

Origin of petroliferous dolomitic beds in the Uteland Butte Member, Lower Green River Formation, Uinta Basin, Utah

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The lacustrine Green River Formation is an important oil-producing formation in the Uinta Basin, Utah. Of particular interest for horizontal drilling are three beds with up to 100% dolomite in the Uteland Butte member (UBM) of the lower Green River Formation. These beds are 1.5 to 7.1 feet in thickness and interbedded with organic-rich limestones and shales. They have up to 30% porosity but only max 0.1 mD permeability, thus forming an unconventional reservoir. However, not all dolomitized layers, of which there are several more in the UBM, are of reservoir quality.

Deposition of the UBM took place during three transgressive-regressive cycles that were driven by climate variations. High lake level in cooler periods alternated with low lake level in warmer periods, last developed likely by reduced fluvial input and/or evaporation. The three reservoir layers were deposited during the first of these cycles in lacustrine littoral to sublittoral environments as intraclastic and ooidal grainstones, peloidal packstones, and bioturbated mudstones and wackestones

Dolomite crystal sizes are <10 µm and porosity is mainly intercrystal. There is no discernible relationship between dolomitization and depositional environments. Permeability is low due to irregular and commonly disconnected pore throats. Porosity and permeability occluding phases are silicification commonly formed nodules of quartzine, chalcedony and equigranular quartz, blocky ferroan calcite and equant to blocky calcite cement.

Dolomitization took place very early, i.e., almost syndepositional, from lake water that was moderately evaporated and probably also enriched in Mg during drier periods. Increased fresh water input during more humid climate periods stopped dolomitization and facilitated deposition of lime mud layers that are now interbedded with the dolomitized beds. The origin of the microporosity undetermined. The origin of the microporosity - or lack thereof - is as yet undetermined.

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