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Drivers of foraminiferal evolution and extinction in the deep sea

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This PhD research aims to increase understanding of the causes of global evolution and extinction in the deep sea. This is addressed by focusing on the enigmatic extinction of a distinctive group of cosmopolitan deep-sea benthic foraminifera during the late Pliocene-Middle Pleistocene “Last Global Extinction” (LGE) (3 – 0.12 Ma). This so-called “Extinction Group”, comprising nearly 100 species (c. 25% of deep-sea foraminiferal diversity at that time), all shared a similar morphology of elongate, cylindrical and uniserial tests with small, specialised apertures.

To find out what type of change could have been so all-encompassing to decimate and wipe out this abundant and cosmopolitan group of foraminifera, even precluding them to re-immigrate from refugia, we extend the studies back in time. The LGE was coeval with the pulsed expansion of the northern hemisphere ice cap, rendering deep-sea conditions colder and more oxygenated during increasingly severe glacials. The dominant hypothesis states that the extinct taxa and/or their food supply, both adapted to a Greenhouse World (65 - 33.5 Ma), were unable to cope with these large and rapid changes in the deep-sea environment. To test this proposition, we obtained a record of the occurrence and abundance of the “Extinction Group” species in ODP Sites 689 (Southern Ocean) and 1211 (North Pacific Ocean) throughout the Cenozoic, allowing the investigation of palaeoenvironmental drivers of abundance, extinctions and originations of species.