

Sterane Compositional Traits of Bowser and Sustut Basin Crude Oils: Indications for Three Effective Petroleum Systems

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ABSTRACT

Crude oils extracted from Bowser Lake and Sustut groups have distinctive compositions that are inferred to be indicative of at least three effective petroleum systems that have generated, expelled and accumulated crude oil. Compositional differences among the three effective petroleum systems are illustrated by compositional variations of steranes, complicated molecules that have retained structural similarities to their inferred biological precursor, cholesterol. Oil stains occur widely, both geographically and stratigraphically. One compositional oil family is inferred to be derived from Stikine assemblage, the sub-Hazelton succession. This petroleum is derived from pre-Jurassic marine carbonate source rocks deposited in hypersaline to mesohaline environments. A second compositional oil family is derived from Mesozoic open marine source rocks, that are inferred to be within the upper Hazelton or lower Bowser Lake Group, as the lowest stratigraphic occurrence of these oils lies in marine slope deposits of Bowser clastic wedge. A third oil family is inferred to be derived from lacustrine Mesozoic source rocks occurs in northern Bowser and Sustut Basins, where it is probably derived from thick, often coaly, non-marine Bowser Lake successions. The occurrence and composition of these crude oils expand the petroleum prospectivity of the Bowser and Sustut basins by reducing petroleum system risks and indicating a possible petroleum system for Hazelton Group, which is now attributed petroleum potential.