(both trace and body) will help us to understand the continental recovery from the ETE event.

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Technical Session 3: Terrestrial Ecosystems – Early Cretaceous (Saturday, June 10, 2023, 10:15 AM)

UPDATES ON THE CHRONOSTRATIGRAPHIC FRAMEWORK OF THE CEDAR MOUNTAIN FORMATION OF UTAH AND IMPLICATIONS FOR FAUNAL COMPARISONS AND THE CRETACEOUS TERRESTRIAL REVOLUTION

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The Lower Cretaceous of Utah preserves a multitude of dinosaur taxa, records the spread of angiosperms on the North American continent, along with the evolution of marsupial and eutherian mammals. Despite this importance, the timing of deposition of these rocks, unconformities within the record and depositional rates are poorly understood. Important fossil-bearing units as well as correlation of these units must be determined to understand climatic and tectonic controls on these biological events. Recent work from our group is clarifying the age distribution and depositional rates of the Cedar Mountain Formation of east-central Utah by using a combination of detrital zircon geochronology, C-isotope chemostratigraphy of bulk organic matter, and biostratigraphy. Here we present the first full C-isotope chemostratigraphic curve for the Cedar Mountain Formation (CMF) on the western end of the depositional belt and compare it to some of the ages and chemostratigraphy from other locations in the CMF.

Bulk organic C, carbonate C, and detrital zircon geochronology samples were taken from near Moore Cutoff Road (UT Hwy 803), approximately 25 km south of Castle Dale, Utah, within southwestern Emery County. Organic C samples were taken every 25 cm where possible and detrital zircon samples were taken at key stratigraphic intervals. A detailed measured section was taken from the top of the Morrison Formation to the base of the Naturita Sandstone. Members of the CMF described include the Yellow Cat, Ruby Ranch, Short Canyon Conglomerate, and Mussentuchit. Within the Yellow Cat Member, pre-excursion values are $\delta^{13}C \approx$ -26‰ VPDB, followed by a small negative C-isotope excursion (NCIE) of -2.5‰ magnitude at 6.5 m. This is followed by a double peaked positive C-isotope excursion (PCIE) that reaches a maximum of -22.8‰ at 9.7 m. C-isotopes values then decrease consistently from this point throughout the remainder of the Yellow Cat Member. A CA-ID-TIMS generated detrital zircon sample gives a weighted mean age of 126.45 ± 0.08 Ma sampled between 4.75 to 6.25 m at the base of the PCIE suggests the PCIE must be younger than 126.45 Ma. The Ruby Ranch Member preserves at least three PCIE. Background values start ∼ -24‰ and increase to -22.8‰ then decrease to pre-excursion values. The main PCIE expressed in the section ranges between 40 m above the Morrison Formation boundary to 60 m above the Morrison Formation boundary and is a double peaked PCIE with a magnitude of ∼ +5‰ to a maximum value of -19.3‰ and then decreases to a minimum of -26.0‰. A third, less extreme PCIE of magnitude +4‰ occurs starting at ∼ 60 m before decreasing in C-isotopic composition to ∼ -24‰. No C-isotope chemostratigraphic samples were taken from the cobble conglomerate lithology of the Short Canyon Conglomerate; however, a detrital zircon sample was taken from the medium to fine grain sands at the top of the member and resulted in a youngest maximum depositional age no older than 103.08 ± 0.05 Ma. The Mussentuchit Member has a background $\delta^{13}C_{org}$ value between -23 to -24‰ before a moderate PCIE occurs with a magnitude of ∼+4‰ between 8.5 and 10.75m above the Short Canyon Conglomerate with a maximum value of -19.98‰ and then rapidly decreases in C-isotopic composition to ∼ -25.5‰. The youngest aged ash zone for the Mussentuchit Member is 98.931 ± 0.054 Ma (Tucker et al., in press) suggesting that the majority of the Mussentuchit Member was deposited in the early Cenomanian.

Based on these values, the Yellow Cat Member at Moore Cutoff Road on the western side of the outcrop belt preserves the PCIE consistent with the OAE1a; a C-cycle perturbation caused by the eruption of the Ontong-Java large igneous province, which formed between 126 and 119 Ma. The Ruby Ranch Member preserves a sustained broad PCIE relative to underlying and overlying units that has been described as the C10 PCIE by (Bralower et al., 1999). This interval ranges in age between ∼117 Ma to ∼112 Ma. The addition of the 103.08 Ma maximum depositional age for the upper part of the Short Canyon Conglomerate suggests the Ruby Ranch Member here is mostly Late Aptian to Albian. Although the PCIE from the Mussentuchit Member is reminiscent of the mid-Cenomanian Event (96.4 – 95.8 Ma), newly described ash ages from Tucker et al (in press) suggests the Mussentuchit Member deposition ranges between 99.95 to 98.931 Ma (Cenomanian) suggesting the PCIE within our section is a local PCIE that is not related to global C-cycle perturbations, however, additional detrital zircon ages from within this section will test this. Overall, the Moore Cutoff Road section preserves a near-

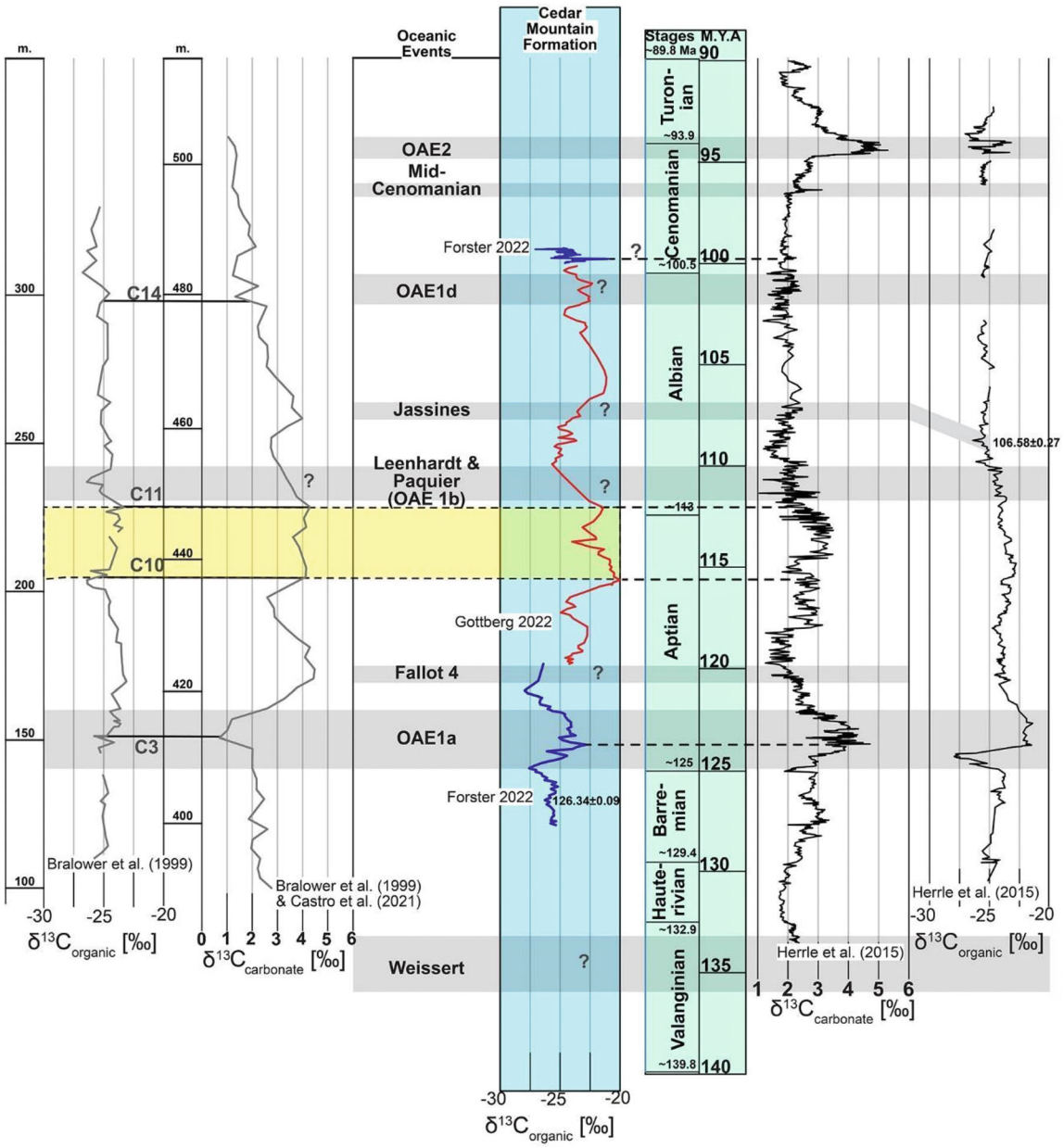

Figure 1. Comparison of C-isotope chemostratigraphic records along with known ocean anoxic events (OAEs) from the Cretaceous to the C-isotope record from the CMF at Moore Cutoff Road (UT-803). The CMF curve is fitted to the chemostratigraphic section and bounding conditions according to (Bralower et al., 1999) and compared to (Castro et al., 2021), (Herrle et al., 2015). All values are compared to VPDB

continuous depositional record (albeit with some unconformities) between a maximum of 126.45 Ma and a minimum of 98.931 Ma.

Relative to other studied sections of the CMF, one clear trend seems to occur. Ages for the Yellow Cat facies from the western part of the CMF outcrop belt preserve maximum depositional ages from detrital zircons, C-isotope chemostratigraphic ages, and magnetostratigraphy of Lower Aptian age (~126 Ma) while sections on the eastern edge of the outcrop belt (east of the Salt Valley Anticline) preserved maximum ages from detrital zircon, C-isotope chemostratigraphy, as well as biostratigraphy (pre-angiosperm pollen, ostracods and charophytes) much older than this, as old as Berriasian (145.0 – 139.4 Ma) (Joeckel et al., 2019; Martín-Closas et al., 2013; Sames et al., 2010). This has significant influence on the faunal assemblages' interpreted age distributions and interpreted faunal turnover. These age discrepancies may be related to differing tectonic control on depositional basins, with the Sevier Fold and Thrust Belt creating

depositional basins and source sediment in the west and salt tectonics controlling depositional basins in the east (Kirkland et al., 2016). Additional high resolution chronostratigraphic work will help us to correlate fauna from the CMF to each other as well as fauna from other units along the Western Interior Basin such as the Cloverly, Kootenai, and Blackleaf formations. This painstaking work is crucial to interpreting the climatic and tectonic controls on the Cretaceous terrestrial revolution, latitudinal faunal zones, and paleobiogeography.

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Theme Session: Global Perspectives on Mesozoic Lacustrine Ecosystems (Thursday, June 8, 2023, 3:30 PM)

A WINDOW TO THE EARLY CRETACEOUS NORTH AMERICAN CLIMATE AND ENVIRONMENT: THE 'LAKE CARPENTER' LACUSTRINE STRATA OF THE CEDAR MOUNTAIN FORMATION

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The Cedar Mountain Formation is thought to span a significant portion of the lower Cretaceous and the base of the upper Cretaceous (Valanginian to Cenomanian). As such, the Cedar Mountain Formation is important for understanding the transition of terrestrial ecosystems from those characterized by pre-angiosperm ecosystems of the Jurassic to the angiosperm-dominated ecosystems that characterized the height of dinosaur diversity in the later part of the Cretaceous. Lacustrine strata offer unique opportunities to shed light on environmental and climate conditions of the past. This study presents results from a multi-proxy study of lacustrine strata in the Cedar Mountain Formation termed "Lake Carpenter." The