

## Geochemical Signatures of Doig Sourced Hydrocarbons: Can Doig Phosphate Source Rock Generate Two Different Types of Oils?

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### Introduction

Doig phosphate is a well-known source rock for the Triassic petroleum system and was believed to be the source of most hydrocarbons in Triassic reservoirs (Riediger et al, 1990; Allan and Creaney, 1991; Ejezie, 2007). Two types of hydrocarbons with distinct geochemical signatures were considered to be sourced from this source rock. The first type of hydrocarbons have a moderate C<sub>24</sub> tetracyclic terpane over C<sub>26</sub> tricyclic terpane ratio, high abundances of hopanes and a low C<sub>35</sub> homohopane index. The second type of hydrocarbons show abundant extended tricyclic terpanes, extremely lower C<sub>24</sub> tetracyclic terpane over C<sub>26</sub> tricyclic terpane ratio and depletion of almost all hopanes. Previous study attributed the observed differences in geochemical signatures to “sporadic salinity enhancements” during the deposition of the Doig Formation (Allan and Creaney, 1991). This study examines the geochemical characteristics and spatial distributions of the two different types of hydrocarbons to investigate their origins and the impact of oil migration on the occurrences of these hydrocarbons in the Doig Formation.

### Method

GC-MS of the Doig extracts from 14 core samples were analyzed to determine the geographic distribution of different hydrocarbons in the study area. Additional 9 rock extracts in well 11-3-73-7W6 were used to examine the variation of geochemical signature in a profile-view. Three samples of Doig Formation in the same well were subject to organic petrology analysis to examine composition characteristics of the organic matter, thermal maturity and lithology. GC-MS analyses from Montney core extracts were subsequently compared with those from the Doig Formation to study the possible origin of the hydrocarbons.

### Results and Observations

The second type of hydrocarbons in Doig Formation exist in only two isolated wells, including well 11-3-73-7W6. The organic petrology data show that the dispersed organic matters (DOM) in well 11-3-73-7W6 are constituted almost entirely of pore filling solid bitumen. The absence of classifiable structured organic macerals in these Doig samples suggests that the DOM are not indigenous, but likely migrated from the underlying Montney source rock in deep basin. It is our inference that the Doig phosphate source rock generates predominantly the first type of hydrocarbons and the second type hydrocarbons in the phosphate interval are likely a result of upward migration of Montney sourced hydrocarbons.

### References

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