Uranium isotope constraints on ocean de-oxygenation during the PETM

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The Paleocene–Eocene Thermal Maxima (PETM) is one of the most studied global warming events in the geological record, and has contributed significantly to our understanding of the forcing and feedback mechanisms that control Earth's climate. It is widely recognized to have been driven by a large and rapid CO_2 emission, either from the destabilization of sedimentary carbon reservoirs, and/or through Large Igneous Province (LIP) volcanic activity. In addition to global warming, the environmental changes during the PETM contributed to ocean acidification, enhanced silicate weathering, increased primary productivity and oceanic de-oxygenation, with the net result of biotic extinction. These feedback processes are thought to have helped stabilize the climate system through CO_2 removal.

Much attention has been focused on the role the inorganic carbon cycle played as a CO_2 sequestration mechanism during the PETM. However, the importance of enhanced organic carbon burial in marine settings is increasingly being recognized. In particular, a more efficient biological pump and heightened organic carbon burial under anoxic conditions has been hypothesised to help explain the recovery trend of the carbon isotope record [1]. Here we attempt to constrain the role of increased organic carbon burial in climate recovery through reconstructing changes in the areal extent of seafloor anoxia during the PETM, using the uranium isotope paleo-redox tool ($\delta^{235/238}U$). Data are presented from well-studied pelagic carbonate sediments, in order to temporally link records of ocean pH, productivity and de-oxygenation, and provide a comparison of changes to the inorganic and organic marine carbon cycles.

[1] Gutjahr et al., (2017) *Nature* 548, 573–577