Quantitative 1-D Basin Modelling And Potential Source Rocks Analysis In Trutch Map Area And Adjacent Plains, Northeastern British Columbia And Northwestern Alberta

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ABSTRACT

Quantitative 1-D burial and thermal history modelling (also referred to as basin modelling) is widely used to examine the history of oil and/or gas generation in a basin. Such models can also be extrapolated to regions with sparse data to aid in prediction of hydrocarbon potential. These models are also useful for determining temperature histories of reservoir zones.

This study applies quantitative 1-D basin modelling methods to the Paleozoic to Mesozoic stratigraphic section in the area bounded by 57º-58ºN and 118º-124ºW in northeastern B.C. and northwestern Alberta. Thermal and burial history of several wells within the study area are reconstructed by using Platte River BasinMod 1-D© Version 7.06. The thermal maturity and the temperature trends across the study area are constrained from vitrinite reflectance and Rock Eval Tmax data measured from Devonian to Upper Cretaceous strata, as well as from bottom hole temperature data from the wells.

Geochemical parameters for 7 potential hydrocarbon source rock units namely, the Exshaw Formation, Montney Formation, “Phosphate Zone” of the Doig Formation, the Baldonnel and Pardonet formations, the Gordondale Member, and the Wilrich Shale, have been determined by Rock-Eval 6/TOC analysis, and these parameters are used in the models to construct thermal maturity windows for these units in the study area. The maturity increases from east to west, with most of the source rocks presently in the oil window in the Beatton River Map area (94H). Further west, source rocks are presently late mature to overmature, and the 1-D models are used to indicate the onset of hydrocarbon generation in these westernmost, undeformed regions. Thermal anomalies associated with the Hay River Fault Zone indicate that hydrocarbon generation likely occurred earlier from strata overlying this basement feature, relative to adjacent regions.

This study illustrates the utility of incorporating 1-D basin modelling to studies requiring an understanding of the timing of hydrocarbon generation, the nature of generated hydrocarbons (i.e. oil vs. gas), and the temperature history of the stratigraphic package, all of which aid in constraining the geologic history of a sedimentary basin.