

**Limestone-Fraction Porosity: A Key Concept in Assessing the Role of Dolomitization on the Origin of Pores of Dissolution Origin in a Dominantly Limestone Succession, the Upper Devonian Jean Marie Carbonate of Northeastern British Columbia**

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The Jean Marie carbonate in northeastern British Columbia consists of mainly limestones and partially dolomitized limestones, with variable dolomite content and porosity. Dolomitization occurred from the intermittent flow of hydrothermal brines up through fault conduits, resulting in the formation of patchy meter-thick dolostones at the top of the Jean Marie, close to the faults, and the partial dolomitization of limestones away from the faults.

Most pores in the Jean Marie are from the secondary dissolution of calcitic components and vary in size from micropores to larger molds, as well as some even larger vugs in the few dolostones. Visually, there is a general relationship that the degree of calcite dissolution, and hence porosity occurrence, is greater within intervals that have a high-matrix dolomite content.

To test the validity of this relationship, a statistical study was made using full-diameter core analysis data from approximately 250 wells, employing grain density as a proxy for dolomite content. In this analysis, porosity was normalized to the limestone (calcite) fraction of the rock. Mean values of limestone-fraction porosity were then computed for each 0.05 dolomite fraction (or 5% fraction) of the rock and plotted against the values of the dolomite fraction. This resulted in a remarkably linear trend, with limestone-fraction porosity increasing from 4.5% for samples with no dolomite content to approximately 12% for samples with 50% dolomite content.

This statistical analysis confirms the relationship between dolomite content and porosity based on visual examination. We conclude that dissolution of calcite is an integral part of the dolomitization process. The results of this analysis also indicate that dissolution of calcite started at a very low degree of dolomitization and increased with progressive dolomitization. It is hypothesized that the dissolution of calcite is driven by the need of carbonate ions for dolomite crystal growth. This need promotes the dissolution of nearby calcitic constituents, providing the source of the carbonate ions.