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Characterizing the Paleoclimate Conditions during the Mid-Maastrichtian and Late Maastrichtian Warming Events Using Paleosol Mineral Assemblages, Tornillo Basin, Texas

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Preceding the K/Pg Boundary are two rapid hyperthermal events that exhibit similar perturbations in pCO2 and temperature – the Mid-Maastrichtian Warming Event (MMWE) and the Late Maastrichtian Warming Event (LMWE). Both events have been well-established in the marine record using oxygen isotopic excursions in carbonates [1]. However, characterization of the MMWE and LMWE in the terrestrial environment remains limited [2]. It has long been debated whether these short punctuations in climate played a role in the Late Cretaceous mass extinction, with more recent evidence suggesting that the climate recovered before the meteorite impact occurred [3].

This study improves the environmental constraints for the MMWE and LMWE within the terrestrial record. To reconstruct the weathering intensity and provide insight into climate change during the Late Cretaceous, mineral assemblage data was collected from paleosols at the Dawson Creek section in Big Bend National Park, Texas. These results are compared to Mean Annual Precipitation (MAP) data derived from element paleosol-transfer functions[4] from the Dawson Creek section that highlight differing hydrological responses between the MMWE and LMWE. The MMWE is characterized by wetter conditions than the drier LMWE, and both recovered prior to the Late Cretaceous mass extinction. Climate sensitive minerals such as calcite, felspar, plagioclase, smectite, and kaolinite are expected to mirror the MAP responses indicating that these hyperthermals had opposite hydrological responses and recovered pre-extinction. This study offers insight into how the environment responds to rapid changes in climate, as well as refine our understanding to changes we might experience with anthropogenic climate change.

[1] Voigt, Gale, Jung & Jenkyns (2012), *Newsletters on Stratigraphy*

[2] Nordt, Atchley, & Dworkin (2003), *GSA Today*

[3] Hull et al. (2020) *Science*

[4] Stinchcomb et al. (2016) *American Journal of Science*