

STRUCTURAL INTERPRETATION OF THE SOUTHERN HALF OF THE SAWTOOTH SALIENT OF THE MONTANA DISTURBED BELT

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The Sawtooth salient is an assemblage of interlocking arcuate thrusts and associated folds. Subsurface and surface data show a transition from the northerly strike of the thrust faults of the Sawtooth salient to a northwesterly strike in the Sun River reentrant to the south.

Two zones of thrust faulting have been mapped in the subsurface using 500 miles of seismic reflection data. The western zone consists of five major thrust faults dipping 25-30 degrees westward with 1-7 miles of displacement. The eastern zone consists of thrust faults with similar dips but an order of magnitude less displacement. Some of these thrusts can be traced directly to surface exposures to the north. Surface mapping and data from 20 boreholes in the area provided control for the seismic interpretation. Forward and inverse seismic modeling and formulation of regionally consistent structural and tectonic models provided further constraints for processing and interpreting the seismic data. Displacements and fault angles were determined from geologic cross-sections generated via an analytical ray-tracing inversion of selected seismic lines. Surface exposures, well data and seismic data reveal that Paleozoic units in thrust plates dip nearly vertically toward the truncation by the underlying thrust fault.

Displacement transfer patterns mapped in the adjacent Sawtooth Range are similar to patterns interpreted from the seismic data and provide detailed examples to aid seismic interpretation. The ability to accurately map strike closure for structural hydrocarbon traps is dependent on understanding the structure within the transfer zones. Geometric and kinematic analysis of the fault transfer zones indicates that displacement on adjacent faults occurred contemporaneously.