



The earliest Cambrian record of animals and ocean geochemical change

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The earliest Cambrian is characterized by the diversification of skeletal animals and deep animal burrows, the first appearance of metazoan reefs, and some of the largest amplitude $\delta^{13}\text{C}$ variability in the Phanerozoic (comparable in amplitude even to Neoproterozoic excursions). The $\delta^{13}\text{C}$ oscillations form the backbone of many earliest Cambrian intra- and inter-continental correlations constructed to address questions about timing and geographic patterns in animal evolution. Furthermore, the $\delta^{13}\text{C}$ data has been used to model the behavior of the earliest Cambrian carbon cycle. However, recent challenges to the validity of carbon-isotope data from carbonate rocks as a primary record of the global inorganic carbon reservoir cast doubt on these correlations and carbon cycle models. We discuss sedimentological, U-Pb geochronological, and stable isotopic data from Morocco, Siberia, Mongolia and China to test competing models for the origin of earliest Cambrian $\delta^{13}\text{C}$ variability. In particular, we evaluate burial diagenesis and Holocene-Bahamas-style meteoric diagenesis models for negative $\delta^{13}\text{C}$ excursions, and compare early Cambrian $\delta^{13}\text{C}$ behavior to that in the Neoproterozoic and Cenozoic.