THE SEDIMENTOLOGY AND STRATIGRAPHY OF SALT CREEK FIELD, KENT COUNTY, TEXAS

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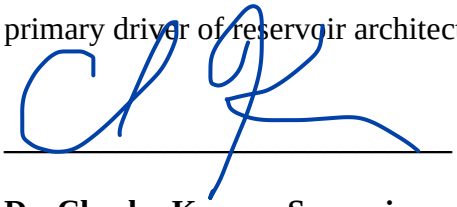
ABSTRACT

The Horseshoe Atoll of the Permian Basin is one of the largest hydrocarbon accumulations in the Permian Basin with a cumulative production of more than 2.7 Bbbl since 1948. This atoll is contemporaneous with the development of the Late Paleozoic Ice Age (LPIA), perhaps the best-known Phanerozoic phase of glaciation after the Pleistocene. The Pennsylvanian-Early Permian record of the Horseshoe Atoll is contemporaneous with peak Marathon-Ouachita orogenesis. A critical question for the understanding of the Horseshoe Atoll geologic framework is whether LPIA-associated glacioeustacy or Ouachita tectonics was the main driver for the development of the stratigraphic cyclicity and flow unit structure of the atoll.

Detailed stratigraphic analysis focused on the Salt Creek Unit, one of several separate buildups within the Atoll trend. A unique set of 40 cores (4 studied in detail in this thesis), a 3D reservoir model in Petrel with 3D seismic data and a log suite of >250 wireline logs allowed construction of a high-resolution flow-unit architecture and stratigraphic model. The reservoir is mid-late Pennsylvanian (Canyon-Cisco) in age and consists of 3 Canyon composite sequences and one Cisco composite sequence. Each composite sequence contains 3-6 high-frequency cycles marked by a sharp flooding surfaces and commonly well-developed subaerial exposure surfaces with differential cementation and paleosol development. Depositional facies include shale, crinoid-skeletal wackestone, crinoid and fusulinid-crinoid mud- and grain-dominated packstone, ooid-peloid grainstone, and a set of reefal facies dominated by phylloid algae forming buildup cores and lithoclastic-skeletal rudstone/breccia as flank beds.

Extensive paleosol development and dramatic vertical and lateral facies offsets across individual cycles support the contention that high-amplitude, high-frequency glacioeustacy is the primary driver of reservoir architecture.



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