

Hydrocarbon Migration from the Exshaw Formation during movement of the McConnell Thrust

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ABSTRACT

The Exshaw Formation is an organic rich black shale, Early Mississippian in age. The Exshaw Formation overlies the Devonian Palliser Formation, a massive limestone unit, and is capped by the Mississippian Banff Formation, a silty limestone unit, which in turn is overlain by thicker limestone units of the Rundle Group. These units all outcrop, and were sampled, along Jura Creek on the McConnell Thrust sheet.

During the Laramide Orogeny the McConnell Thrust moved this package eastward. During thrusting, fractures opened and closed mostly perpendicular to the fault planes. Where calcite cementation occurred along fractures, a record of fluid conditions in the units during thrusting was preserved. These cements provide a data for the composition of both aqueous and non-aqueous fluids present during thrusting and allow assessment of whether or not mature hydrocarbons migrated from the Exshaw during this time.

Using Quadrupole Mass Spectrometry, the composition of non-aqueous fluids within fluid inclusions in these cements was determined. Results indicate that fluid inclusions from fracture filling cements associated with thrusting contain a wide range of non-aqueous fluids. Fluid inclusions range from dominantly water to those with variable amounts of methane, carbon dioxide and hydrogen sulfide. Methane is by far the major hydrocarbon. Higher hydrocarbons are not a major component in samples analyzed. Many samples contain fluid inclusions in which methane is more abundant than water.