Seismic Fracture Detection in the Second White Speckled Shale: Anisotropic Perspectives on an Isotropic Workflow

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Abstract

Direct methods for seismic fracture detection typically require an azimuthal analysis of the recorded wavefield. However, conventional data acquisition practices often provide insufficient azimuthal and offset coverage for proper application of azimuthal techniques. Therefore in most cases, alternative methods must be used for fracture detection.

This study investigates the ability of seismically derived isotropic properties in the delineation of fractures within the Second White Speckled Shale. Fracture systems with structural controls were identified through attributes that are sensitive to changes in the structure of the seismic image. Elastic properties were derived from the seismic measurements to determine the optimal conditions for fracture formation and the elastic response of fractures. In addition, travel-time anisotropy effects in shales were analyzed to determine its relationship to fracturing. The analysis yields a set of attributes that are sensitive to fractures and are used in the reduction of uncertainty for the delineation of the associated fracture systems.