The impact of the Cretaceous–Paleogene (K–Pg) mass extinction event on the global sulfur cycle: Evidence from Seymour Island, Antarctica

JAMES D. WITTS[1*], ROBERT J. NEWTON[2], BENJAMIN J.W. MILLS[2], PAUL B. WIGNALL[2], SIMON H. BOTTRELL[2], JOANNA L.O. HALL[2], JANE E. FRANCIS[3], J. ALISTAIR CRAME[3]

[1]Divison of Paleontology (Invertebrates), American Museum of Natural History, New York, NY, 10026, USA (correspondence: jwitts@amnh.org)
[2]School of Earth and Environment, University of Leeds, Leeds, LS2 9JT, UK
[3]British Antarctic Survey, High Cross, Madingley Road, Cambridge, CB3 0ET, UK

The Cretaceous–Paleogene (K–Pg) mass extinction event 66 million years ago led to large changes to the global carbon cycle, but effects on the global sulfur cycle are not well understood. We report new carbonate associated sulfate (CAS) sulfur isotope data from well-preserved fossil bivalves from an expanded high latitude Maastrichtian–Danian (69–65.5 Ma) succession (Seymour Island, Antarctica).

Primary data indicate a generally stable sulfur cycle during the latest Cretaceous. There is no evidence of the direct influence of Deccan volcanism on the seawater sulfate isotopic record, nor of a direct influence by the Chicxulub impact event.

A negative excursion in seawater $\delta^{34}S$ of 3–4‰ during the early Paleocene, suggests that a global decline in organic carbon burial also impacted the sulfur cycle via a significant (>15%) drop in pyrite burial and short-term increase in weathering. Recovery of the sulfur cycle to pre-extinction values occurs at the same time (~320 kyrs) as initial carbon cycle and biotic recovery. Box modelling suggests that to achieve these changes, concentrations of sulfate in the oceans must have been 2mM, lower than previous estimates for the K–Pg interval and an order of magnitude lower than today.