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Sequence Stratigraphic Architecture and Reservoir Characterization of the Lower Triassic Montney Formation, NE British Columbia

Greg M, Baniak[1], Thomas F. Moslow[1,2], Stavros Michailides[1], and Matthew G. Adams[3]

1: Petronas Canada

2: Moslow Geoscience Consulting Ltd.

3: University of Toronto

Summary

Herein, we present an example from the Lower Triassic Montney Formation showing the benefit of applying high-resolution sequence stratigraphy to optimize drilling and associated fluid recovery in unconventional shale reservoirs. Through stratigraphic analysis, we are able to show the impact of depositional facies and petrophysical parameters within time-equivalent units on reservoir quality and associated fluid recovery. From this, the wider implications of stratigraphic analysis in unconventional reservoirs will be addressed as well.

Methods

Using geophysical well-logs, ~ 4000 m of subsurface core, and conodont biostratigraphy, we evaluated the Montney Formation in NE British Columbia (Figure 1) with the aim of correlating time-equivalent stratigraphic parasequences. The stratigraphy is calibrated using chronostratigraphic, lithostratigraphic, and sequence stratigraphic methods. Chronostratigraphic work is based on conodonts and lithostratigraphic work is based on core descriptions. Sequence stratigraphic work is derived from published literature in an attempt to provide a global correlation to sea level history and major globally recognized unconformities (Baniak et al, in press).

Results

The Montney Formation can be subdivided into three 3rd order sequences that correlate directly with Lower Triassic substages (Griesbachian-Dienerian, Smithian, and Spathian). The Griesbachian-Dienerian reflects a retrogradational to aggradational set of distal ramp parasequences while the Smithian is comprised of prograding mixed clastic-carbonate ramp parasequences. The Spathian has two distinct stratigraphic successions. The lower unit is deposited in a distal offshore transition to offshore setting while the upper unit is an offlapping set of siliciclastic shoreface parasequence sets.

From this work, we are able to show multiple examples of previously drilled horizontal production wells that are landed in multiple stratigraphic horizons. Among others, this shows the inherent difficulty with doing proper reservoir performance prediction and type curve analysis within shale unconventional reservoirs without proper stratigraphic calibration and mapping. Additionally, we are able to broadly observe a correlation of sedimentological parameters (e.g., bedded carbonates) within production results, thereby reinforcing the necessity for correlating time-equivalent units to optimize future drilling.

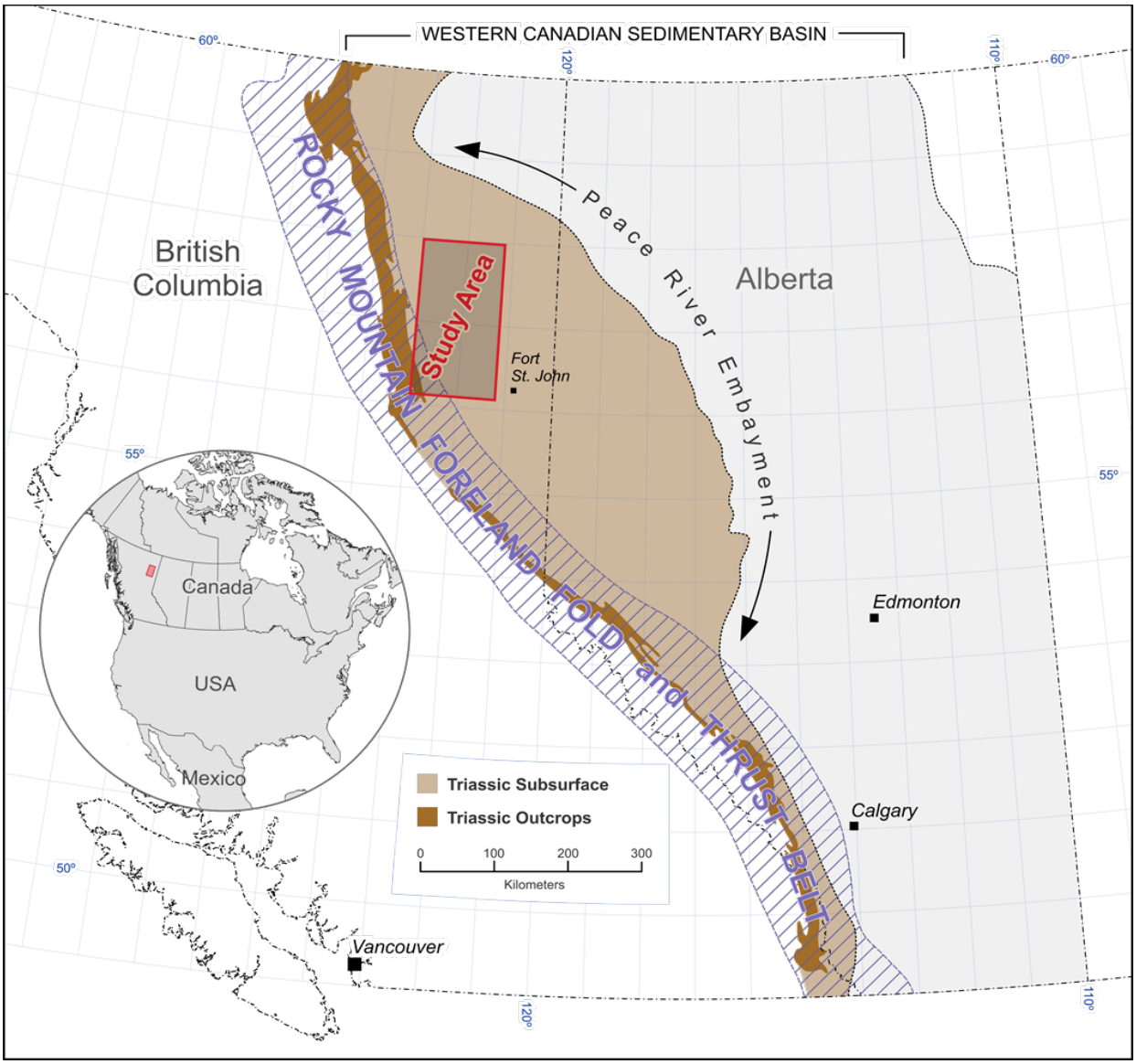

Figure 1: Location map of the Triassic Montney Formation is western Canada. The focus of the study presented herein is located in northeastern British Columbia.

Novel/Additive Information

Through this work, we are able to show multiple examples of value added. Among others, these include more thorough evaluation of stratigraphic landing depths across all previously drilled horizontal wells. From this, a better understanding of production rates and associated recovery factors can be determined by comparing time-equivalent geological parameters across the same stratigraphic interval. Lastly, optimization of future pad locations can be made that incorporate both the updated type curves and stratigraphic complexities present.

Acknowledgements

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References

Baniak, G.M., Moslow, T.F., Michailides, S., and Adams, M.G., in press, Sequence stratigraphic architecture of the Lower Triassic Montney Formation, NE British Columbia, Canada: AAPG Bulletin.