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PROBING AN ATYPICAL SHURAM EXCURSION BY SIMS

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The globally-recorded Ediacaran Shuram Excursion (SE) represents the largest carbonate carbon isotope ($\delta^{13}C_{carb}$) negative anomaly in Earth's history. Typically, the SE is characterized by $\delta^{13}C_{carb}$ values that plunge to a nadir of ca. −10‰ over a short stratigraphic interval and then rise steadily in the overlying tens or hundreds of meters before recovering to baseline values of ca. +5‰. It was recently hypothesized that ^{13}C-depleted authigenic carbonates may have contributed to the SE. Supporting evidence for this hypothesis has been found in South China, where an atypical SE at Zhongling has been arguably correlated with the typical SE at Jiulongwan. Sedimentological and geochemical investigation of the Zhongling section finds several dolostone intervals with distinct methane-derived authigenic calcite nodules or cements ($\delta^{13}C_{carb}$ down to –37.2‰) in the upper Doushantuo Formation. Despite intensive studies of the Zhongling section, the origin of these authigenic carbonates and their causal link to the typical SE remain enigmatic. To better understand the genesis of these authigenic calcites, we conducted a detailed study via μXRF, CL, SEM, and SIMS. The SIMS data show a range of over 40‰ in $\delta^{13}C_{carb}$ (*in situ*, 7 mm spots) with negative values (from –37.5‰ to –9.3‰) in authigenic calcites and positive values (mostly from +0.2‰ to +4.0‰) in marine dolomites. Detailed μXRF, CL and SEM results reveal that the authigenic calcite phase displays dull luminescence and is more enriched in Sr compared with the dolomite phase. Based on multiple lines of field, petrographic, and geochemical evidence, we conclude that authigenic calcites in the upper Doushantuo Formation at Zhongling are syndepositional (during early diagenesis, before sediment compaction), and formed after the dissolution of preexisting dolomite. Microbial sulfate reduction and anaerobic oxidation of methane during marine authigenesis may have played a central role in generating the anomalous low-$\delta^{13}C_{carb}$ signals. The atypical SE at Zhongling, therefore, provides a unique window to studying the origin of the global SE.

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T108. Understanding the Neoproterozoic Earth-Life System (Posters)
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