

Interrogating the trigger mechanisms for OAE1d using boron isotopes

GOWTHAM SEKAR¹, MARKUS ADLOFF¹, BRIAN HUBER², RICHARD D. PANCOST¹, FANNY MONTEIRO¹
AND MICHAEL J. HENEHAN¹

¹University of Bristol

²National Museum of Natural History, Smithsonian Institution

There is an increasingly pressing need – in light of current expansion of oxygen minimum zones – to understand Cretaceous Ocean Anoxic Events (OAEs) and the driving mechanisms behind them. Increased input of nutrients – particularly phosphorous (P) – due to volcanic CO₂ injection has been suggested as a key driver [1], with P regeneration from anoxic sediments sustaining them [2]. Intriguingly also, several Cretaceous OAEs are associated with a decline in either

the abundance, diversity or absolute flux of pelagic marine calcifiers [3, 4], which could affect the efficiency of the biological pump via reduction in CaCO₃ mineral ballast [5, 6]. Because the efficiency of the biological pump controls the position and intensity of oxygen minimum zones in the water column, there is the potential for loss of CaCO₃ ballast to drive changes in P remobilisation from anoxic sediments.

Here, we present new boron isotope data derived via MC-ICP-MS analysis of planktic and benthic foraminifera across OAE 1d, a relatively poorly-studied event, whose cause is unclear. Relative to other OAEs, there is less support for volcanic CO₂ as the main trigger, while possible changes in the

efficiency of the biological pump remain uninvestigated. Our new multispecies timeslices provide insights into surface pH and vertical water column pH gradients across OAE 1d, helping disentangle changes in atmospheric CO₂ and biological

pump efficiency across this enigmatic event.

[1] Monteiro *et al* (2012) *Paleoceanography*, **27**(4).

[2] Beil, S., *et al* (2020) *Clim. Past*, **16**(2), 757-782.

[3] Erba *et al* (2010) *Science*, **329**(5990), 428-432.

[4] Jones *et al* (2023) *Nature Geoscience*, **16**(2), 169-174.

[5] Ruebsam *et al* (2022) *Global and Planetary Change*, **217**, 103954.

[6] Henehan *et al* (2019) *Proceedings of the National Academy of Sciences*, **116**(45), 22500-22504.