Decoupled marine carbon-sulfur isotopes on the Yangtze Platform during the early to middle Smithian (Early Triassic) climate warming

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Marine ecosystem undergo prolonged recovery in the Early Triassic after the end-Permian mass extinction. Extreme climate changes was regarded as one of the main reason for the delayed recovery of maine organisms in the Early Triassic. Previous studies proposed reinvigorate oceanic circulation during the Smithian-Spathian boundary cooling event, among which upwelling of sulfidic seawater at the beginning of the event lead to the extintions of both conodont and ammonoid animals based on carbon-surfur isotope studies. However, our knowledges on the marine carbon-sulfur cycles in the continental margin during the climate warming period in the Early Triassic, which usually regarded as adverse factors for biological survival, is still lacking. Here, we studied two uppermost Dienerian to middle Smithian successions from the Yangtze Platform in South China, the Qiyueshan (carbonate platform facies) and Daxiakou sections (slope facies). High resolution carbon ($\delta^{13}C_{carb}$) and sulfur isotopes ($\delta^{34}S_{CAS}$) in both sections show coupled variations around the Dienerian-Smithian boundary (climate cooling interval: positive C-isotope excursion) and the middle Smithian (warm climate: long-term low values of C-isotope), while decoupled during the early to middle Smithian (climate warming interval: negative C-isotope exursion). The decoupled carbon-surfur isotopes suggests anomaly carbon-sulfur cycles at continental margin, which may contribute to the biodiversity loss of both conodonts and ammonoids during the climate warming period in the early to middle Smithian. The present study detailly described a specific event during the delayed recovery of marine organisms in the Early Triassic, which may deepen our understanding of the co-evolution of biology and environment after the end-Permian mass extinction.

Keywords: Carbon-sulfur isotopes; Climate warming, Early Triassic