

Dolomitization and Hydrothermal Alteration by Long-Distance Migration of Gypsum and Halite Brines in the Devonian Clarke Lake Gas Field, British Columbia, Canada

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Rock and formation water samples from the Middle Devonian Clarke Lake gas field in the subsurface of northeastern British Columbia, Canada reveal an interesting and in parts unusual history. The major fluid-dynamic and diagenetic events that have been identified are (i) long-distance fluid migration of a halite-saturated brine that effected pervasive dolomitization, and (ii) hydrothermal alteration of the dolomitized reservoir rocks by a hybrid brine that originated from mixing of the halite brine with a gypsum brine. A combination of burial curves, thermal modeling, and circumstantial evidence suggests that these events took place during the Late Devonian and Carboniferous. Furthermore, the reservoir presently contains admixtures of meteoric fluids that must have invaded in relatively recent times, i.e., after the Laramide orogeny that formed the Rocky Mountains to the west.

Trapping of hydrocarbons is controlled mainly by the configuration of the Slave Point platform margin relative to the structural tilt, which provides closure in many locations. The regional flow pattern of meteoric water did not change the trap locations, as it is directed structurally updip, but it probably modified trap capacity in several pools.