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Reconstructing Late Cretaceous Atmospheric pCO_2 and Climate Sensitivity

BERNÁT HESZLER[1], ROSS WHITEFORD[2], CAITLYN WITKOWSKI[1], DAVID NAAFS[1], MARIA ROSE PETRIZZO[3], BRIAN HUBER[4] AND MICHAEL J. HENEHAN[1]

[1]University of Bristol
[2]Royal Holloway University of London
[3]University of Milan
[4]National Museum of Natural History, Smithsonian Institution

During the Late Cretaceous Earth experienced some of the warmest global temperatures of the Mesozoic and Cenozoic eras, alongside major changes in the carbon cycle that profoundly impacted climate dynamics and marine ecosystems. However, in the absence of tight constraints, our picture of how atmospheric CO_2 levels varied during this time remains uncertain. Understanding the role of CO_2 in driving extreme Cretaceous warmth, and the sensitivity of the climate system under such conditions, is vital in light of ongoing anthropogenic warming[1].

Here we present a new, multi-species planktic foraminiferal boron isotope ($\delta^{11}B$) record from the Albian to the Maastrichtian from low (DSDP Site 463) and high latitude (DSDP Site 511, ODP Site 762) sites, providing improved quantitative constraints on climate forcing from CO_2 throughout the Late Cretaceous. We combine the new $\delta^{11}B$ data with the marine $^{87}Sr/^{86}Sr$ record and geochemical modelling to explore possible $\delta^{11}Bsw$ evolution. We discuss the implications of this new record, as well as strategies to surmount remaining hurdles to deriving absolute Cretaceous atmospheric CO_2, namely the boron isotopic and major ion composition of Cretaceous seawater, vital effects in extinct foraminifera, and a second carbonate system parameter.

[1] Tierney, J. et al. (2020) *Science* 370 (6517):eaay3701.