Applying analysis of oceanic crust using receiver function to refraction exploration

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For precisely estimating the extent of legal continental shelf, the estimation of the thickness of oceanic crust is needed. Refraction or reflection wave exploration is one of the methods for deep oceanic crust investigation. These explorations use multi-component (x,y,z component of acceleration and pressure) seismometer, but these methods use only compressional wave or depth component of seismometer. Hence, it is needed to use shear wave or lateral component of seismograms for more precise investigation to estimate the thickness of oceanic crust. Receiver function is a function at a place that can be used to estimate velocity interface by receiving the wave of distant earthquake including shear wave. Receiver function analysis uses depth and lateral component of seismograms by deconvoling each other and reads the time of P-S converted wave after direct P wave and inverse the depth of the velocity interface. This analysis is advantageous in inverting velocity interface including Mohorovicic discontinuity using two components of seismogram data.

This study tries to apply this method to the investigation using refraction wave not from earthquake but artificial sources at ground or sea surface. Refraction wave propagated under velocity interface of upper mantle radiates P-S converted wave as well as the wave from deep underground. The model for simulation has sloped Mohorovicic discontinuity as second model and the source is located at surface. However, receiver function analysis cannot image velocity interface clearly over S-P converted wave or multi-reflected wave in sediment layer. One of this causes is that the angle of received wave incidence is too large compared to underground source model, therefore it cannot make use of the approximation that shear wave is recorded almost in lateral component of seismometers. Therefore, recorded refraction wave needs transformation of Cartesian coordinate into cylindrical coordinate, and then Ps converted wave can observe clearly. After the above numerical processing, receiver function analysis as one of the methods of velocity interface estimation and applicability to refraction wave analysis is justified. The further study should be conducted for more realistic model which contains viscoelastisity, OBS (ocean bottom seismometer) analysis model, and inhomogeneous sediment model.