STRUCTURAL CONTROLS ON THERMAL MATURATION AS DETERMINED FROM COAL RANK STUDIES, ROCKY MOUNTAIN FOOTHILLS NORTH OF GRANDE CACHE, ALBERTA

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Mean maximum vitrinite reflectances (Ro_{max}) from Lower and Upper Cretaceous coals outline major variations in thermal maturation across the Foothills north of Grande Cache, Alberta. In the west, the rank of coals exposed in the Lower Cretaceous Gething Formation increases from high-volatile A bituminous at their western limit of exposure, to low-volatile bituminous at their eastern limit. In the east, low-volatile bituminous coals and semi-anthracite occur in the Gething Formation in the subsurface, whereas high-volatile A bituminous coals, in the basal part of the Upper Cretaceous Wapiti Formation, are exposed at the surface. Nearly constant coalification gradients for the Gething Formation suggest that a uniform geothermal gradient occurred across the Foothills belt.

Time-depth coalification curves show that the eastward increase in coal rank across the Foothills can be explained by an eastward increase in time and depth of burial beneath Late Cretaceous-Tertiary foredeep deposits. In the west, Lower Cretaceous strata were uplifted 4 to 5 km during Late Cretaceous-Tertiary (Laramide) deformation. This uplift essentially terminated the thermal maturation of these sediments. The eastward increase in rank within coals of the Gething Formation can be related to a west to east progression in the movement along the few major thrust faults that underlie the area. In the east, the Lower Cretaceous strata remained deeply buried and thermal maturation continued after Laramide deformation.

Gething strata are in the wet and dry gas zones in the east, but are in the oil and wet gas zones where exposed in the westernmost Foothills. Extrapolation of these data

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suggests that potential Mississippian and Triassic reservoir rocks should be in the wet gas zone beneath the westernmost Foothills and Front Ranges.