Fracture Analysis and Diagenetic Characterization of an Upper Paleozoic Gas Play, East-Central British Columbia, Rocky Mountains, Canada

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Regional fracture patterns were examined in outcrops within the Hannington, Belcourt and Fantasque formations to determine the effect lithology and Laramide reactivation played on the origin and density of fractures. Normal block faulting occurred during the Pennsylvanian to Permian creating sub-basins and affecting stratigraphic distribution and preservation. Reactivation of these faults during Late Cretaceous Laramide thrusting compartmentalized reservoir distribution throughout the east-central British Columbia Foothills and surface analogues within the Front Ranges. The effect of local structures on fracture patterns was used to create a model applicable to the subsurface. Image logs were used to constrain fracture properties within the subsurface and correlate them to outcrop and core. In outcrop, most small fractures were filled while larger ones were open, probably related to unloading during uplift and weathering. Microfractures were examined in thin section and related to surface and subsurface data. Fracture sets developed parallel to the regional fold axis and perpendicular to bedding surfaces. This implies fractures oriented parallel to the regional fold axis resulted from folding during compression whereas fractures oriented perpendicular to bedding were a result of increased curvature during deformation. Linear scanline and circular scanline methods were used on outcrop whereas the curved scanline method was used on core.

Examining the diagenesis within this Upper Paleozoic succession is also vital to characterizing this gas play. The effect of diagenetic constituents on fracture density and intensity was studied to further define the fracture model and was key to resolving the timing of fractures. The degree of dolomitization variably affected fracture properties and porosity and is related to stages of burial. In addition, local conodont colour alteration index patterns and variations were related to regional trends to reconstruct the thermal history and constrain geothermal gradients in an attempt to characterize the degree of hydrocarbon maturation.

Analyzing the fractures and characterizing the diagenetic components within the Foothills of east-central British Columbia aid in refining the tectonic history and calculating optimal drilling directions for these reservoir units. Creating a regional fracture model for the area will lead to enhanced methods of recovery in addition to more efficient exploration techniques.