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Uniaxial Stress vs Elastic Properties. Experimental Measurements and Theoretical Predictions for 3 VTI and one HTI Samples

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Abstract

Inherent anisotropy of the sedimentary rocks must be taken into account by any kind of seismic imaging. The elastic parameters and anisotropy of elastic medium are dependent on the ambient stress conditions.
We present results of ultrasonic velocity measurements for three VTI and one HTI samples under uniaxial stress conditions. A significant velocity change is observed only parallel to loading direction, indicating the closure of aligned thin cracks (compliant pore space). Based on the determined full set of velocities we calculated the compliance tensor. Using the porosity deformation approach (originally: piezosensitivity theory, Shapiro, S. (2003)) we successfully predicted the change of compliances with increasing load. Based on comparison of different data sets, we consider the contribution of stiff and compliant porosities to the change of elastic parameters.

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References

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