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INTEGRATED STRUCTURAL AND FRACTURE ANALYSIS AT LISBON VALLEY ANTICLINE, UTAH

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The Lisbon Valley Anticline is one of several NW-trending, salt-cored anticlines in the Paradox Basin of eastern Utah and southwestern Colorado. These structures formed when evaporites of the Paradox Formation were subjected to differential loading by southwestward-prograding sediment that was shed from the Uncompaghre Uplift during the Pennsylvanian to Jurassic. This study combines fieldwork with isotopic analysis of veins and host rocks, well-logs and seismic data to create an integrated interpretation of the architecture and origin of the fracture and paleofluid systems in the Lisbon Valley Anticline. Seismic data indicate that the Lisbon Valley Anticline localized above three, partially inverted, sub-salt normal faults that cut the underlying Mississippian basement. Although all three faults trend NW-SE, the eastern two faults appear to curve and terminate against the straight, westernmost fault, forming a complex relay structure. Growth of an elongate salt pillow above this basement structure initiated the diapiric anticline, which was subsequently cut by the northeast-dipping, listric, Lisbon Valley fault. Fieldwork and analysis of satellite imagery reveal that there are two systematic fracture sets throughout the structure: one strike-parallel and one cross-strike. A third, strike-oblique fracture set is locally present, but this set is not as well developed as the others. Regional abutting relations indicate that the strike fractures predate the cross-strike fractures, and the absence of similarly oriented fractures in nearby flat-lying rocks suggests all of the fracture sets are related to the evolution of the Lisbon Valley structure. With the exception of the Honaker Trail Formation, veins are rare throughout the area. Carbon and oxygen stable isotopic analysis of calcite veins shows that vein-forming fluids were derived from an external source, and that fractures played an important role in transmitting fluids through the suprasalt section.

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