

Structural Style and Hydrocarbon Distribution in the Foothills of British Columbia, Canada

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ABSTRACT

The foothills of the Canadian Rockies in British Columbia have some significant differences from the Alberta foothills located along strike to the south. Large displacement thrusts in the foothills of British Columbia are rare and the deformation style is dominated by folding above thrusts with relatively small displacements. Within the foothills of British Columbia there are also systematic variations in structural style from south to north that can be related to facies changes in the Paleozoic and Mesozoic stratigraphy. These facies changes influence detachment levels, fold geometry and displacements on individual thrusts that are superimposed on cumulative changes in basement structure that occur across the Peace River Arch, the Fort St John Graben and the Hay River Fault zone. These features converge as they intersect the foothills belt near Williston Lake which is located at a major change in surface geology; Triassic strata dominate at outcrop to the north of Williston Lake, whereas mostly younger Mesozoic strata are exposed south of the lake. South of Williston Lake the foothills are dominated by thin-skinned deformation that creates a series of detachment and fault propagation folds, some of which host significant gas fields. To the north of the lake there is extensive evidence of the reactivation of basement structures. Some of these basement structures show clear evidence of earlier extension controlling growth sequences; others appear to be inherited from strike slip fault systems. The changes in structural style and the hydrocarbon field distribution for a series of key conventional and unconventional plays are illustrated in a series of maps and regional cross-sections. Versions of the regional cross sections also have been constructed to show the variations in lithofacies rather than stratigraphic units. This helps to highlight the changes in mechanical stratigraphy from north to south that are thought to be a significant influence on regional structural style, trap geometry and field distribution in the foothills.