The Triangle Zone and Foothills Structures Adjacent to the Oldman River, Southern Alberta: A Reappraisal Based on Seismic Data and New Structural and Stratigraphic Observations

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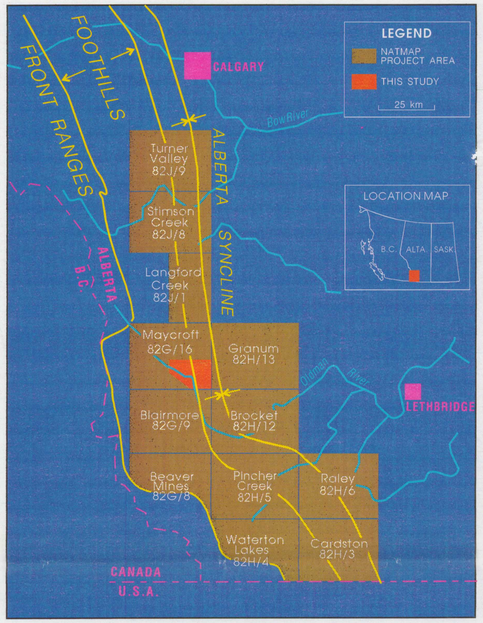
Geological Survey of Canada, Open File #2937



Excellent exposures of triangle zone and foothills structures occur along and adjacent to the Oldman River, in the Maycroft map-sheet (82G/16), southern Alberta. Maycroft is centred within the region encompassed by the new GSC Southern Alberta Foothills NATMAP Project (LEFT). Preliminary structural mapping utilizing a new stratigraphic subdivision of the Belly River Group and upper Alberta Group (RIGHT; Jerzykiewicz and Norris, 1993, in press), in conjunction with interpretation of 1:20,000 scale colour aerial photographs, suggests that revision of earlier structural interpretations is necessary (Stockmal and MacKay, 1994). The new map interpretation of part of the Maycroft sheet (FAR RIGHT), representing work in progress, is corroborated and augmented by industry seismic reflection data gathered north of Oldman River (BOTTOM; and Lawton et al., 1994). The line drawing shown below, produced from a depth-migrated section, appears courtesy of Amoco Canada Petroleum Co. Ltd.

The dominant west-vergent asymmetry of macro- and meso-scale structures observed in outcrop within the St. Mary River and Willow Creek strata changes abruptly ~1 km upstream of the Highway 22 bridge over the Oldman River, coincident with the mapped belt of Bearpaw Formation. To the west, Belly River Group strata are folded and thrust faulted with a clear and consistent east-vergent geometry. We interpret the trace of the triangle zone upper detachment to lie at or just above the Belly River-Bearpaw contact (the Big Coulee Fault).

Open to close folds, up to kilometre-scale, and numerous west-vergent thrusts within the hanging wall of the Big Coulee Fault indicate that the strata above the foreland-propagating wedge did not behave passively. Shortening associated with wedge propagation has been partitioned above and below the upper detachment, which should be viewed as a domainal boundary rather than a deformational boundary.

REFERENCES CITED

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_____, in press: Stratigraphy, structure and syntectonic sedimentation of the Campanian "Belly River" clastic wedge in the southern Canadian Cordillera; Cretaceous Research.

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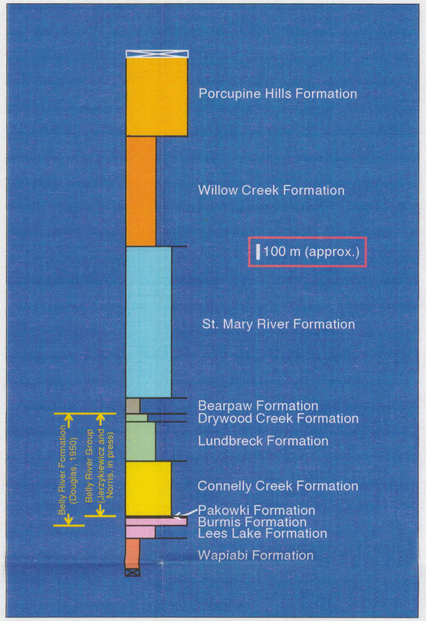

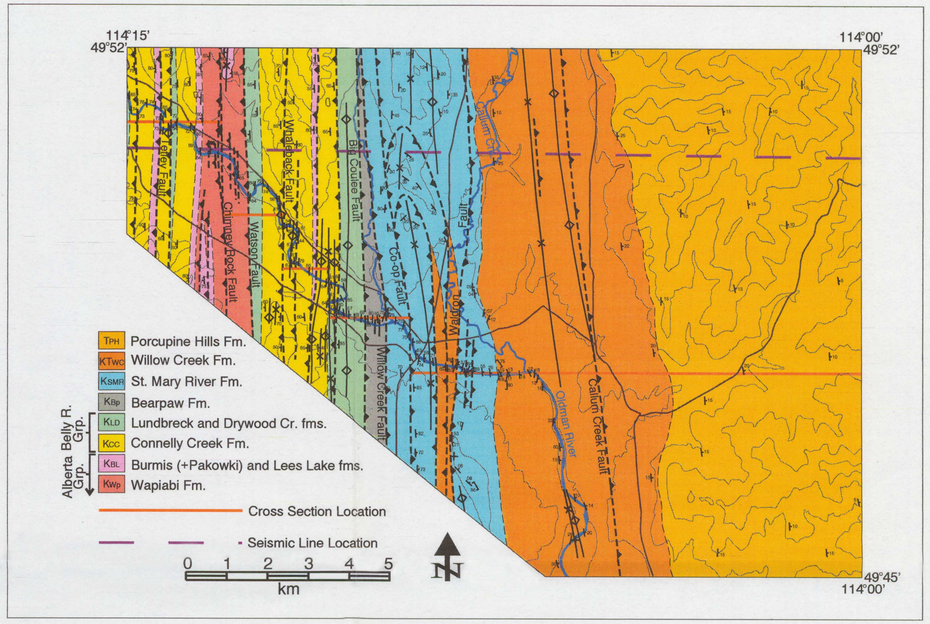

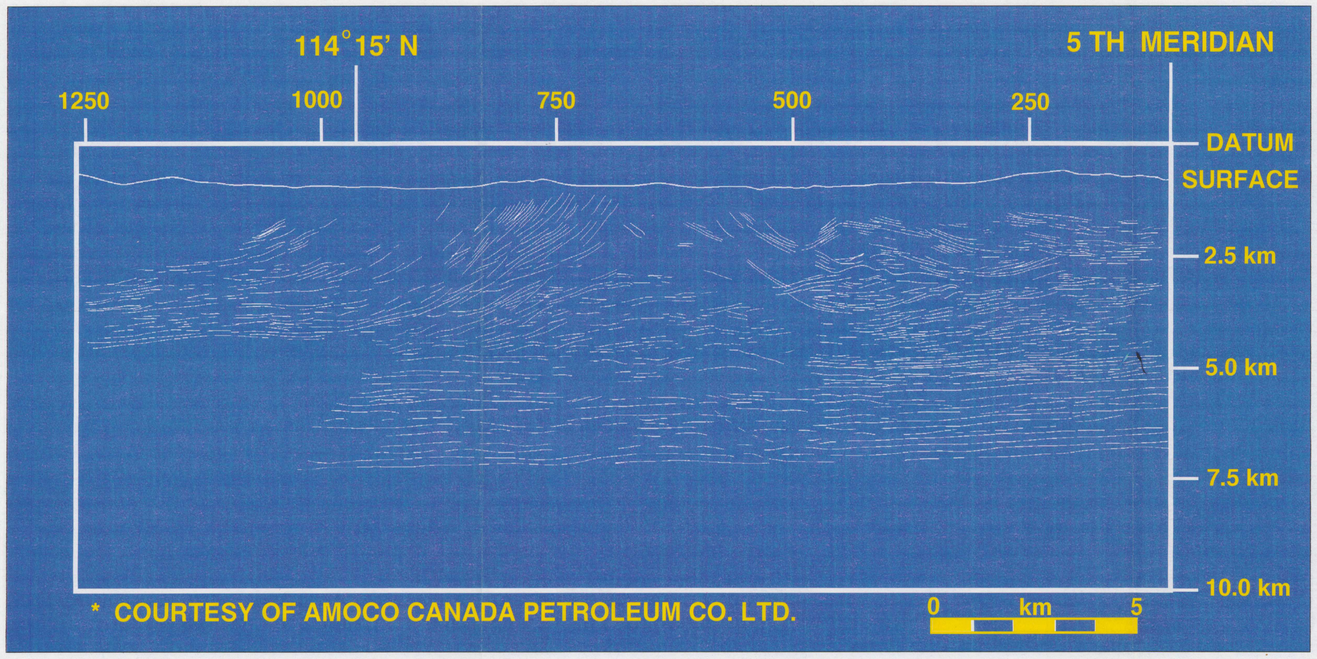

Geological map (TOP) based upon Douglas (1950) and preliminary field observations and aerial photo interpretation. Interpretation of thrusts associated with the large syncline, forming part of a west-vergent fold pair in the hanging wall of the Co-op Fault, is supported by aerial photos. The cross-section (BOTTOM) is based on mapped geology, the line drawing of Amoco Canada Petroleum Company seismic data (BOTTOM LEFT, location TOP), and seismic data acquired by Sefel Geophysical in 1975 along roads adjacent to Oldman River and recently reprocessed in support of the NATMAP project (Lawton, et al., 1994). The map and cross-section differ slightly from that of Stockmal and MacKay (1994), in accord with the findings of Lawton et al. (1994).

The four main, west-vergent thrusts in the hanging wall of the Big Coulee Fault (Willow Creek, Co-op, Waldron, and Callum Creek faults) are progressively less folded by underlying structures from west to east. This suggests that they are successively younger backthrusts that developed progressively toward the foreland, in an "in-sequence" fashion, in response to the rotation and folding of the earlier "upper detachments". Alternatively, some of these faults may represent a kinematic process involving overlap zones and linkage between backthrusts propagating along strike.