

## **Low Temperature Hydrothermal Fluids in Relation to Gas Production in the Cherokee Basin**

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### **ABSTRACT**

The thin Desmoinesian and Atokan age (Pennsylvanian) coals of the Cherokee Basin, Mid-Continent USA have been gas productive since the 1920s from less than 500 meters. The Cherokee Basin has also been very prolific for oil and conventional gas production at less than 800 meters even though the maximum thickness of the Paleozoic strata has not exceed 2,300 meters and at present is less than 1,300 meters thick. Reflectance data indicates the major carbonaceous mudstones and coals in the basin are well in the oil window. The coals are high volatile A to medium volatile rank, less than 0.6 meters thick, cleats contain base metals, sulfur (5% to 11% sulfur), lower vitrinite content than equivalent age coals in adjacent basin. Several of these adjacent basins are not gas charged in the coals. Therefore another mechanism for thermal maturation of and gas generation from the coals other than depth of burial has been identified. The basin itself lies over the paleo east-west trending Chautauqua Arch of Devonian and Silurian age. Compression of the Ouachita-Marathon Orogeny in Late Pennsylvanian and Permian time to the south forced low temperature hydrothermal fluids to migrate via Cambrian and Ordovician carrier beds through the Cherokee Basin. The Chautauqua Arch is defined by a thin of Pre-Pennsylvanian rocks that as the fluids migrated through allowed the transfer of heat to the coals. The presence of faulting and fracture systems allowed the fluids to migrate in the Pennsylvanian rocks. The center of the Cherokee Basin has prolifically produced coal gas as well as select localized Paleozoic thin areas related to local wrench faulting, localized structural closures and intrusions. The low temperature hydrothermal fluids also deposited zinc into Mississippian carbonates in the Tri-State Mining District in southwest Missouri, several other minor MVT deposits in Kansas and deposition of base metal sulfide mineralization on the cleats of coals. Interestingly only coals with high sulfur content contain are gas productive and lower sulfur coals between these productive coals are non-gas productive. This presentation will go through the sequence of events and data that supports the low temperature fluids as source of maturation of and gas generation for the coals in the Cherokee Basin.