Philippine Sea Plate and Serpentinized Mantle Wedge beneath Kii Peninsula

Yuta Kitawaki[1]; Takuo Shibutani[1]; Kazuhiro Nishimura[1]; setsuro Nakao[2]; Kiyoshi Ito[1]; Shiro Ohmi[1]; Kazuo Ogawa[3]; Kazuro Hirahara[3]

[1] DPRI, Kyoto Univ.; [2] RCEP, DPRI, Kyoto Univ.; [3] Geophysics, Sciences, Kyoto Univ.

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The deep low frequency events (DLFEs) widely distribute from western Shikoku to central Tokai through southern Kii Peninsula (Obara, 2002). High 3He/4He ratios are found in Kinki district (the Kii Peninsula is located in the southern part of Kinki) despite in the forearc region (Wakita et al.,1984). When we explain these phenomenon by the behavior of 'water' dehydrated from the Philippine Sea Plate (PHP), it is important to know structures of the PHP and the mantle wedge beneath the Kii Peninsula. In order to predict strong motions accurately, it is very important to know large scale structures beneath the Kii Peninsula, through which seismic waves from the Tonankai and Nankai Earthquakes travel to Osaka area . The purpose of this study is to image the S wave velocity discontinuities beneath the Kii Peninsula by using receiver function (RF) analyses with waveforms from teleseismic events and to estimate the shapes of the PHP and the Moho discontinuity.

RFs are calculated by deconvolving the vertical component of the P coda from teleseismic events from the corresponding radial component in order to remove 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 averaging the depth-converted RFs along the corresponding ray paths. We can also estimate S wave velocity structure by inverting the RF image.

The figure shows the S wave velocity discontinuities in the cross-section along a profile line from the southeast Kii Peninsula to the northern Kinki. The continental Moho is located at about 30km beneath the northern half of the profile line and becomes shallower beneath the Kii Peninsula. The upper boundary and the slab Moho of the Philippine Sea Plate are imaged as blue and red pixels, respectively, descent toward the NW direction from the depths of 20 - 25 km at the SE edge of the image. The oceanic crust between them shows obvious low velocity anomalies to the depths where the DLFEs occur, and less low velocity anomalies beyond the depths. This suggests that the dehydration is active in the source region of the DLFEs. The discharged water serpentinizes the mantle wedge, which shows widespread low velocity anomalies.