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Intensified hydrological cycle during the Early Eocene Climatic Optimum (EECO) recorded in the Xining Basin, NE Tibet

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The evolution of Asian climate during the Cenozoic is traditionally linked to shifts in paleogeography such as the proto-Paratethys Sea incursions and uplift of the Tibetan Plateau driving monsoonal circulation and affecting the mid-latitude westerlies in Central Asia. In contrast, the role of global climate in the Asian hydrological cycle remains unclear. Here, we present a new stratigraphic record from the terrestrial Xining Basin in central China, which covers the Early Eocene Climatic Optimum (EECO), a period characterized by long-term global warmth and elevated atmospheric CO_2 levels. The record is dated using magnetostratigraphy and extends the previously studied Paleogene strata down to 50.9 Ma (chron C23n). We use a variety of paleoclimate proxies, to derive the hydroclimatic evolution of the basin at this time. The lithostratigraphy is characterized by organic-rich mudrocks and gypsum beds (reaching TOC contents of up to 1.7%) interpreted as an alluvial mudflat to saline lake. The higher organic content of the strata indicates either increased organic productivity or preservation, both of which suggest a wetter depositional environment during the EECO. This is corroborated by palynological records showing a large increase in the abundance and diversity of trilete spores, indicating a wetter biome at this time. In addition, the $d^{13}C$ values of the bulk organic matter and leaf waxes (both C_{29} and C_{31}), suggest a reduction in water stress on plants and a wetter environment as well. These observations are in stark contrast to the arid red beds, evaporites and xerophytic pollen observed in the underlying Cretaceous-Paleocene strata and overlying middle-late Eocene deposits. The

peak global warmth of the EECO is thus clearly linked to an intensified Asian hydrological cycle suggesting a major driving role for global climate.