Geophysical Research Abstracts, Vol. 9, 07686, 2007
SRef-ID: 1607-7962/gra/EGU2007-A-07686

Ocean acidification and calcareous nannoplankton at the Paleocene-Eocene Thermal Maximum

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The Paleocene-Eocene Thermal Maximum (PETM, ∼55 Ma) was a transient interval of global warming and ocean acidification that resulted from the rapid release and oxidation of methane from ocean sediments. The addition of massive amounts of carbon to the ocean-atmosphere system at the PETM, analogous to modern fossil fuel burning, caused prominent lysocline shoaling and was likely accompanied by a significant, concurrent drop in surface-water saturation state. The record of calcareous nannoplankton allows us to test this prediction. The onset of the PETM carbon cycle perturbation coincides with a peak in nannofossil origination and extinction rates compared to background levels, coeval with dramatic localized and global shifts in assemblage character driven primarily by changes in nutrient availability and temperature. Assemblage shifts and new nannofossil flux calculations suggest that these changes were related to localised environmental conditions and suggest no overriding global surface-water saturation control. Furthermore, the pattern of extinctions and originations lack a calcification bias and the presence of large, robust nannofossil taxon (e.g. *Rhomboaster* and *Discoaster*) suggest that surface water saturation levels across the event did not inhibit calcification. Our records suggest surface-water saturation state across the PETM was not perturbed to the point where it was detrimental to calcareous nannoplankton survivorship.