Paired carbon isotopes study of the Early Triassic Smithian-Spathian boundary event

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Some of the largest Phanerozoic carbon isotopic excursions are recorded in Early Triassic sediments, deposited during the aftermath of the end-Permian mass extinction. Among them, a global Smithian negative carbonate carbon isotope ($\delta^{13}C_{carb}$) excursion has been identified, followed by an abrupt increase across the Smithian-Spathian boundary (~250.8 Myr ago). This chemostratigraphic evolution is associated with palaeontological evidence indicating a major collapse in terrestrial and marine ecosystems during the late Smithian. It is commonly assumed that Smithian-Spathian isotopic variations and biodiversity patterns are intimately linked through major perturbations of the exogenic carbon reservoir. We present paired carbon isotope measurements from peritidal to deep subtidal settings from the eastern Panthalassa Thaynes Group (Utah, southwestern USA). They allow us to evaluate the extent to which the observed isotopic perturbations reflect changes in the Early Triassic global carbon cycle and oceanic chemistry during the biotic recovery. The $\delta^{13}C_{carb}$ variations obtained here reproduce the previously observed Smithian $\delta^{13}C_{carb}$ negative excursion but we argue that these variations are better explained by authigenic carbonate formation during early diagenetic processes. The $\delta^{13}C$ signal of the bulk organic matter is however invariant across the Smithian-Spathian boundary. We therefore suggest that the observed $\delta^{13}C_{carb}$ signal does not reflect secular evolution of the exogenic carbon cycle during the Smithian-Spathian transition but changes in physico-chemical conditions at the sediment-water interface.