Depositional Megacycles in the Woodford Trough of Central Oklahoma

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The Woodford Shale is one of several Devonian/Mississippian black shales that are currently being targeted for unconventional gas/oil exploration in North America. Previous studies have focused on the Woodford Shale in the Arkoma, Anadarko, and Ardmore basins, yet there is anomalously thick, organic-rich Woodford shale deposited on the central Oklahoma cratonic platform. This shale was deposited in intervals exceeding 300' thick. After compaction/dewatering, subsequent uplift and episode(s) of erosion, there still remains 200' of Woodford Shale with some areas exceeding 300' thick. This Woodford shale is highly organic, gas saturated, and correlative from the west Anadarko Basin, over the Cherokee platform, and east into the Arkoma Basin.

Megacycles within this Woodford shale package were mapped using compensated neutron/density logs and gamma ray logs from wells throughout McClain, Pottawatomie, and Cleveland counties. These cycles are highly correlative throughout the Woodford interval and provide insight into the timing of structural and stratigraphic features. Woodford deposition was not entirely independent of the underlying topography. However, preservation of the Woodford is largely dependent on the paleogeography of the shelf, the timing of faults, and structural movement. Large areas and volumes of Woodford shale were peneplaned off due to erosion, yet it was preserved in stratigraphic lows and downthrown fault blocks. Identifying and mapping these cycles is crucial when identifying: 1) depositional history, 2) timing of structures, 3) slump blocks and faults within the Woodford package which would not have been otherwise identifiable, 4) stratigraphic control of microfractures, 5) the best location for the placement of laterals, and 6) the best possible design for fracture treatment and stimulation of wells.