

The record of the Latest Danian Event in ODP Leg 165 (Caribbean Sea): Evidence for a hyperthermal event?

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The Paleocene to early Eocene is punctuated by several transient, ~20–200 ky lasting hyperthermal events of which the Paleocene-Eocene Thermal Maximum (PETM) was the most prominent one. Abrupt shallowing of the lysocline/CCD, negative stable carbon isotope excursions, and benthic faunal turnover all imply a major perturbation of the ocean system during these events. Our recent research at the Southern Tethyan shelf suggests the presence of an additional hyperthermal event associated with sea-level fluctuations slightly preceding the Danian-Selandian boundary, the Latest Danian Event (LDE) [1]. At Zumaia, Northern Spain, a negative ~0.5‰ carbon isotope excursion is present in the uppermost Danian that may correlate to the LDE [2]. Moreover, cyclostratigraphic studies have shown that several deep-sea sites are characterized by a prominent peak in both Fe and MS data at cycle Pc₁₀₀38 in the uppermost Danian: this applies to all Walvis Ridge (Atlantic) and Shatsky Rise (Pacific) sites as well as Site 1001 in the Caribbean Sea (“Top Chron C27n Event”) [3]. These results suggest that the LDE in the Tethys and the Top Chron C27n Event in the Atlantic may be correlative. We have conducted mineralogical, geochemical, and micropaleontological investigations to characterize this event in the Western Atlantic. Our first results from ODP Leg 165 Site 1001 reveal that the Top Chron 27n event [3] corresponds to a ~12 cm thick clay layer. Mineralogical analyses reveal a sharp ~50% drop of the carbonate content in the clay layer and a disproportionately high increase of the phyllosilicate content in the insoluble residue compared to the quartz and illite content. Bulk rock isotope analyses show an abrupt negative ~0.6‰ carbon isotope excursion at the onset of the clay layer, followed by a 1 m thick interval where isotopic shows a tailing back to pre-event values. The magnitude and pattern of the carbon isotope excursion is very similar to the results for the LDE in the Tethys and at Zumaia. In conclusion, our results demonstrate a supra-regional transient perturbation of the carbon cycle during the LDE in the Tethyan realm, the Atlantic, and possibly the Pacific Ocean.

References:

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