
3D Seismic Interpretation of Polygonal Faulting in Upper Cretaceous Sediments, Powder River Basin, Wyoming

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EXTENDED ABSTRACT

Interpretation of a 24 sq. mi 3D seismic dataset indicates polygonal faults in Upper Cretaceous prograding marine shelf sands within the Powder River Basin, Wyoming. These faults display a complex network of layer-bounded normal faulting affecting the Teckla, Teapot, and Parkman sandstones. Utilizing 3D seismic data covering portions of Converse and Niobrara counties, Wyoming, the extensive network of faulting was mapped in detail. The fault traces in map view express a geometry similar to the polygonal faulting described in North Sea reservoirs. Fault cuts were picked from well logs in the seismic study area as well as in nearby productive fields. Although these faults were observed to be predominately associated with the Teapot Sandstone, a significant number extended through the Parkman Sandstone and, to a lesser extent into the Teckla Sandstone. All faults exhibit normal fault movement with an average throw of 40 ft with some components of growth faulting. These faults likely formed during layer-bound contraction of the fine grained sediments as they underwent dewatering. Recognition of polygonal faults in the Teapot Sandstone is economically significant as several large productive Teapot Sandstone fields (Kaye and Well Draw) are located in close proximity to the 3D seismic study area. These polygonally-faulted fields could provide potential for redevelopment exploiting modern 3D seismic technology and thus allowing for detection of polygonal compartmentalization of reservoir rocks.

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