

Estimation of azimuthal angle of S-wave anisotropy using virtual cross-dipole data generated by the Virtual Source Method

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Shear wave splits into fast and slow shear waves when traveling layers anisotropic in seismic velocities and one of the important aspects of such anisotropy is the relation with the history of stress field surrounding the anisotropic media. This information is quite important to design drilling and to suggest the subsurface fluid flow from geophysical approach. Although conducting shear wave survey in a quantitative manner is important, it is difficult to put into practice in the offshore. The importance of researches on marine shear-wave survey, therefore, is obvious and many offshore shear wave sources have been proposed in the history but none of them has been commercialized due to the complexity of the mechanisms or to the interference with environmental conservation. For precise estimation of lithological parameters of offshore sub-seafloor materials in the future, we would like to propose entirely novel approach to utilize the virtual source method with a single survey line of air-gun shots and a single ocean bottom seismometer (OBS). The virtual source method makes it possible to generate virtual cross-dipole data even using monopole seismic sources in offshore condition. In our previous study we showed the potentialities to extract shear wave signals from anisotropic layer in the reflection seismic data acquired by a single OBS and an array of air-gun shots. Although our previous work showed that our method had sufficient accuracy, the numerical simulation model was too simple includes only single anisotropic target. To overcome this problem we make more complex simulation models and apply the previous method to the models. Our numerical results indicate that we conclude our method has sufficient effectiveness in complex models.

Keywords: Virtual Source Method, Shear wave survey, Shear wave anisotropy, Ocean Bottom Seismometer