

Tracking Fine-Scale Stratigraphic Variations in the Woodford Shale, Anadarko Basin, West-Central Oklahoma

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Woodford Shale of the southern midcontinent was deposited in an epeiric sea, during a eustatic sea-level rise punctuated by a number of smaller scale transgressive-regressive cycles. Current study focuses on an area of thick Woodford accumulation in the northeastern part of the Anadarko basin where the formation is characterized by high gas deliverability. Information from visual inspection of whole core, laboratory measured petrophysical properties, and thin section analyses were integrated for this study. The overall dark color, high TOC, laminated nature of the Woodford Shale indicates dysoxic bottom water and restricted water circulation of the Woodford sea. Changes in the lithofacies, gamma-ray characteristics, mineralogy, relative abundances of biogenic silica, and fossils versus kerogen helped to identify individual depositional cycles in a semi-quantitative manner. Broadly, the lithofacies are classified as: (1) organic-rich mudrocks and (2) chert. Rock-eval analyses indicate kerogen type is similar in both the lithofacies. Organic matter is present as both amorphous organic matter and in the form of Tasmenities to a lesser extent. The mudrock facies has higher porosity, higher TOC, and larger pore throat diameters than the chert facies. Silica enrichment resulted from recrystallization of radiolarian ooze deposited during highest organic productivity possibly related to upwelling; such concentration of biogenic silica diluted the TOC concentration in this facies. Some of the silt-size detrital quartz perhaps was deposited as the distal ends of Bouma sequences. In conclusion, it can be stated that TOC content and mineralogy can be used in combination to understand the changes in depositional setting.