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Monsoons are the major source of moisture for NE Tibet but their dynamics remain poorly understood. To provide insight into their driving forces we focus on early monsoonal records during the transition from a greenhouse to an icehouse world, as a part of the ERC “MAGIC” project.
The continental mudrocks of the Xining Basin in NE Tibet provide a unique opportunity to study early monsoons because of their relatively continuous deposits from 40 to 15 Ma yielding reliable records of Earth’s magnetic reversals and observed astronomically-forced alternations of monsoonal moisture. This study specifically aims to extend the stratigraphy further back in time to examine cyclicity from the Early Eocene Climate Optimum (EECO) to the MECO.
Magnetostratigraphic analysis of three parallel sections near Xining shows three chrons that are correlated to C20, C21 and C22. The correlation is supported by U/Pb radiometric dating of zircons in a tuff (50.0 $\pm$ 1.1 Ma). The lithostratigraphy shows dry mudrocks alternating with wetter fluvio-lacustrine intervals in regular 10-12 meter cycles. These cycles could be paced by the 405 kyr eccentricity cyclicity according to the age model. XRF scanning of the record reveals three main geochemical components reflecting relative variations of carbonate (Ca), gypsum (S) and lithogenics (Ti). Spectral analysis on these components confirm the observed lithostratigraphic cycles and reveals higher frequency cycles in the carbonate/gypsum content of the muds. Towards the Late Eocene the lacustrine intervals become increasingly gypsiferous followed by the onset of obliquity cyclicity at the Middle Eocene Climatic Optimum (MECO) and up to the Eocene-Oligocene Transition (EOT). This suggests a shift in forcing mechanisms on the monsoons during the transition from greenhouse to icehouse conditions in the latest Eocene.