New estimation of Late Paleocene calcareous nannoplankton fluxes at ODP site 1209 (North Pacific)

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The early Paleogene was punctuated by several greenhouse gas-driven hyperthermal events, the best known being the Paleocene-Eocene Thermal Maximum (PETM; 56 Ma). Planktonic organisms have been severely impacted by the environmental changes induced by these abrupt events. Calcareous nannoplankton produce calcite shields using the dissolved carbon at the surface ocean, which constitute major component of deep-sea sediments. It is thus essential to produce highly resolved records of their production and burial across hyperthermals to better constrain their role in mitigating or amplifying ancient carbon cycle perturbations.

In this work, we present a quantitative assessment of the abundance of calcareous nannofossils and their fragments across a 1.2 Myr interval occurring earlier than the PETM at ODP site 1209 (Pacific Ocean). The quantification of nannofossil fragment size and shape allowed to re-calculate nannofossil absolute abundances. We have developed a new age model based upon extraterrestrial ^{3}He to reconstruct fluxes of the exported calcite particles throughout the water column. In parallel, dissolution has been reconstructed thanks to planktonic foraminifer fragmentation and sediment coarse fraction to disentangle the respective effects of production and dissolution on the nannofossil record.

Our main results challenge the widely accepted model previously developed for hyperthermal events, according to which $CaCO_3$ accumulation is mainly controlled by dissolution. Our results suggest that other parameters such as temperature, water stratification and nutrient availability exert a major influence on carbonate production, export and accumulation for most of the Late Paleocene hyperthermal events.