Numerical Study for Anisotropic Influences on Elastic Wavefields Near Surface

*Rina Yoneki[1], Hitoshi Mikada[1], Junichi Takekawa[1]

1.Graduate School of Engineering, kyoto University

Anisotropic velocity analysis is important for understanding characterization of hydraulic induced fractures and near surface structure with sedimentary materials. There are many studies on seismic wave propagation in transversely isotropic and orthorhombic media (e.g., Thomsen, 1986; Alkhalifah, 2000). In most of those studies, the magnitude of anisotropy is assumed to be weak. In addition, there are few studies on seismic wavefields in quite strongly anisotropic media. Therefore, it may not be appropriate to apply their theories directly to strongly anisotropic subsurface media. It is necessary to understand the effects of the anisotropy on the behavior of seismic wave propagation in strongly anisotropic media in the seismic exploration. In this study, we investigate the influence of strong anisotropy on received seismic waveforms using three-dimensional numerical models, and verified capability of detecting subsurface anisotropy. Our numerical models contain an isotropic and an anisotropic (transversely isotropic) layer in an isotropic background subsurface. Since the difference between the two models is only the anisotropy in the vertical propagation velocity, we could observe the influence of anisotropy in the residual wavefield that is the difference in the observed wavefields of two models. The residual waveforms could be exploited to estimate both the order of anisotropy and the thickness of anisotropic layer in subsurface.

Keywords: Anisotropy, Elastic wavefiels, Numerical simulation

