Structural Framework of the Appalachian Plateau of Central West Virginia

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The Appalachian basin has attracted great interest recently due to the hydrocarbon potential from the Marcellus Shale. 2D seismic data have brought new insights to areas, particularly Webster County, WV, that were once considered low potential due to the lack of knowledge of the deep structures in this region. It has been previously thought that no faults were likely to exist due to the gentle dip of surficial Pennsylvanian and Mississippian units observed in the field.

The seismic data demonstrates Pennsylvanian to Devonian age fore and back thrusts that seem to project to the surface. This stratum overlies Ordovician to Cambrian age extensional faulting. The locations of these structures are much farther away from the structural front than what was once thought likely. Kinematic modeling demonstrates the deformation process of this region of the plateau at different stages. This allows for a reinterpretation of structures. These faults may have the potential to produce small fractures and offsets within the Marcellus Shale that will likely affect well locations and production potential. Therefore, understanding these deep structures and how they affect shallow structures is essential to geologist working in this region.

The fore and back thrusts may be observed in the Mauch Chunk and Greenbrier Groups through 30 gas well and 200 shallow coal well correlations. Curvature maps of the shallow surface illustrate locations of discontinuities. This increases the resolution of the structural maps generated through seismic at depths where the data is noisy. LIDAR data visualizes the effect that the faults play on the immediate surface (for example, controlling location of stream valleys) while removing other trees and brush that make it impossible to map small faults penetrating the surface in the field. The combination of this new data improves the resolution of present maps along with the understanding of the structural framework of the Appalachian Plateau of central West Virginia.