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Stable versus chaotic eras in the early Eocene San Juan Basin, New Mexico

EMILY BEVERLY[1], ANDREW FLYNN[1], KRISTINE ZELLMAN[2], HENRY C FRICKE[3], THOMAS WILLIAMSON[4], KATHRYN SNELL[5], SAMANTHA BAKER[1], EMILY STIVISON[1] AND CARLY MCCARTHY[1]

[1]University of Houston
[2]United States Geological Survey
[3]Colorado College
[4]New Mexico Museum of Natural History & Science
[5]University of Colorado Boulder

Presenting Author: ejbeverly@uh.edu

The US has incurred billions of dollars in damage from extreme weather and climate disasters linked to anthropogenic climate change since the 1980s. However, studying modern landscape response to climate change is difficult due to the lag time of clastic sedimentation, and the need for more data from warmer climates under a range of pCO_2 levels to improve earth systems models and understanding of regional variability. The regional response is especially important in the western US, which is particularly sensitive to climate change due to high topography and sediment yield. Early Eocene carbon cycle perturbations and hyperthermal events provide an excellent deep-time analog for the predicted levels of warming and rapid increases in pCO_2. Previous work has tied early Eocene hyperthermal-driven hydrologic cycle intensification to increased erosion, deposition of large sand bodies, and large changes in plant and animal communities. However, most research has been done at mid-high latitudes, inhibiting our understanding of differential latitudinal landscape response to hyperthermal events. Here we present our ongoing work on the lower San José Formation in the San Juan Basin, New Mexico, USA, which preserves an extensive early Eocene terrestrial record and is an ideal location to study the effects of early Eocene climate change in mid-low latitude North America. New mammalian biostratigraphy and magnetostratigraphy constrain lower San José Formation deposition to the first ~3.5 Myr of the Eocene (C24r-C23r) during the early-middle Wasatchian North American Land Mammal Age. Paleosol-based paleoclimate proxies indicate rapid changes in temperature (>10°C; $T(\Delta_{47})$) and precipitation (>500 mm/yr; RF-MAP) coeval with physical landscape changes (e.g., soil color, horizonation). In addition, basin-wide, amalgamated fluvial channel bodies are likely tied to intensification of the hydrologic cycle during hyperthermal events similar to others found globally. Grain size and point counting of fluvial sandstones also indicate shifts in sediment source during these hyperthermal events. This ongoing work demonstrates that the San Juan Basin will expand our understanding of how global warming drives changes in monsoon intensity, extreme rainfall events, and landscape response in North America.