Geophysical Research Abstracts
Vol. 14, EGU2012-2186, 2012
EGU General Assembly 2012

Potential Pitfalls in Seismic Interpretation for Transversely Isotropic Media - A Physical Model Study

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Anisotropy is ubiquitous in upper crust and shows its effect on reflection seismology. In this study, we aim to show the pitfalls of subsurface images that could be characterized from the reflection profiles of transversely isotropic media (TIM). To demonstrate the potential pitfalls in seismic interpretation from TIM, reflection experiments were individually conducted over a vertical transverse isotropy (VTI) and a horizontal transverse isotropy (HTI) blocks with zero offset and constant offset acquisitions.

In imaging the spherical dome from a VTI medium, the configurations of target structure could be overly imaged in lateral due to velocity anisotropy. The phenomenon of over imaged in VTI media becomes significant as the offset interval is increased and is emphasized by our laboratory works. As imaging goes to HTI, a false image could be interpreted from offset profiles to response to azimuthal variation; therefore, the spherical dome was imaged as an ellipsoid-like structure with its major oriented along the layering and the minor perpendicular to the layering. In addition, result evidence that the existence of HTI can be inferred from the azimuthally propagating times of signals that come from a CRP, apex of the dome-structure, gathers. It is the hope that the degree of anisotropy can also be estimated from the azimuthal traveltime differences which were revealed from the CRP gathers.