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Early Eocene cyclicity in BBCP drill cores, Wyoming: Orbital forcing and environmental response

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Most detailed stratigraphic records of early Paleogene hyperthermals come from deep-sea sediment sections with relatively few well-resolved continental stratigraphic records available. During the summer of 2011, over 900 meters of core were recovered in 6 holes drilled at 3 sites as part of the Bighorn Basin Coring Project (BBCP). The Bighorn Basin preserves a highly expanded early Paleogene continental sequence and includes an approximately 40-meter-thick PETM interval. Two of the BBCP sites (Basin Substation and Polecat Bench) target the PETM in different environments, and the third site (Gilmore Hill) targets the younger and smaller hyperthermals known as ETM2 and H2. The BBCP cores allow developing high-resolution (circa 1000-year) proxy records of climate change, carbon cycling, and biotic change from unweathered material to investigate the response of a terrestrial depositional and ecological system to extreme global warming events.
We present non-destructive X-ray fluorescence (XRF) scanning data combined with high-resolution core images for all the BBCP holes to test if statistically significant orbital cyclicity is present in the high resolution geochemical records, which is the first application of the methods intensively used for marine cores to continental cores. These data will be used to better characterize the overall geochemical composition of the sediments, investigate potential diagenetic alteration, and identify potential changes in sediment provenance. Integration of XRF data with available data from outcrops reveals profound changes in wet-dry cycle thickness due to changes in sedimentation rates. These changes might be related to warming induced changes in the hydrological cycle. Furthermore, the observed cyclicity in our records integrated with marine records will help to better constrain the duration and position of these hyperthermals in the astronomical time scale to further test the potential role of orbital variations in causing these events.