

Comparison of the Upper Cretaceous Greenhorn Formation in Cores from the Denver-Julesburg Basin; Implications Ocean Anoxic Event 2 in the Western Interior Sea

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Abstracts

Despite considerable study of the Cenomanian-Turonian Boundary (93.9 ± 0.15 Ma) in North America, the timing of massive volcanic events and their relationship Ocean Anoxic Event 2 (or OAE 2) remains difficult to resolve. Beginning in the late Turonian, a severe, global environmental perturbation is expressed as an extreme, positive carbon isotopic excursion of $\delta^{13}\text{C} > 3 - 7\%$ VPDB. Widespread organic matter burial, development of marine anoxia, pronounced increases in sea surface temperature, elimination of many benthic foraminifera, and elevations in proxy pCO_2 concentration all occur within a few thousand years. These conditions persist into the early Turonian but are not uniform throughout the ~600 – 800 ka duration of OAE 2. A transitory cooling phase known as the Plenus Cold Event echoes cool conditions and more negative $\delta^{13}\text{C}$ values immediately prior to OAE 2. Critically, well studied sections, including the Global Boundary Stratotype Section and Point (GSSP) and the USGS Portland 1 core near Pueblo, CO suffer from depositional hiatuses during these initiation and early phases of OAE 2. This study assesses the depositional conditions and stratigraphic completeness of the Upper Cretaceous Greenhorn Formation from unpublished cores in the more distal Denver-Julesburg Basin. Core descriptions, aided by compositional, geochemical, and isotopic datasets, establish that the Greenhorn Formation is more complete in these more distal areas when correlated to existing proximal-distal transects of the Basin. Detailed study of more distal cores is therefore warranted to determine the contribution and timing of massive volcanism to the development of marine anoxia during OAE 2.

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