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Mass extinctions, recovery and resilience

A biomarker and compound specific isotope investigation into the end-Triassic extinction; implications for CIEs and extinction

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The end-Triassic mass extinction (ETE), driven by the large igneous province the Central Atlantic Magmatic Province (CAMP), is characterised by negative excursions in the organic carbon isotope record (CIEs). Because the leading hypothesis behind the CIEs is CAMP induced methane clathrate release, the precursor, initial, and main CIEs are used as chemostratigraphic markers to correlate globally dispersed sections during the ETE. One focal section to which many organic carbon isotope records are correlated too is St. Audrie's Bay in the SW UK. However, high-resolution biomarker and compound specific isotope investigations here implicates correlations and extinction. We find the precursor CIE is instead related to organic matter change, not CAMP activity. Similarly, there is strong evidence the initial CIE said to represent the ETE is instead related to the emergence of microbial mats containing purple and green-pigmented green sulfur bacteria. Here, the proposed extinction event and "dead zone" is simply explained by changes in salinity and water depth, well evidenced by brackish to freshwater organisms and sedimentary features. Better placement for the ETE in the SW UK is with return to fully marine conditions in overlying strata. Here, conodont, phytosaur, and bivalve extinctions are observed, above which a biocalcification crisis is evidenced by poorly preserved and decalcified shelly taxta with lack of ammonites and corals. During the biocalcification crisis strong evidence of anoxia and persistent photic zone exunia, a process important in other mass extinction events, in conjunction with acidification may better account for the ETE and lack of sedimentary carbonates.