Geochemical Conditions During Movement of the McConnell Thrust

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ABSTRACT

Fluid chemistry and thermal history during thrusting is preserved in fluid inclusions from cements in fractures and tension gashes. Fractures and tension gashes open as thrusts propagate. Relative timing of cements can be determined by examining the orientation if the fractures and tension gashes. Petrographic observations and stable isotopes are used to determine the relative timing of migration and chemical evolution of fluids. Quadrupole mass spectrometry is used to assess the composition of non-aqueous fluids.

During this study samples were collected from the Eldon, Southesk, and Palliser formations in the hanging wall of the McConnell Thrust. Calcite cements formed in fractures propagated at different times during thrusting. Early-formed cements are heavily twinned and fractured as a result of deformation as displacement continued along the thrust.

Analysis of host rocks indicate that methane was abundant in these formations prior to thrusting. Fluids present in fractures during thrusting contain relatively less methane and more carbon dioxide. Immediately adjacent to the thrust surface higher hydrocarbons (C_2, C_3, C_4, possibly up to C_8) were present. These higher hydrocarbons likely originated in the Cretaceous strata of the footwall and migrated into the hanging wall during thrusting.