Thermal and Paleoceanographic Responses to OAE2 from Δ_{47} Geochemistry and a Refined Chronostratigraphy

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The Late Cretaceous Oceanic Anoxic Event 2 (OAE2) represents among the most severe disruptions of the Mesozoic carbon cycle, and potentially the thermal maximum of the past 100 Myr. Reconstructing the Earth system response to large igneous province (LIP) volcanism at the onset of OAE2 requires a finely resolved chronostratigraphic framework spanning the Cenomanian-Turonian boundary interval. We present an integrated stratigraphic record of OAE2 from a transect of cores in the Western Interior Basin (WIB) of North America, linking carbon and initial osmium (Os_i) isotope chemostratigraphy, astrochronology, macrofossil biostratigraphy, and relative sea level fluctuations. We anchor this chronostratigraphy with new $^{40}Ar/^{39}Ar$ incremental-heating dates of sanidine crystals in WIB bentonites measured using a high-sensitivity multi-collector mass spectrometer with sub-100 kyr analytical uncertainties. Refined temporal constraints on the unradiogenic Os_i excursion at the base of OAE2 indicate a rapid onset of LIP volcanism (<20 kyr) coeval with a shoaling of the marine calcite compensation depth, as indicated by a compilation of wgt. % carbonate data from ~30 marine sites globally.

Although detailed geochemical research to date has constrained the behavior of numerous marine elemental cycles during OAE2, the fundamental paleoclimate response to LIP volcanism and subsequent Earth system feedbacks remains poorly constrained. To quantify temperatures pre- and syn-OAE2 in the mid-latitude WIB, we present new carbonate clumped isotope data (Δ_{47}) from well preserved oyster macrofossils specimens (*Pycnodonte*). Preliminary temperatures are 30-35°C for this time period, warmer than other measured intervals of the Cretaceous. Initial results highlight the potential, as well as challenges, of reconstructing pre-Cenozoic thermal maxima and inferred super-greenhouse intervals from Δ_{47} measurements, and emphasizes the utility of macrofossils as robust paleoclimate archives of OAEs.