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Depositional Controls on Cretaceous Source Rocks: Insights from the Western Interior Seaway

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The mid-Cenomanian and Cenomanian-Turonian boundary intervals are marked by two globally recognized positive carbon isotope excursions (CIE) reflecting the widespread removal of ¹²C-enriched organic matter into marine sediments. The latter and most well-known event, termed Oceanic Anoxic Event 2 (OAE-2), is characterized by the development of anoxic/euxinic conditions at many locations worldwide. Depositional characteristics during the earlier perturbation in the global carbon cycle, termed the Mid Cenomanian Event (MCE), are less well-documented, but have been suggested to bear similarities to depositional regimes observed during OAE-2. The exact timing and trigger of these two global events as well as their regional and local expressions are still very much debated.

We studied the controls on the formation of Cenomanian-Turonian (Late Cretaceous) shelf deposits in Texas (USA). Samples from several continuously cored sections, representing the upper Buda Limestone, Lower and Upper Eagle Ford Formation and lower Austin Chalk, provide an up to 8 million year record of a proximal to distal depth transect through the Maverick intra-shelf Basin at the southern edge of the Western Interior Seaway.

Our multidisciplinary (geochemical, stratigraphical and sedimentological) data shows a basinal MCE marked by suboxic/anoxic conditions at its onset followed by anoxic-euxinic conditions at its maximum CIE, accompanied by increasing organic matter burial and good source-rock quality. In contrast, the entire OAE-2 in the Maverick Basin is marked by oxygenated conditions, with reduced organic matter burial and poor source-rock quality.

