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Diagenetic overprint on negative δ^{13}C excursions across the Permian/Triassic boundary: A case study from Meishan section, China

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The Permian-Triassic carbonate succession that formed during the biggest mass extinction event in geological history has long been studied to examine the biomass extinction patterns and mechanisms. Such studies have shown that the stable inorganic carbon isotope displays a worldwide significant negative shift in the Permian/Triassic transitional period, which has generally been attributed to a synchronistic shift in δ^{13}C in the global carbon cycle. The assertion, however, is based on the assumption that the δ^{13}C signals recorded in the carbonate succession are primary in origin. In this study, the diagenetic features of Beds 24 to 62 from Meishan Section, China, which is the Global Stratotype Section and Point (GSSP) of the Permian-Triassic boundary, are examined to determine the negative shift in δ^{13}Ccarb across the Permian-Triassic mass extinction (PTME) is diagenetic in origin or not. Bed 24, the topmost unit of Changhsing Formation, is formed of skeletal packstones. Beds 25 to 62, belonging to Yinkeng Formation, are formed of either claystones, or mudstones and/or calcareous mudstones with dolomite being present. Petrographic data indicate that zoned dolomite crystals are widespread in early Triassic beds. Geochemical data including stable isotopic composition, minor and trace elements, and rare-earth elements indicate that the dolomite and coexisting calcite are formed in different depositional/diagenetic environment. The dramatically negative δ^{13}C excursions of calcite in Beds 26 and 28 are related to meteoric diagenesis, while the negative δ^{13}C excursions of calcite in dolomite-bearing beds are ascribed to enriched ^{12}C resulted from dolomitization mediated by sulfate reducing bacterial (SRB) in burial process. The results show that the δ^{13}C signals recorded in the global stratotype section that spans the PTB is not primary in origin. The synchronistic negative shift in δ^{13}C signals across the PTME are partly contributed by diagenesis.