

3-D Structural Interpretation: The Application of New Concepts and Techniques

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The interpretation of complex structures in areas with limited data can be significantly improved by the application of new three-dimensional interpretation techniques. The techniques are illustrated using surface and subsurface examples from the Idaho-Wyoming thrust belt. Poorly exposed surface structures from the Palisades Reservoir area in the Idaho belt are mapped by draping geological maps and orthophotos over digital elevation models. Visualization of the surface geology and structural geometry, combined with field reconnaissance studies, is used to refine structural maps of the area. Structural cross sections constructed from the digitally enhanced maps are integrated and projected to interpret the 3-D of the Jurassic Nugget Formation. The structures exhibit branching, relay, and en echelon folding patterns, and abrupt changes in vergence both across along structural trend, strongly suggestive of disharmonic detachment folding.

Subsurface structures from the Fossil basin area, such as the Painter and East Painter Reservoir structures are interpreted using formation tops and dipmeter data. Area-balanced cross sections constructed through the structures are integrated with well data to develop 3-D surfaces of selected reservoir units and faults. Comparison of structures in the Palisades Reservoir area and subsurface structures in the Fossil Basin area suggest that the structures consist of asymmetric detachment and faulted detachment folds formed above detachments in the Triassic and older incompetent units. The improved structural models resulting from these studies can be used to explore for new structures in the area as well as to improve production from existing fields.