

# **Spatial Characteristics of Middle Devonian Oils and Non-associated Gases in the Rainbow area, northwest Alberta**

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## **ABSTRACT**

Previous studies indicate that the Middle Devonian of the Rainbow sub-basin is a closed petroleum system with the Muskeg evaporite acting as the regional seal. To study the spatial and compositional characteristics of the oil and gas in this area, multivariate statistical methods were used to study the geochemical signatures of a suite of Middle Devonian oils and analyze the geographic dependency of the non-associated gas occurrence in the sub-basin. The results indicate that these oils can be subdivided stratigraphically and spatially into two genetic groups. Separate source rock intervals were the probable cause for the stratigraphic division of the oils. There are indications that reactivation of basement faults may have resulted in different evaporitic settings in this area, with the water depth relative shallower in the northeast than in the southwest. Rapid variation in the sedimentary facies, both laterally and vertically, appears to have provided ideal setting for localized oil generation, migration and entrapment with accumulated oils displaying highly variable and distinctive geochemical signatures. Geographic dependency of the non-associated gases, spatial variation of pool size and reservoir characteristics suggest that crossing formational migration of hydrocarbon may have occurred via major fracture systems. The findings in this study may provide useful clues for future oil and gas hunting in this and adjacent relatively unexplored regions.