to lacustrine sequence, which may be as thick as 16,000 ft (5 km) on the east side, thinning to a few thousand feet or to zero on the west where fault bounded. The Kishenehn formation contains lignite and oil shale beds which may be buried deep enough in parts of the basin to generate hydrocarbons; recent drilling discovered oil and gas shows at less than 200 ft (61 m).

The presence of oil and gas shows in many formation as well as the presence of major structures containing porous host beds indicates that this area has an excellent potential for the discovery of hydrocarbons.

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Dissolution of Plagioclase as Hydrocarbon Reservoirs

Plagioclase feldspar is an important contributor to reservoir porosity as indicated by studies of first-cycle Miocene basins of south Texas (Frio Formation) and southern California (Stevens Formation). In the former case study, volcanic plagioclase (An_{32}) exhibits secondary porosity with associated partial albitization. In the latter case, plutonic plagioclase (An_{30}) exhibits secondary porosity without albitization, although petrographically albite was stable with respect to the leach fluids. In both examples, dissolution was highly selective proceeding 2 to 3 times faster along cleavage planes than normal to them.

The dissolution by-product is chiefly kaolinite such that the overall reaction is $2H^+ + H_2O + CaAl_2Si_2O_8 = Al_2Si_2O_5(OH)_4 + Ca^{++}$. Formation water compositions indicate the leach reactions are occurring today at about 100°C (212°F).

Petrographic, microprobe, and mass balance calculations indicate that alumina is conserved on the scale of a thin section. Calcium is particularly mobile on a scale of tens of meters.

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Thermal-Mechanical Modeling of Early Paleozoic Miogeoclinal Sequences in Southern Canadian Rockies

We have applied 2-dimensional thermal-mechanical stretching models to palinspastically restored sections of the early Paleozoic miogeocline in the southern Canadian Rocky Mountains. Results of modeling suggest that the miogeocline consists of an inner easterly tapering wedge of mainly carbonate rocks over 200 km (124 mi) wide in which early Paleozoic tectonic subsidence was controlled mainly by thermal contraction as predicted by the passive margin model for the miogeocline. To the west lies a complex and much wider belt of uplifted, carbonate platforms and downfaulted shale-filled basins in which subsidence was episodic and probably controlled by recurrent movement along high angle or listric normal faults. The boundary between the two belts is the Kicking Horse Rim, a narrow northwest-trending reeflike tract of stacked algal complexes. Preliminary analyses of early Paleozoic miogeoclinal strata north and south of the southern Canadian Rockies suggest that these belts can be traced through most of the Cordilleran miogeocline.

We have analyzed stratigraphic relations within the inner carbonate belt east of the Kicking Horse Rim using one- and two-layer stretching models that include lateral heat flow and time-space dependent flexure. Each model was applied to three palinspastically restored cross sections of Upper Cambrian to Upper Ordovician strata restored to their original thicknesses and densities through time using delithification procedures we have developed for fully compacted lithologies in ancient basins. Both models (1) produce the overall shape of the carbonate wedge, (2) imply that thermal subsidence could not have begun earlier than about 550 to 600 m.y. ago, and (3) suggest an eustatic rise and fall occurred between Middle Cambrian and Middle Ordovician time. However, the widespread sub-Cambrian unconformity and the rapid eastward pinch-out of Early Cambrian strata within the carbonate wedge can be produced only by the two-layer model. In addition, lateral heat flow predicted by the two models at the outer edge of the carbonate wedge causes a small uplift whose position and timing could account for the sub-Middle Cambrian unconformity beneath the Kicking Horse Rim and shoaling required for growth of the algal complexes of the rim itself.

Both models imply that a hinge zone (zone separating crust thinned by stretching from crust of normal thickness) trended northward and lay close to the restored position of the McConnell thrust at about 52° lat. To the south at about 51° the hinge zone bends westward and at about 50° it lies along the west-trending St. Marys-Dibble Creek fault zone. We suggest that west-trending middle Precambrian high angle faults recognized along the St. Marys-Dibble Creek Zone controlled the position of a west-trending reentrant in the early Paleozoic margin. Between 52° and 51° the position of the hinge zone on a palinspastically restored base coincides closely with a distinct step in the depth to Moho indicated by refraction data. This relation may indicate that fundamental crustal structures of rifted margins such as hinge zones can be preserved in Moho topography over geologically long periods of time even where subsequent compressional events have occurred.

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Vitrinite Reflectance and Temperature Gradient Models Applied at a Site in Piceance Basin, Colorado

Two adjacent DOE multiwell experiment (MWX) boreholes were drilled to a depth of 2,520 m (8,268 ft) below the valley of the Colorado River near Rifle, Colorado. High quality vitrinite reflectance data ranging from 0.88 to 2.07% were obtained from cores from the Upper Cretaceous coaly interval (1,340 to 2,423 m; 4,396 to 7,949 ft). Remnants of basalt flows that cap highlands above the valley are 9 m.y. old, and 1,500 m (4,921 ft) of Eocene and Pliocene sediments have apparently been eroded from above the site by the Colorado River since the basalt was extruded. The excellent reflectance data and the geologic setting allow a test of three ways to evaluate maturation of vitrinite.