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Bighorn Basin Coring Project (BBCP): High-Resolution Continental Records of Early Paleogene Hyperthermals

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Hyperthermals like the Paleocene-Eocene Thermal Maximum (PETM) are transient global warming events associated with large negative carbon isotope excursions (CIEs) that may serve as analogs to present-day climate change. Determining the causes and effects of hyperthermals is important for understanding the long-term carbon cycle and its effects on other parts of the Earth system. Most detailed stratigraphic records of hyperthermals come from marine sediment cores (e.g. IODP) with relatively few well-resolved continental stratigraphic records available. The Bighorn Basin is an intermontane basin that formed during the Laramide orogeny and experienced rapid subsidence and aggradational fluvial deposition from the early Paleocene through the early Eocene (∼65–50 million years ago). It preserves the most complete early Paleogene continental sequence in the world and includes an approximately 40-meter-thick PETM interval

During the summer of 2011, over 900 meters of core were recovered as part of the Bighorn Basin Coring Project (BBCP). Two 6.2-cm diameter overlapping cores were drilled at each of three sites. Two of the 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 make it possible to develop 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. The coring localities are also distributed along a transect from the margin to the axis of the basin to compare the tectonic and depositional effects on the hyperthermal records. Down-hole logs, multi-sensor core logs (magnetic susceptibility and color reflectance), visual core descriptions, and preliminary isotopic samples will be evaluated, with special emphasis on correlation to previous studies from outcrop sections.