A New Model for Bovie Structure

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An analysis of Bovie Structure (a.k.a. Bovie Fault Zone, Bovie Anticline, Bovie Trend), conducted by removing effects of deformation (flattening and fault restoration), leads to a new model in which it is the product of two compressional events. In this model, a shallow Laramide detachment fault intersected a pre-existing deep-rooted thrust block and carried its upper segment to its present location.
This model is fundamentally different from the widely accepted one that incorporates extension and a combination of west-dipping normal faults and prograding shelf edges. Seismic, across the area where Bovie has surface expression, provides evidence for compression. It images shortening of bed-length and a west dipping monocline with an east-plunging axial plane within Devonian to Mississippian strata and the basement reflector.
The monocline's east-dipping axial plane has been described by others as evidence of a series of westward-prograding shelf edges on a subsiding margin. It is here interpreted as a product of compression rather than extension.
Structural restoration of the seismic shows no evidence of Bovie Structure having influenced strata until possibly as late as immediately pre-Cretaceous when the hangingwall block of a deep-rooted east-dipping thrust fault was uplifted. Subsequent pre-Cretaceous erosion across the structure resulted in the abrupt eastward thinning of the Mississippian Mattson Fm that is found in the subsurface at Bovie today.

Laramide compression generated a shallow-detachment thrust in the upper Banff Fm that 'decapitated' the older hangingwall block. The severed block was then carried eastward approximately 4 km and upwards bringing the sub-Mattson, Flett Fm to the surface.