

Lithologic and Chemostratigraphic Evaluation of the Woodford Shale in the Western Arkoma and Eastern Anadarko Basins, Oklahoma

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ABSTRACT

Woodford Shale sections in the eastern Anadarko basin and western Arkoma basin were compared to test the hypothesis that Woodford sediments deposited in similar settings in the Oklahoma basin generated similar lithologies. Two Woodford intervals, one from Garvin County and the second from Coal County, which are separated by the Arbuckle Uplift where Woodford is absent, were described and analyzed for sedimentary, biogenic, structural and diagenetic features. X-ray diffraction and thin section petrography were used to establish bulk mineralogy, whereas x-ray fluorescence identified proxies for paleoredox conditions during deposition, allowed an estimation of bottom water chemistry, sediment influx, and frequency of disruption of water stratification. Correlating the two sections was not achieved with confidence. For example, the Anadarko Woodford is enriched in detrital proxies Ti, Zr and K in the upper section, whereas the Arkoma Woodford is enriched across the entire interval. The Anadarko Woodford is enriched in biogenic quartz across the entire interval, but enrichment is confined to the upper section of the Arkoma Woodford. Correlating lithofacies was not possible due to dissimilar wireline log signatures. The commonly used upper, middle and lower informal stratigraphic subdivisions of the Woodford are arguably inapplicable to these cores. However, reservoir facies in core correlated to wireline log signatures and cumulative reservoir thickness linked to well productivity. The lack of chemostratigraphic, lithologic, and electrofacies correlation between these two cores is attributed to localized depositional processes including upwelling and the influx of eolian or current driven sediment that affected lithology and bottom water chemistry.