

Shallow Subsurface and Deep Burial Hydrothermal Dolomitization: Examples From Devonian and Mississippian Reservoirs in the Western Canada Sedimentary Basin

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In the Western Canada Sedimentary Basin (WCSB), regionally extensive fluid flow events may have occurred during tectonic thrusting, sediment loading, uplift and compression. These fluids were instrumental in the formation of sediment-hosted ore deposits; petroleum migration and dolomitization affecting the majority of Devonian and Mississippian carbonate reservoirs. The timing and origin of these fluid flow events remain a controversial issue. Pre-, syn-, and post-Laramide fluid flow events have been invoked in the literature based on a multitude of paleomagnetic, geochemical and other evidence. The composition and evolution of ancient sedimentary fluids have been successfully reconstructed using the techniques of stable and radiogenic isotopes and fluid inclusion analyses.

In this contribution several examples will be discussed to show how hydrothermal fluids could have been instrumental in the formation of dolomite. These fluids were mostly focused through fractures and faults generated early and late in the diagenetic history of the basin. Examples include the Devonian Slave Point Formation, Sulphur Point Formation, the Wabamun Group of the Peace River Arch area in northwest Alberta and northeast B.C., and Mississippian carbonates from northeast B.C. Earlier hydrothermal incursions occurred in a shallow burial environment during the Tournaisian or Visean, while later hot fluids were generated during and post-Laramide tectonic event. The composition, temperature and salinity of the hydrothermal fluid produced during these two main events were very different.