

Deep-sea benthic foraminiferal faunal and isotopic records of the Latest Danian Event from Walvis Ridge (ODP Site 1262), Southern Atlantic Ocean

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Abstract

During the early Paleogene, the marine ecosystem was severely disturbed by several transient (<200 kyr) hyperthermal events, of which the Paleocene-Eocene Thermal Maximum or PETM (~56 Ma) was the most prominent one. Since 2000, a number of other Paleocene and Eocene events have been discovered. The Latest Danian Event (LDE) is characterized by a >0.7‰ negative benthic foraminiferal CIE in various Tethyan and deep-sea sections. This raises interesting research opportunities, as the deep-sea benthic foraminiferal faunal record of Paleocene events, such as the LDE (~62.25 Ma), is particularly relevant to the broader understanding of hyperthermals. In this study, we present new benthic foraminiferal faunal and stable isotope data from Walvis Ridge ODP Site 1262 (Atlantic Ocean) in order to reconstruct the prevailing seafloor conditions at ~3000 m water depth. The studied 9 m interval covers ~1 Myr and includes the 200 kyr of the LDE. The high percentage of planktic foraminifera (on average 99.2%) indicates good carbonate preservation.

Stable isotope analyses on the benthic foraminifer *Nuttallides truempyi* show a ~0.9‰ $\delta^{13}\text{C}$ shift at ~62.19 Ma. A concurrent ~0.8‰ $\delta^{18}\text{O}$ excursion indicates a ~3°C temperature rise, ~1°C more than at Shatsky Rise. A second $\delta^{13}\text{C}$ peak is apparent at ~62.09 Ma, coinciding with a second negative $\delta^{18}\text{O}$ excursion of 0.5‰, an XRF Fe peak and decreasing CaCO_3 percentages. Also the ODP Site 1209 (Shatsky Rise) record shows these double Fe, $\delta^{18}\text{O}$ and $\delta^{13}\text{C}$ peaks. This feature is shared with some early Eocene hyperthermals, like ETM-2/H1-H2 and I1-I2, and might point to a common origin as these events.

The studied interval was characterized by a highly diverse assemblage. *Gyroidinoides octocameratus*, *Paralabamina lunata*, *Siphogenerinoides brevispinosa*, *N. truempyi* and *Gavelinella beccariiiformis* each reach an average relative abundance of 5-10%. No faunal turnover is associated with the onset of the LDE at Walvis Ridge. This contrasts with results from other events, such as ETM2 at Bay of Biscay, where smaller isotope excursions are associated with more prominent faunal change. At the end of the LDE, absolute abundances of *P. lunata* increase; abundances of other taxa remain constant. Throughout the whole interval, there is a gradual decreasing abundance of *G. beccariiiformis* and *N. truempyi*, combined with a slightly increasing abundance of *S. brevispinosa*, possibly indicating a gradually rising food flux. Although the isotope excursions are slightly more prominent at Walvis Ridge than at Shatsky Rise, the benthic fauna seems unaffected during the LDE at Walvis Ridge.