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Micro-Variability of Floodplain Paleosols in the Snyderville Shale Member, Oread Limestone Formation (Late Pennsylvanian), Southeast Kansas

Paleosols are good paleoclimatic indicators, but micro-variability caused by local bedrock lithology, topography, and hydrography may complicate climatic interpretation. We investigated the micro-variability of floodplain paleosols and their paleoclimatic implications. The paleosols occur in the Upper Pennsylvanian Snyderville Shale in Southeast Kansas. We studied 12 sections at a cm-scale on an outcrop 200 m long and 10 m thick. Siltstone-rich levee deposits dominate at the western and eastern parts of the outcrop, and floodplain mudstone in the middle part. Commonly, 3-4 paleosols stack upward from thin (50 cm) Protosol to thick (80-200 cm) Calcisol or Vertisol. The vertical change of soil type suggests increasing soil maturity and exposure following episodic deposition. Lateral variability is indicated by changes of type, thickness, and number of stacked paleosols from levee to floodplain areas. In the levee area, Protosols are thick (150 cm) and Calcisols are thin (50 cm) with cm-scale slickensides. In contrast, the floodplain Protosols are thin (50 cm), and thick (80-200 cm) Vertisols, rich in calcitic nodules, replace Calcisols. Some horizons are gleyed, suggesting an elevated groundwater table. Lateral and vertical variability of paleosols were influenced by topography and parent lithology from the high, siltstone-rich levee area of active sedimentation to the low, mudstone-rich floodplain. Combined with regional occurrence of Calcisols and Vertisols, we interpreted a semi-arid to subhumid paleoclimate with strong seasonal precipitation. This climatic interpretation, however, is enigmatic because the study area was located on the western coast of an epeiric sea near paleoequator.