Pronounced biotic and environmental change across the latest Danian warming event (LDE) at Shatsky Rise, Pacific Ocean (ODP Site 1210)

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PII: S0377-8398(17)30024-5
DOI: doi:10.1016/j.marmicro.2017.10.001
Reference: MARMIC 1664

To appear in: *Marine Micropaleontology*

Received date: 2 February 2017
Revised date: 9 September 2017
Accepted date: 9 October 2017

Please cite this article as: Arne Deprez, Sofie Jehle, André Bornemann, Robert P. Speijer , Pronounced biotic and environmental change across the latest Danian warming event (LDE) at Shatsky Rise, Pacific Ocean (ODP Site 1210). The address for the corresponding author was captured as affiliation for all authors. Please check if appropriate. Marmic(2017), doi:10.1016/j.marmicro.2017.10.001

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Abstract

The early Paleogene is characterized by numerous hyperthermals, transient (<200 kyr) ocean warming events, of which the Latest Danian Event (LDE, ~62.1 Ma) is one of the first. Although the LDE appears to be controlled by similar processes as early Eocene hyperthermals, the first open ocean benthic foraminiferal record across the LDE at Walvis Ridge revealed little faunal response. Here, we studied benthic foraminifera from the uppermost abyssal (2000-2500 m) ODP Site 1210, Shatsky Rise, Pacific Ocean, to provide a broader view of faunal response to the LDE. Late Danian oligotrophic background conditions are characterized by a *Nuttallides umbonifera* dominated assemblage. Yet, ~200 kyr before the LDE, benthic foraminiferal assemblages, with increased relative abundance of endobenthic morphotypes and benthic foraminiferal accumulation rates indicate a slightly enhanced food flux. A temperature increase ~40 kyr before the first carbon isotope excursion (CIE) of the LDE (= LDE1) is associated with a rise in abundance of *Tappanina selmensis*, suggesting episodic input of fresh phytodetritus. At the start of LDE1, and through the second CIE (= LDE2), the seafloor returned to more oligotrophic conditions. Between 220 and 430 kyr after the onset of the LDE, a second phase of episodic fresh phytodetritus input is suggested by a renewed dominance of *T. selmensis*. Although the patterns of faunal change during hyperthermals relate to local conditions (circulation patterns), the magnitude of faunal change is probably more related to an absolute temperature threshold.

keywords: benthic foraminifera; Paleocene; Latest Danian Event; Pacific Ocean; Shatsky Rise; ODP Site 1210

1. Introduction

The early Paleogene is characterized by numerous hyperthermals, transient (<200 kyr) deep-sea and surface ocean warming events, associated with negative carbon isotope excursions (CIE) and carbonate dissolution in the deep sea. Of these, the Paleocene-Eocene Thermal Maximum (PETM; ~56 Ma) is the most extreme and best-studied example, which is characterized by extinction among deep-sea benthic foraminifera (e.g., Tjalsma and Lohmann, 1983; Kaiho et al., 1996; Thomas, 1998; 2003). More recently, less intense hyperthermals have been discovered, such as Eocene Thermal Maxima (ETM) 2 and 3 at ~54 Ma (Lourens et al., 2005) and ~53 Ma (Agnini et al., 2009), respectively. The early Paleocene Latest Danian Event (LDE) at ~62.1 Ma is among the earliest Paleogene hyperthermals discovered (Bornemann et al., 2009; Westerhold et al., 2011).