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The Top Chron C27n Event in the Western Atlantic: Evidence for a transient perturbation of the carbon cycle in the Late Danian?

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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 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, the Latest Danian Event (LDE; Speijer, 2003; Bornemann et al., 2009). At Zumaia, Northern Spain, a negative ∼0.5 per mil carbon isotope excursion is present in the uppermost Danian that may correlate to the LDE (Arenillas et al. 2008). Moreover, cyclostratigraphic studies have shown that several deep-sea sites are characterized by a prominent peak in both Fe and MS data at cycle Pc100-38 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; Westerhold et al., 2007). 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 show that the Top Chron 27n Event shown by Westerhold el al. (2008) 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 disproportionally 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 per mil carbon isotope excursion at the onset of the clay layer, followed by a 1-m thick interval where carbon isotopes 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.

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Speijer, R.P., 2003, GSA Special Paper v. 369, p. 275–290.
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