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Characterization of the Latest Danian Event by means of benthic foraminiferal assemblages along a depth transect at the southern Tethyan margin (Nile Basin, Egypt)

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ABSTRACT

The Latest Danian Event (LDE) has been recognized on the southern Tethyan margin (Egypt; Tunisia), and in the Atlantic (Zumaia, Spain) and Pacific Oceans (ODP Site 1209). Based on a supraregional carbon isotope excursion, and a negative shift in oxygen isotopes in the Pacific it has been suggested that the LDE is an early Paleogene transient warming event. So far the environmental effects of the LDE have been observed in few sections and details on its impact and duration are scarce. We present a quantitative study of benthic foraminiferal assemblages retrieved from five sections along a depth transect on the Paleocene southern Tethyan shelf (Nile Basin, Egypt) to assess paleoenvironmental change during the LDE. The lithologic sequences and foraminiferal assemblages indicate that the onset of the LDE is related to widespread shelf dysoxia. The organic-rich laminated marls of lower LDE bed I contain levels devoid of benthic foraminifera. During the later stage of the LDE (dark-gray shales of bed II) the shelf is repopulated by a *Neoeponides duwi* benthic assemblage, occurring in all sections, initiating a gradual restoration of normal-marine shelf environments. Q-mode and R-mode correspondence analysis assist in the interpretation of the *N. duwi* assemblage, which is related to disturbed conditions at the sea floor following oxygen depletion and increased organic loading. The sharp lithologic boundary at the base of the LDE suggests that the event coincides with a rapid transgression following a sea-level fall, with an estimated amplitude of ~50 m or less. Comparison with the Dan-C2 and ELPE/MPBE, two proposed transient warming episodes preceding and postdating the LDE, shows that the three Paleocene events have several characteristics in common. However, the duration of the LDE (~200 kyr) exceeds the estimated duration of the other events, and a sea-level cycle is only reported from the LDE.

1. Introduction

Studies of causes and consequences of the Paleocene–Eocene Thermal Maximum (PETM, around 55 Ma: e.g., Kennett and Stott, 1991; Dickens et al., 1997; Norris and Röhl, 1999; Thomas et al., 2002; Kent et al., 2003; Higgins and Schrag, 2006; Sluijs et al., 2007; Zachos et al., 2008) have led to a search for similar transient warming episodes, preceding and post-dating this globally impacting event. Several younger, early Eocene hyperthermals have been proposed and identified, such as the ETM-2 and 'X' events (e.g., Lourens et al., 2005; Nicolo et al., 2007; Agnini et al., 2009; Stap et al., 2009). It is likely that similar events preceded the PETM (e.g., Thomas and Zachos, 2000; Bralower et al., 2002), as these hyperthermals are probably triggered by astronomical forcing parameters (e.g., Cramer et al., 2003; Dinarès-Turell et al., 2003; Lourens et al., 2005; Westerhold et al., 2008, 2011; Lunt et al., 2011). Proposed Paleocene transient warming events are the early Paleocene Dan-C2 event (Quillévéré et al., 2002, 2008; Coccioni et al., 2010), and the Early Late Paleocene Event (ELPE: Petrizzo, 2005; Bralower et al., 2006), or Mid-Paleocene Biotic Event (MPBE, Bernaola et al., 2007).

A transient warming event, associated with sea-level change in Egypt around the Danian–Selandian transition (~61 Ma) was proposed because of sedimentologic and paleontologic similarities with

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