Paleogeographic and Paleoclimatic Implications of Widespread Eolian Deposition in the Middle Permian of Oklahoma

Templet, Alisan C.[1]; Soreghan, Lynn [1] (1) School of Geology and Geophysics, University of Oklahoma, Edmond, OK.

The lower-middle El Reno Group (Guadalupian) in northwestern Oklahoma comprises the Flowerpot Shale and Blaine Formation, a succession of predominantly red mudstone long considered restricted marine deposits based on interbedded dolomite and gypsum in the Blaine Formation. The clastics form >75% of the section but have received little study, and are largely cast as distal deltaic deposits, although the positions of deltaic feeder systems and ultimate clastic source(s) remain enigmatic. We hypothesize that the Flowerpot Shale records continental deposition whereas the Blaine Formation preserves a restricted marine signal, but the clastics in both these units archive widespread eolian delivery.

In Blaine County, Oklahoma, the Flowerpot Shale composes >30 m of predominantly blocky, well-sorted, massive red-brown siltstone to mudstone. Laterally continuous clayey intervals, locally with nodular gypsum, reduction haloes and horizons, and a blocky ped structure occur. The Blaine Formation here is >22 m thick and consists predominantly of reddish-brown mudstone to shale with recurring “cycles” 2-5 m thick composed of red-brown to gray-green clayey and gypsiferous mudstone capped by thin (up to 15 cm) fenestral dolomite with abundant quartz silt and a thick (≤1 m) bed of laminar gypsum.

We hypothesize that the clastics in the Flowerpot Shale and Blaine Formation represents eolian deposition as evinced by the restricted grain size, occurrence of massive mudstone, and lack of fluvio-deltaic channels. Additionally, interbedded clay-rich horizons with local gypsum, reduction haloes, blocky ped structure and inferred root traces likely reflect pedogenesis. In contrast, the dolomite and gypsum within the Blaine Formation likely record restricted marine deposition, as inferred previously, albeit we are investigating alternative interpretations.

An eolian origin for the volumetrically significant clastics of the lower-middle El Reno Group reflects a marked change from previous interpretations and implies widespread delivery of eolian dust to this region and implies vigorous atmospheric circulation. The source(s) for the clastics remain problematic; possibilities include the Wichita uplift (Oklahoma) and the ancestral Rocky Mountains uplift farther west—we are currently investigating provenance using detrital zircon geochronology. Coeval, silt-rich strata exert a profound influence on reservoir geometry within, e.g., the Hugoton region of Kansas.