

Bakken-derived Oils Beyond the Bakken Formation in the Canadian Williston Basin

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There have been two different definitions of the Upper Devonian - Mississippian Bakken / Madison petroleum systems in the Canadian Williston Basin. Early studies proposed the Bakken shales as the source for oils in both Bakken Formation and Madison Group reservoirs. More recent studies suggested two separate sources for these oils. Thus, large oil reserves were correlated to the Lodgepole carbonates with limited source potential, whereas only small amounts of oil were related to the Bakken shale that has the greatest source potential in the basin. Various hypotheses have been proposed to explain the disproportionately large amounts of the unaccountable Bakken-derived oils. Recent work at GSC-Calgary utilized quantitative results of molecular markers across gasoline-range light hydrocarbons, saturated and aromatic hydrocarbon fractions in 122 oil samples to re-evaluate the oil/oil and oil/source relationships. The steroid and hopanoid parameters collected in this study have confirmed the diagnostic features for end-member Bakken and Lodgepole sources, whereas a range of other molecular markers revealed compositional continuums occurring between the two family oils. The recognition of more extensive mixing of Bakken-derived oils in Madison Group reservoirs indicates focused migration pathways for Bakken oils along a SW-NE Torquay-Rocanville trend in southeastern Saskatchewan and thus significant amounts of the "missing" Bakken oils accumulated in the Madison Group and overlying Mesozoic reservoirs. Evidence for potential new oil plays will be presented in this talk.