GEOLOGICALLY CONSTRAINED SEISMIC CHARACTERIZATION AND 3-D RESERVOIR MODELING OF MISSISSIPPIAN RESERVOIRS, NORTH-CENTRAL ANADARKO SHELF, OKLAHOMA

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Abstract

The onset of horizontal development and hydraulic fracturing in the current “Mississippi Lime” play has significantly increased its viability as a major unconventional play. However, geologic controls on reservoir distribution and productivity are still very elusive. Preliminary data from north-central Oklahoma show that the Mississippian interval is stratigraphically and structurally complex and lithologies and lithofacies vary significantly from relatively high-porosity tripolite and spiculitic limestone, to lower porosity chert, and unaltered, dense limestone fabrics.

The Mississippian carbonates of northern Oklahoma lie conformably above the Kinderhook and are unconformably truncated by the regional pre-Pennsylvanian unconformity. The Mississippian interval commonly consists of four, higher-order shallowing-upward cycles. Each cycle can be capped by an unconformable surface related to subaerial exposure associated with relative falls in sea level and regional tectonics which in turn has led to extensive diagenesis. The porous tripolitic chert most likely formed during periods of exposure and cycle development and while it is most common at the top of the Mississippian interval in various localities in north-central Oklahoama, additional cycles can be capped by high-porosity, low resistivity chert intervals. In zones that exhibit dense unaltered limestone, fractures can be important controls on reservoir production.

Mississippian lithologies described in core will be compared/calibrated to open-hole wireline logs from the same well and tied to seismic attributes. Three-dimensional lithology and petrophysical models constrained by well and seismic attributes will be generated. The models will be used to infer depositional and diagenetic trends specific to the study area.

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