

A Simplified Workflow for Estimation of Elastic Anisotropy in Vaca Muerta

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ABSTRACT

Lab studies and acoustic logs have shown that Vaca Muerta elastic properties indicate strong differences measured parallel and perpendicular to bedding. Shear velocities and microscopic analysis indicate that the anisotropy on the bedding planes is negligible.

This specific case of anisotropy, common in shale plays, is known as TIV (transverse isotropic vertical), which is a fairly accurate assumption since most of the Vaca Muerta bedding planes in the area of study are near to horizontal. The important differences observed in elastic moduli suggest that the assumption of isotropy for stress computations may lead to significant errors.

The estimation of the TIV strain tensor from well logs acquired in vertical wells is challenging due to the limitation of the logging tools to measure compressional and shear velocities in directions different than the direction of the well. Service companies have proposed procedures based on the estimation of horizontal shear from Stoneley waves and the implementation of correlations to overcome this problem.

Here we are proposing a simplified and innovative methodology based on ultrasonic velocities and stress-strain relationship measured in triaxial tests on core plugs to derive a pseudo-anisotropic model from compressional and shear well log measurements.