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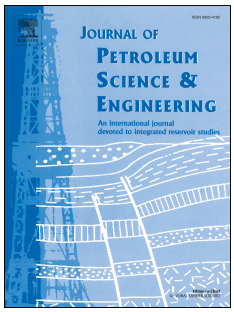

Examples of seismic diffraction imaging from the Austin Chalk and Eagle Ford Shale, Maverick Basin, South Texas

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Examples of seismic diffraction imaging from the Austin Chalk and Eagle Ford Shale, Maverick Basin, South Texas

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ABSTRACT

Diffraction events are recorded along with reflection data during seismic acquisition. However, after processing, final migrated stack data are devoid of diffraction events, which have been collapsed to discrete points, smoothed out, and overshadowed by reflection events. Thus, diffraction events that ought to be available for analysis of the subsurface are lost.

In this study, we extract diffractions from 3D stack and then build a 3D diffraction volume that not only images faults but also contains amplitude information used to examine lithological composition in fault zones within the Austin Chalk and Eagle Ford Shale in South Texas. We then transform the diffraction data into amplitude envelope volume. This seismic attribute, together with clay volume (V_{CLAY}) data, is extracted along interpreted horizons and fault planes. Cross plots between seismic attributes and V_{CLAY} show that V_{CLAY} increases with increasing diffraction energy. In addition, we observe that the higher the diffraction energies, the higher the fluid saturation, suggesting higher impedance contrast at diffraction points. Furthermore, cross plots between instantaneous dominant frequencies extracted from the diffraction-image volume and amplitude envelope show that within the hydrocarbon-saturated zones, the dominant frequency is approximately constant and in the low-frequency range between 25 and 33 Hz.