

Constraining the Timing of Maturation and Type of Hydrocarbon Generated in the Bowser Basin, BC Using 1D Petroleum Systems Modeling

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Abstract

The Bowser Basin (65,000km²) in the interior of British Columbia, Canada, overlies Paleozoic, Triassic and lower Jurassic volcanic and sedimentary rocks. It is one of many intermontane basins within the Canadian Cordillera and comprises up to 6000m of Jura-Cretaceous clastic sediments belonging to the Bowser Lake and Skeena groups. Bowser Basin and underlying rocks are involved in the northeast-verging Cretaceous Skeena Fold Belt. Metamorphic grade in Bowser Basin is low relative to the bounding Omineca and Coast Belt with large areas being in the oil and gas window.

Three effective petroleum systems, that have generated, expelled, and accumulated hydrocarbons are known to exist. Hydrocarbon shows in the form of stains and inclusions are found throughout the basin. Petroleum systems are fed by marine pre-Jurassic (Stikine assemblage), marine Mesozoic (upper Hazleton/lower Bowser Lake Group), and lacustrine Mesozoic (Bowser Lake Group) sources.

While multi-dimensional models require data mostly unavailable in frontier areas, sufficient information for one-dimensional (1D) models often exists and such models contribute tremendously to the general understanding of maturation processes. Multiple 1D Petroleum Systems Modelling based on existing geologic, geophysical and geochemical information enables us to constrain the burial and maturation history of Bowser Basin source rocks. Calibration to present day vitrinite reflectance (%R_o) and apatite fission track data reveals timing of source rock maturation and hydrocarbon generation. This helps identify lateral variations in the palaeo thermal regime and will ultimately have implications for further exploration.