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Depositional environment of Cenomanian/Turonian black shales from Demerara Rise (ODP Leg 207) - Implications from trace metal patterns

A. Hetzel (1), A. Forster (2), H.-J. Brumsack (1)

(1) Institute for Chemistry and Biology of the Marine Environment, University of Oldenburg, P.O. Box 2503, D-26111 Oldenburg, Germany, (hetzel@icbm.de), (2) Royal Netherlands Institute for Sea Research (NIOZ), P.O. Box 59, 1790 AB Den Burg, Texel, The Netherlands

During ODP Leg 207 relatively expanded, shallowly buried Cretaceous sediments were recovered from Demerara Rise off Suriname, South America. Multiple sequences of Cenomanian and Turonian black shales evidence varying levels of bottom water dysoxia and/or enhanced surface water productivity. Under severe oxygen-depleted conditions, several redox-sensitive or sulfide forming elements are enriched within the sediments. Therefore, the C/T boundary (OAE 2) is characterized by a specific distribution pattern of diagnostic metals. It is suggested that trace metals provide useful information when reconstructing paleoenvironmental conditions.

High-resolution profiles for major as well as selected minor elements were investigated from black shale sequences of Sites 1258 and 1260, including the C/T-boundary, as evidenced by a positive delta13Corg-excursion. Element enrichment patterns indicate high bioproductivity like in recent coastal upwelling settings. An extended coastal upwelling oxygen-minimum-zone (OMZ) is demonstrated by extremely low Mn/Al ratios. Chemical changes in the depositional environment during the OAE 2 are suggested from elevated Fe/Al and Co/Al values within the C/T interval, while above and below the C/T interval ratios are constant (close to average shale). This indicates euxinic conditions in the water column (sulfide forming) and at the same time reductive Fe and Co mobilization in oxygen-depleted nearshore sediments during OAE 2.

Beside these implications for local depositional environment at Demerara Rise, the analysis of the trace metal (TM) profiles reveal information about the impact of global black shale deposition during the C/T event: Mo/Al, V/Al, and Zn/Al ratios are gen-

erally high throughout the analyzed sequence, but a significant depletion is notable exactly at the C/T interval. This depletion in TM/Al ratios may reflect the enlargement of euxinic depositional areas during the event. Because hypoxic or even euxinic environments form a significant sink for TM in seawater, the global onset of black shale formation, particularly during OAE 2, led to a rapid drawdown of the seawater TM reservoir causing the decline in TM enrichment in Demerara Rise strata.