochemical proxies through the OAE1a interval included: (i) decreasing concentrations of 2-methylhopanes derived from cyanobacteria with increasing temperature, and (ii) fluctuations in V concentrations that reflect temperature trends, and correspond closely with organic C contents, except where Corg >30%. Among parameters linked to levels of oxygenation, the biomarker constituents in the OAE1a interval include steroidal and hopanoid ketones consistent with an oxygenated water column, but the sediments also contain traces of isorenieratane from green sulphur bacteria suggesting intermittent photic zone anoxia. Similarly, the observed values far exceeding unity for the lycopane index [(lycopane + n-C35)/n-C31] imply anoxic bottom waters, although the location of Shatsky Rise in the mid-Pacific during the Aptian may skew this ratio because of the paucity of biological sources for n-C31. In addition, the elevated Mo concentrations (7 - 540 ppm) in these sediments are typical of euxinic conditions, and yet marcasite, a likely product of pyrite oxidation, is prevalent throughout the section. Comparison of these proxies reveals a correspondence between the lycopane index and Mo concentrations, with higher values for both parameters during warmer intervals. These results suggest that specific indicators for levels of oxygenation may perhaps be controlled by environmental variables including changes in ocean temperatures that exert an influence on surface ocean conditions that govern seasonal productivity and affect stratification in the water column, and yet are independent from the controls on anoxia within the sediment after deposition.