Geophysical Research Abstracts, Vol. 9, 07871, 2007
SRef-ID:

Reconstructing water column anoxia during the Cenomanian-Turonian boundary event using biomarker and trace metal proxies

E.C. van Bentum (1), A. Hetzel (2), A. Forster (3), G.-J. Reichart (1), H.-J. Brumsack (2) and J.S. Sinninghe Damsté (1, 3)

(1) Department of Earth Sciences - Molecular Paleontology, Faculty of Geosciences, Utrecht University, PO Box 80021, 3508 TA Utrecht, The Netherlands (2) Institute for Chemistry and Biology of the Marine Environment, Oldenburg, Germany (3) Department of Marine Biogeochemistry & Toxicology, Royal Netherlands Institute for Sea Research, PO Box 59, 1790 AB Den Burg, Texel, The Netherlands (bentum@geo.uu.nl)

Mid-Cretaceous climate was characterized by high temperatures and consequently both ocean chemistry and circulation were strongly different from today. During this period, several episodes known as ocean anoxic events (OAEs) occurred. OAEs are characterized by the widespread and increased deposition of marine organic carbon-rich laminated sediments, so-called black shales, which are also often associated with elevated concentrations of redox sensitive trace elements (TMs). These OAE black shales formed either by enhanced organic matter preservation under anoxic bottom water conditions or by an increased flux of organic matter (OM) because of higher primary productivity.

One of the most extreme and widespread OAEs is OAE-2 at the Cenomanian-Turonian boundary (C/T; 93.5 Ma). We examined the OAE-2 interval from ODP Leg 207, Site 1260 on Demerara Rise off the coast of Surinam. Interestingly, the C/T boundary falls here within a sequence of black shales, enriched in both OM and sulphur. The semi-continuous occurrence of black shales suggests that Demerara Rise experienced anoxic conditions and/or high primary productivity during most of the Cenomanian-Turonian, not just during the OAE. The stratigraphic position of OAE-2 within the Demerara shales was determined by its distinct positive stable carbon isotope excursion, evident from both bulk and compound specific records. During this interval of enriched carbon isotope values, pronounced changes are also observed in the trace

metal and molecular fossil records.

The setting at Demerara rise, where prolonged bottom water anoxia has resulted in a perfectly preserved record of both redox sensitive elements and molecular fossils, allows us to unravel the effects of water column oxygenation and increases in productivity during OAE-2. Variations in oxygenation were reconstructed using molecular fossils derived from pigments and redox sensitive and sulphide forming trace metals. Isorenieratane, a biomarker for euxinic conditions in the photic zone, was found in significant concentrations only within parts of the positive δ^{13}C excursion. It seems therefore that at Demerara Rise bottom waters experienced long-term anoxia while the base of the photic zone only became euxinic during OAE-2.