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Reservoir Characterization of the Utica Shale Play within Columbiana County, Ohio, Using Well Logs, Rock Mechanics, and Geochemical Data

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ABSTRACT

The Ordovician Utica Shale play is a rapidly developing play extending throughout the Appalachian Basin. The play is a mixed carbonate-siliciclastic system that grades from primarily carbonates at its base in the Lexington/Trenton limestones into primarily shale within the Utica Shale. As of January 2021, it is the third highest producing dry shale gas play in the contiguous U.S., although it is known to produce wet gas and oil in various parts of the basin. In addition to being an unconventional reservoir, the Utica Shale is a known source rock for much of the Paleozoic strata across the Appalachian Basin, including multiple lower Paleozoic sandstone and carbonate units in the region. Although some data are available on this play, models that scale from well site through basin are not publicly available.

The objective of this research was the production of a model capable of reflecting the geology and geochemistry across Columbiana County, OH, as a part of a larger effort to create a scalable model that will encompass the entire Utica Shale Play. Here, data are relatively abundant, hydrocarbons transition from wet gas to oil production, and a TOC sweet spot exists. Well logs, rock mechanic data (permeability, porosity, Poisson Ratio and Young's Modulus), and geochemical (mineralogy, TOC, and thermal maturity) data were utilized in the creation of a model in DecisionSpace software from Landmark. The Schmoker and Hester method was utilized to estimate TOC from the readily available well logs, calibrated from the little core data. This model furthers what is known of the Utica Shale play in the study area by not only assisting with future hydrocarbon exploration and optimizing production, but also reflects the relationship between lithology, eustatic sea level changes, prevalence of organic material, and basin subsidence in the area.

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