
Fracture Porosity Inversion from P-Wave AVOA Data along 2-D Seismic Lines

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I present a method for inverting the fracture porosity from 2-D P-wave seismic data using amplitude variation with offset and azimuth analysis with examples. The method is based on the assumption that a negative sign of the anisotropic AVO gradient indicates a gas-saturated reservoir, while a positive sign indicates liquid-saturated reservoir. This assumption is accurate as long as the crack aspect ratio is less than 0.1 and the P-wave/S-wave velocity ratio is greater than 1.8; two conditions that are satisfied in most naturally fractured reservoirs. The inversion then uses the fracture strike, crack aspect ratio, and P-wave/S-wave velocity ratio to invert fracture porosity from the anisotropic AVO gradient after inferring the fluid-type from the sign of the anisotropic AVO gradient. Applying this method on dip and strike lines from the oil-saturated zone of the fractured Austin Chalk of southeast Texas, I found that the inversion is accurate along the dip line and significantly deteriorates along the strike line, which is expected by the theory.
