

Derivation of Generalized Reflections From Point Sources in VTI Media

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Abstract

AVO modeling in VTI media is a valuable tool in exploration seismology. However, work by these authors has shown in the isotropic case that the plane-wave assumption of most modeling is not valid near critical angles, even at considerable depth. One would assume that the same is true in VTI media. The literature contains formal work related to reflections of point-source waves in anisotropic media, but working expressions have not been given.

In this work, detailed expressions are derived for generalized reflections from point sources in a two-layer VTI medium. First the displacements resulting from P-wave and S-wave point sources in a homogeneous medium are obtained. These are given as integrals over the corresponding plane-wave displacements. The generalized reflection coefficients are then derived and are seen to be integrals over plane-wave reflection coefficients. Computational results based on these expressions are given in a companion paper.