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Receiver function imaging of the Philippine Sea Plate beneath the Kii Peninsula

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We carry out a seismic observation in the Kii Peninsula to investigate underground structure under the DAIDAITOKU Project whose purpose is to reduce damages in urban areas due to large earthquakes. We have deployed seismic stations at every ˜5 km on Shingu-Kawachinagano Profile Line which is designed to be parallel to the subducting direction of the Philippine Sea Plate (PHP). The purpose of the observation is to image S wave velocity discontinuities beneath the profile line by using a receiver function (RF) analysis with recorded waveforms from teleseismic events and to estimate the shapes of the PHP and the Moho and Conrad discontinuities. To know the large scale structure beneath the Kii Peninsula through which seismic waves from the Tonankai Earthquake travel to Osaka area is very important to predict accurately strong motions.

RFs are calculated by deconvolving the vertical component of the P coda from teleseismic events from the corresponding radial component in order to get rid of source time functions. Not only the direct P waves but also Ps converted waves generated at S wave velocity discontinuities beneath stations are left in the obtained RFs. We can convert the relative travel time between the Ps converted wave and the direct P wave to the depth of the S wave velocity discontinuity assuming a velocity structure. We can draw a image of the S wave velocity discontinuities by arranging the depth-converted RFs along the corresponding ray paths.

In order to stabilize deconvolutions in calculating RFs Park and Levin (2000) applied a multi-taper technique in which waveform data are Fourier transformed with prolate tapers. This procedure prevents the spectra from having very small values due to spectral leakage. Moreover, it stabilizes the spectral division by adding the pre-event noise power spectra to the vertical power spectra in the denominator. However, this technique has a disadvantage that it is difficult to calculate RFs with a long time window because the prolate tapers suppress the amplitude in more than 2/3 of a whole time window.

Shibutani et al. (2006) improved the extended-time multi-taper RF estimation devised by Helffrich (2005) so that we can calculate RFs with an any time length by applying some sets of prolate tapers shifting with 75 % window overlap and adding the obtained spectra with the corresponding phase lag. We apply this technique to waveform data from the Shingu-Kawachinagano array. In our poster we will discuss features of the obtained images of the S wave velocity discontinuities beneath the Kii Peninsula.