Goldschmidt 2025 Abstract
https://doi.org/10.7185/gold2025.30209

Serpukhovian mass extinction linked to interglacial warming and marine anoxia

JITAO CHEN[1], XIANGDONG WANG[2], TERRY ISSON[3], ZOÉ GIBERT[4], ISABEL P MONTAÑEZ[5] AND SHUZHONG SHEN[6]

[1]Nanjing Institute of Geology and Palaeontology, Chinese Academy of Sciences
[2]State Key Laboratory for Mineral Deposits Research, School of Earth Sciences and Engineering and Frontiers Science Center for Critical Earth Material Cycling, Nanjing University
[3]University of Waikato (Tauranga)
[4]Te Aka Mātuatua, University of Waikato
[5]University of California, Davis
[6]School of Earth Sciences and Engineering and Frontiers Science Center for Critical Earth Material Cycling, Nanjing University, Nanjing 210023, China

The mid-Carboniferous Serpukhovian ecological crisis ranks as the fifth-most severe mass extinction of the Phanerozoic. Although climatic cooling has been attributed as the chief driver, the kill mechanisms for this mass extinction remain uncertain, in part owing to its synchroneity with a widely developed unconformity linked to Gondwanan glaciation and the Central Pangean Orogeny. Here, we present continuous coupled carbon and uranium isotope records from a mid-Carboniferous (332–320 Ma) carbonate slope succession in South China spanning this event. Our records shed light on the evolution of global carbon-cycle dynamics and ocean-redox conditions during the Serpukhovian biocrisis. Both carbonate and organic $\delta^{13}C$ records show a negative excursion at 332–328 Ma, which is consistent with a similar negative excursion in both carbonate $\delta^{238}U$ and previously published conodont-based $\delta^{18}O$ records. These datasets collectively suggest an interval of global carbon-cycle perturbation coincident with warming and a shift toward more widespread seafloor anoxia (from a baseline of ~1% to >6%), associated with climatic warming in tropical regions from ~20 ºC to ~25 ºC. We find that warming and expanded oceanic anoxia coincided with a rapid decline in several benthic marine faunal clades, suggesting a causal linkage. Subsequent cooling and glaciation resulted in a large glacio-eustatic fall and a secondary pulse of oceanic deoxygenation, delaying marine ecosystem recovery during the Late Paleozoic Ice Age (LPIA).