Geophysical Research Abstracts,
Vol. 10, EGU2008-A-10116, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-10116
EGU General Assembly 2008

Response of coccolithophorid algae to the PETM: productivity and carbon acquisition

H. Stoll (1,2), N. Shimizu (3), P. Ziveri (4,5), D. Zentner (1), K. Emhoff (1)

(1) Geoscience Dept., Williams College, USA, (2) Dept. Geologia, Univ. de Oviedo, Spain, (3) Woods Hole Oceanographic Institute, USA, (4) Vrije University Amsterdam, The Netherlands, (5) Universitat Autonoma de Barcelona, Spain

The response of marine organisms to the changes in ocean temperature, acidity, and nutrient regimes of the Paleocene-Eocene Thermal Maximum remains poorly constrained but significant to our perception of future carbon cycle perturbation. Here we describe the elemental and stable isotope geochemistry of coccoliths as indicators of the response of the dominant calcifying plankton during the late Paleocene. Coccoliths, the dominant calcifying plankton during the late Paleocene, were extracted from the siliclastic coastal section at Bass River NJ exhibit exceptionally good preservation and negligible overgrowth compared to typical ocean carbonate-rich sediments. Analysis of individual coccoliths using secondary ion mass spectrometry (SIMS) reveals no within-specimen heterogeneity in ratios of diagenetically sensitive elements like Sr or Mn.

Sr/Ca ratios in modern sediment traps and culture experiments covary positively with nutrient stimulated productivity of individual genera. For Paleocene-Eocene Bass River samples, Sr/Ca ratios of populations of the dominant genera Toweius analyzed by SIMS are high during the pre-event and early recovery phase. Minima in Sr/Ca occur briefly 15 cm below the base of the foraminiferal carbon isotope excursion, during the CIE minimum, and late recovery. Throughout, Toweius Sr/Ca of Toweius covaries inversely with the relative abundance of Apectodinimum among dinoflagellates, possibly indicating periodic substitution of environments favorable to dinoflagellates and those favorable to coccolithophorids.

With the excellent preservation of coccolithophores, we observe in pre-PETM sediments a range in carbon isotope ratios of up to1.7 permil among different coccolith size fractions. In modern cultures and sediment traps vital effects correlate with cell size and carbonate ion. We will present results on the evolution of these interspecific and intraspecific vital effects over the PETM at Bass River and other sites.