Diffraction and Specular Imaging for High-Resolution Seismic Interpretation

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ABSTRACT

Accurate spatial identification of high-resolution geologic features like faults, natural fractures, and small scale subsurface heterogeneities can provide a pathway to higher permeability; therefore, they need to be characterized and mapped. These features act as scattering sources for the wavefield propagating through the subsurface, which is identified as diffraction energy. Their associated seismic amplitude is much smaller than the amplitude of the impedance interfaces between geological layers. Although this type of energy is recorded during data acquisition, it is typically suppressed during conventional processing in favor of continuous seismic reflections. Consequently, in a traditional seismic interpretation workflow, some derived discontinuity attributes (e.g. coherence curvature or fault likelihood) may carry only partial information. This presentation describes the decomposition of the full wavefield into reflection and diffraction energy, and illustrates its benefits when complementing a traditional structural interpretation workflow. This leads to an accurate, high-resolution, and high-certainty structural framework for risk-managed field development.