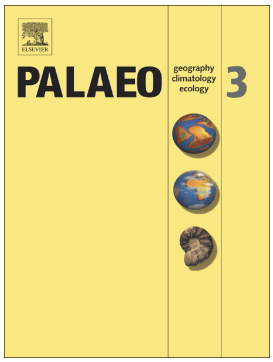

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Sedimentology, Stratigraphy, and Paleoclimate at the Late Miocene Coffee Ranch Fossil Site in the Texas Panhandle

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Abstract

The late Miocene Coffee Ranch fossil assemblage contains some of the earliest evidence of C_4 herbivory in North America. However, little is known regarding the environmental setting associated with the fauna, and a general lack of detailed paleoclimate data exists for the late Miocene from the North American continental interior. In this study, the sedimentary environments, stratigraphy, geochronology, and paleoclimate are interpreted for a series of outcrops of the late Miocene Ogallala Formation in the Texas Panhandle that includes the Coffee Ranch locality. Updated magnetostratigraphy coupled with previously published geochronology indicates that all exposed strata were deposited over a ~277 kyr interval within chron C3An.2n from ~6.42-6.70 Ma. Depositional environments include fluvial channels, floodplain ponds, floodplain paleosols, eolian paleosols, riverine tufa, and reworked volcanic ash. Trunk and tributary fluvial channels are differentiated using channel dimensions, sedimentary structures, and bounding surface architecture, and indicate seasonally-variable discharge. Paleosols from nine pedofacies are described and preserve a spectrum of weakly developed Entisols and weakly to moderately mature Inceptisols and Vertisols. Constitutive mass-balance calculations reveal that mature paleosols formed along distinct pedogenic pathways. Calcic Vertisols accumulated pedogenic carbonate and exhibited either net volumetric dilation or collapse as a result of