

Origin and Inferred Migration Fairways of Oils in Jurassic to Lower Cretaceous Reservoirs in Southern Alberta and Northern Montana

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Organic geochemical signatures of oils from Jurassic to Lower Cretaceous reservoirs in southern Alberta and northern Montana reveal the presence of two distinct oil families. Family E oils (API <25°; S>2.0 wt %) were derived from the Exshaw Formation, whereas better quality oils in oil family M (API >37°; S = 0.7 to 1.4 wt %) are tentatively correlated to shales within the overlying Banff Formation. These source rocks are mature in the Alberta-Montana Trough, and quantitative basin modeling studies in that area suggests that petroleum generation occurred in latest Cretaceous to early Tertiary time. Cross-formational flow of family E and M oils into Jurassic to Lower Cretaceous reservoirs likely occurred via NW-SE trending normal and re-activated high angle reverse faults, and by incision of Cretaceous channels into older Jurassic and Mississippian carrier beds. The Bow Island Arch (BIA) in southeastern Alberta separates the Williston Basin on the east from the Alberta Basin on the west. Both oil families, E and M, occur on the east flank of the BIA, and are distributed along a west to east migration fairway across southern Alberta and northern Montana, with no obvious deflection around a paleo-BIA, suggesting that at the time of petroleum migration, the BIA was not a positive feature preventing oil migration into southeastern Alberta, southwestern Saskatchewan and northern Montana.