Smithian-Spathian boundary event recorded in the Shitouzhai section, Guizhou, South China: carbon and sulfur isotopes and trace elemental analysis

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Earth life suffered a protracted recovery following the Permian-Triassic mass extinction (PTME) (Chen and Benton, 2012). The extremely slow recovery process was believed to have been caused, in part, by the continuous impacts of multiple biocrisis during the Early Triassic (Stanley, 2009), of which the Smithian-Spathian boundary (SSB) event is conspicuous and resulted in a severe loss in biodiversity of several clades such as conodonts and ammonoids. The SSB biocrisis therefore provides some insights into the cause of the profound recovery of ecosystems after the PTME. Here, we report the SSB event from a new Lower Triassic section in the Shitouzhai section of Ziyun, Guizhou Province, South China by a means of precise correlation of $\delta^{13}C_{carb}$ excursions and broad conodont biostratigraphic constraint. Like its counterpart in other SSB sections, a dramatic positive shift of $\delta^{13}C_{carb}$ excursion brackets the SSB in Shitouzhai. Such an extraordinary $\delta^{13}C_{carb}$ excursion, together with distinct vegetation turnover across the SSB indicated by microfloral changes and biomarker signals, has been interpreted as cooling of global climate from late Smithian hothouse regime (Galfetti, 2007; Sun *et al*., 2012). Climatic cooling is also indicated by a sharp decline in REE concentrations and CIA near the SSB, all of which indicate the decreased chemical weathering. Both $\delta^{13}C_{carb}$ and $\delta^{34}S_{CAS}$ excursions represent a constantly fluctuate but quite coupled recycling process which indicate a variable and unfriendly environment in late Smithian. Trace elemental analysis combining with age-depth model suggest that the study area once suffered a large flux decline across the SSB. All proxies indicate a climatic extreme and environmental stress in late Smithian, which prevented ecosystem's restoration. Oceanographic conditions were ameliorated in early Spathian.

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