Supplementary Material

Tectonics and Volcanism in East Asia: Insights from Geophysical Observations

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Introduction

Supplementary material for this article provides a brief summary of the teleseismic receiver function method. We have examined the P-wave receiver function (RF) using two stations (BGD and JJU; Fig. 3) to observe the lithospheric structure of the southern part of S. Korea (Fig. 4). Method/data processing steps are summarized here.

Method and Data Analysis

Teleseismic receiver functions (RFs) are time series, which show a relative response of near-receiver structure, computed from distant earthquakes. Standard RF processing emphasizes P-to-S converted

(direct Pds; ‘d’ represents a discontinuity) phase and reverberated phases beneath the receiver by removing source complexity through deconvolution of radial component seismograms by corresponding vertical component seismograms (Langston, 1979). The amplitude of Pds phases primarily depends on the incidence angle of the impinging teleseismic P wave and velocity contrast across the discontinuities. Modeling the amplitude and timing of the direct Ps and reverberated phases can provide valuable constraints on subsurface geology (e.g., Kim et al., 2010; Song and Kim, 2012a, 2012b). Additionally, by measuring distinct moveouts as a function of source-receiver offsets (assuming a locally flat layered structure), it is possible to estimate discontinuity depth and average P-to-S velocity ratio (*Vp*/*Vs*) between the surface and the discontinuity associated with each mode (Chen et al., 2010; Zhu and Kanamori, 2000). In practice, individual seismic modes can be difficult to observe and identify on individual traces. Thus, stacking many earthquakes at similar distances and backazimuths is employed, and a search is performed over a range of depths to the discontinuity and *Vp*/*Vs* ratios. These ratios (or Poisson’s ratios) typically provide much tighter constraints on the crustal composition than either compressional or shear velocity alone. Uncertainty estimates on crustal thickness and *Vp*/*Vs* ratio for the grid search algorithm are estimated from by the 95% confidence interval.

Earthquake sources within 30 to 90 degree distance ranges with magnitudes greater than 6.0 are used in the analysis. Individual waveform data are (1) time-windowed to 90 s, (2) band-pass filtered at 0.01–1 Hz for the region, and (3) rotated to radial and tangential coordinates. Radial component seismograms are then deconvolved with vertical component seismograms at each station using time-domain iterative deconvolution (Kikuchi and Kanamori, 1982; Ligorria and Ammon, 1999) with a Gaussian filter parameter of 4. We only concentrated on radial RFs in this paper.

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