EGU23-8719, updated on 25 Feb 2024
https://doi.org/10.5194/egusphere-egu23-8719
EGU General Assembly 2023

Extraterrestrial 3He-based reconstruction of sedimentation rates across the Paleocene-Eocene transition at ODP Site 1209 (North Pacific)

Nicolas Pige[1], Guillaume Suan[1], Pierre Henri Blard[2], and Emanuela Mattioli[1]
[1]Laboratoire de Géologie de Lyon :Terre, Planète, Environnement, Université Claude Bernard Lyon 1, Villeurbanne, France (nicolas.pige@univ-lyon1.fr)
[2]Centre de Recherches Pétrographiques et Géochimiques, CNRS, Nancy, France

Numerous hyperthermal events have been documented through the Paleocene-Eocene transition. The best known hyperthermal event is the Paleocene-Eocene Thermal Maximum (PETM; around 56Ma), a period that led to surface and bottom water warming of about 5°C within a few millennia at tropical latitudes. It is therefore considered as one of the best analogues of current global warming. The PETM is also characterized by an abrupt 3-4 per mil negative $\delta^{13}C$ excursion in deep marine core sediments and by a thin clay-rich layer associated with the PETM onset, most often interpreted as carbonate dissolution due to the shoaling of the CCD. The duration represented by these clays and carbonates is of peculiar interest to constrain the exported carbonate production dynamics of surface ocean and its dissolution throughout the water column. This is key to produce realistic carbon budgets across hyperthermal events.

To this end, we generated a new 4 Ma (57.5-53.5) record of extraterrestrial ^{3}He-derived sedimentation rates from pelagic sediments recording at least 10 hyperthermal events at ODP Site 1209 (North Pacific). Our main results indicate that carbonate sedimentation dropped drastically during the PETM onset (minimum of 0.02 cm/ka) and recovered rapidly during the recovery phase of the event (around 0.7 cm/ka). Surprisingly, the sedimentation rate is low (0.3 cm/ka) after the recovery until the Eocene Thermal Maximum 2 (ETM2; around 54Ma). After this major event, the sedimentation rate increased abruptly (0.7 cm/ka) over the last 500 ka of the studied interval due to the overabundance of *Zygrhablithus bijugatus* a large rod-shaped nannofossil whose ecology is poorly understood yet.

Comparisons between the new record of extraterrestrial ^{3}He-derived sedimentation rate and dissolution proxies from this and previous studies lead us to challenge the widely accepted model previously proposed for hyperthermal events, which assumes that the $CaCO_3$ accumulation is mainly controlled by dissolution.