On the feasibility of geopressure detection from seismic data in Saudi Arabia.

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Abstract

Laboratory measurements of Compressional Velocity (Vp) as a function of Effective Pressure (Pe) were used to determine the feasibility of geopressure detection from seismic data in Saudi Arabia. These measurements were used to calibrate the response of two seismic attributes—Stacking Velocity (Vstk) and acoustic impedance—that are generally considered to be possible indicators of changes in formation pressure. Current laboratory results allowed us to establish a Vp-Pe relation that can be used to calculate RMS velocity (Vrms) for normally pressured to highly overpressured section. This quantity was used to model the expected change in stacking velocity along a 2-D seismic traverse that extended from a normally pressured to an overpressured section in Saudi Arabia. A comparison of the expected change in Vstk (due to geopressure) with estimates of Vstk from the seismic traverse (using coherence plots) showed that the expected change in Vstk was not resolved by the seismic data. These laboratory tests defined velocity as a function of effective pressure for one lithology, one pore fluid, one porosity, and ultrasonic frequencies. Subsequent experiments will broaden the Vp-Pe definition to cover a greater range of lithology and porosity, and the impact of frequency on the Vp-Pe definition will be addressed. They will help to quantify the relative contributions of porosity and effective pressure to changes in velocity. Given a traditional relationship between porosity and impedance, the value of impedance as a geopressure indicator can then be assessed.

Refbacks

There are currently no refbacks.