

## Reconstruction of transverse-isotropic moduli using wave propagation through spherical samples

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In general, rocks are inhomogeneous and have physical or mechanical properties that vary with direction. Rock anisotropy is found from the lab scale to field scale. The reconstruction of anisotropy plays an important role in both wave propagation analysis in geophysics and engineering design. However, the methods of investigating anisotropy usually require testing considerable numbers of samples in various directions. This process is complicated by the rock variability coming from the inhomogeneity of rock mass and the Earth's crust, which causes the variation of physical properties from sample to sample. This introduces the variations in the rock properties that could mask the effects of anisotropy. Reconstruction of anisotropy using a single sample can give better results, but it suffers from the influence of the sample boundaries on the wave propagation, which is different in different directions. This paper proposes a novel method, which is based on using a spherical sample such that measurements of wave propagation in all directions are influenced uniformly by the sample boundary. We made a transverse-isotropic synthetic rock sample and test it using this new approach. The results were compared with the measurements by the traditional approach. The procedure of making sufficient amount of measurement is discussed and the technical feasibility of having measurements using the transducers attached to a curve surface is demonstrated. The new approach has a potential of greatly reducing the effect of rock variability and reducing the cost of measurements.