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Environmental Reconstruction and Intercontinental Correlation of the Turonian Paleoclimate using Stable Isotope Records from the Mancos Shale

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The Cretaceous Western Interior Seaway (KWIS) was a large, shallow epicontinental sea during the Turonian (93.9 to 89.8 million years ago). This period is characterized by elevated sea surface temperatures (O'Brien et al., 2017), pCO_2 over 1000 ppm (Rothman, 2002), and an average sea-level of 250 m above the current level (Haq, 2014). Deposits within the KWIS, such as the Mancos Shale, also consist of kerogen-rich marine shale which has historically been of great economic interest (Broadhead, 2015). The connectedness of the KWIS meant that the epicontinetal sea may have experienced frequent storm events and recent advancements in clay deposition found that clay can be deposited in higher energy environments than previously thought (e.g., Schieber, 2016). This suggests that anoxic environments may be minimal in the KWIS.

We used multiple-parameter chemostratigraphy : $d^{13}C_{organic}$, $d^{13}C_{Carb}$, $D^{13}C$, $d^{18}O_{Carb}$ and $d^{15}N_{sediments}$ values, %carbonate, TOC, and C/N ratio, from a Turonian sedimentary core to reconstruct the environmental conditions during sediment deposition. The timing of deposition and age of chemostratigraphic data was constrained using $^{40}Ar/^{39}Ar$ dates, biostratigraphy, and correlations of our chemostratigraphic data with previously reported carbon isotope events (CIEs). The results of our data show that the favorable conditions during the Turonian encouraged paleoproductivity and marine dysoxia/anoxia which favored organic preservation. Understanding the paleoenvironment of the ultra-greenhouse Turonian can assist in providing more informed climate models of future climate change.

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