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The Ostracod Fm. in Alberta's Deep Basin: applying petroleum system fundamentals to identify an underexplored lacustrine basin

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Summary

Hydrocarbons produced from the Cretaceous Mannville Formation of West-Central Alberta's Deep Basin vary significantly in terms of their liquid yield and geochemical character. As natural gas prices have become more challenged in recent years, the pursuit of increasing liquid yields prompted a geochemical review of the sources and migration pathways within the Mannville Fm.

The highest liquid yields from Mannville production adjacent the Pembina Jurassic Paleo-Uplands is shown to come from sediments straddling the Pre-Cretaceous unconformity. Biomarker analysis was conducted on these oils, yielding two distinct geochemical signatures: the first a Jurassic-aged oil from a marine shale; the other a Cretaceous-aged oil with a lacustrine character.

Thermal maturities of this lacustrine oil, as determined through GCMS/MS analysis, differ to varying degrees from that of its respective adjacent source rocks as determined through pyrolysis. The implied migration from further down-dip was confirmed through a comprehensive hydrodynamic analysis, leading to the recognition of depositional corridors feeding a lacustrine basin.

Hydrocarbon extracts from core collected during the drilling of a vertical stratigraphic well within this lacustrine basin, as well as the analysis of oil produced from an adjacent horizontal well, confirm this lacustrine model, and advance our understanding of the potential of a lacustrine hybrid resource play in the Deep Basin of West-Central Alberta.