Geophysical Research Abstracts
Vol. 14, EGU2012-12774-1, 2012
EGU General Assembly 2012

Early Eocene hyperthermals record orbitally controlled changes in high latitude climates

S. Galeotti (1), R.M. DeConto (2), L. Lanci (1), M. Pagani (3), U. Rohl (4), T. Westerhold (4), and J.C. Zachos (5)

(1) Earth, Life and Environmental Sciences, University of Urbino, 61029 Urbino, Italy (simone.galeotti@uniurb.it), (2) Department of Geosciences, University of Massachusetts, Amherst, MA, 01002 USA., (3) Department of Geology and Geophysics, Yale University, New Haven, Connecticut 06520, USA, (4) MARUM – Center for Marine Environmental Sciences, University of Bremen, 28359 Bremen, Germany, (5) Earth and Planetary Sciences, University of California, Santa Cruz, California 95064, USA

The Late Paleocene to Early Eocene records a succession of short-term (10^4 yr) negative carbon isotope excursions (CIEs) in marine carbonates and organic carbon. Available data indicate that at least three of these episodes, including the Paleocene Eocene Thermal Maximum (PETM) at ca. 55.5, the Eocene Thermal Maximum (ETM)2 at ca. 53.5 Ma and the ETM3 at ca. 52 Ma, were associated with rapid warming, and widespread marine carbonate dissolution forced by shoaling of the carbonate lysocline and lowering of the carbonate saturation state. Large temperature raises associated with decreased δ^{13}C values in both terrestrial and oceanic records and concomitant acidification of oceanic waters implies that hyperthermals were caused by the addition of massive amounts of ^{13}C-depleted greenhouse gases (CH_4 and/or $CO-2$) into the atmosphere and subsequent sequestration by oceanic waters. Cyclostratigraphic analyses of marine sequences provided evidence that CIEs and associated carbonate dissolution episodes were linked to orbital changes in insolation. Here we show grounds that Early Eocene hyperthermals are part of a continuum of δ^{13}C anomaly and carbonate dissolution episodes and are triggered by long-term orbitally-controlled changes in local climates at high latitudes.