

Paleozoic Source Rocks and Thermal History of the Denver Basin, Western Mid-Continent Region USA

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ABSTRACT

Recent drilling in Denver Basin has resulted in several new fields that produce from certain Paleozoic reservoirs. The Denver Basin is an asymmetric foreland basin with a north-south configuration that is up against the ancestral and present day Rocky Mountains. The Transcontinental Arch crosses through the center of the basin, south of the arch is the Pennsylvanian depo center for Denver Basin. They contain several thin highly organic carbonaceous mudstones within the Morrow to Marmaton formations. Pennsylvanian strata on and to the north of the Transcontinental Arch in the Denver Basin, production is from Permian reservoirs and almost all of the thin Pennsylvanian source rocks have disappeared. Prior to 2012 the source identity of petroleum found in the prolific Mississippian and Morrowan reservoirs had not been identified. Many authors assumed oil migrated from the deep Anadarko Basin into the Denver Basin. The Las Animas Arch, a northeast trending positive structural feature on the southeastern part of the Denver Basin make this unlikely. This feature was present during deposition of Paleozoic sediment and a barrier during times of expulsion and migration from the Anadarko Basin. The petroleum in accumulations west of the Las Animas Arch contain petroleum in reservoirs based on geochemistry that are not derived locally. The Cherokee and Marmaton formation reservoirs contain oil that is derived from marine carbonaceous shales and limestones present in the Cherokee strata. The Atokan rocks have generated oil which are lacustrine or terrestrial in nature. Recent drilling has identified Ordovician source rocks in Elbert County, Colorado close to the basin center that are not find elsewhere in the basin to date. The Pennsylvanian basin center, located on the southern end of the basin, has been thought by some researchers to be the area of petroleum maturation and expulsion but there is no evidence for this. Many of the Pennsylvanian carbonaceous shales in this area are less organic, contain more coarsely clastic material and there is a lack of oil shows or accumulations in this area. Discussed here will be the recent data that is available that suggests that oils in Paleozoic reservoirs were thermally altered and expelled from Morrowan, Atoka and Cherokee carbonaceous mudstones in the area of the present day basin center.