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Magnetic tracing of lost time in Cenozoic sediments: Testing dynamic topography of the Yellowstone plume, USA

Dieke Gerritsen, Stuart Gilder, Yi-Wei Chen, Michael Wack, and Alina Ludat

Ludwig-Maximilians-Universität München, Earth and Environmental Sciences, Munich, Germany (h.gerritsen@lmu.de)

Dynamic uplift may be expressed in the geologic record by the presence of unconformities, which represent periods of erosion and/or halted sedimentation. One distinct example, the early Miocene unconformity (EMU), formed shortly before the impingement of the Yellowstone plume in the northern Rocky Mountains. The most complete geologic record around this event is preserved in southwest Montana. There, we sampled eight sedimentary sections crossing the EMU. Our magnetostratigraphic study in combination with published radiometrically-dated ash layers determines the EMU ended at ~20.1 Ma and lasted up to 1.5 Myr. We found that the EMU is marked by an abrupt increase in magnetite concentration coincident with a shift in detrital zircon age spectra. These data indicate a rapid reorganization in sediment source likely caused by the emplacement of the Columbia River flood basalt synchronous with a shift in the North American drainage divide. The passage of the Yellowstone plume and/or the onset of Basin and Range extension likely provided the tectonic stimulus for the widespread unconformity and changes in sediment source.