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SIT35-P11 Room:Convention Hall Time:May 26 18:15-19:30

Teleseismic P- and S-wave tomography beneath Japan Islands

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The Japan Islands are characterized by complex structure and tectonics caused by four plates which are interacting with each other. Many seismic tomography studies using local seismic data have been made to investigate the 3-D velocity structure beneath Japan. However, the study areas of the previous researches are limited to the shallow part, in the crust and shallow mantle, whereas the deep structure beneath Japan (a depth range of 200-700 km) is not well known. Investigation of the deep structure is very important for improving our understanding of the subducting slabs and mantle upwelling, as well as subduction dynamics.

In this work, we apply teleseismic tomography to relative travel-time residuals of teleseismic events to study the 3-D P- and S-wave velocity structure of the Japan subduction zone. Although there have been several studies using P-wave data so far (e.g., Zhao et al., 1994, 2012; Abdelwahed and Zhao, 2007), few studies using S-wave data have been conducted. Using both P- and S-wave data, we can determine not only the P- and S-wave velocity structures but also other physical parameters such as Poisson's ratio, which are useful for better understanding the physical property of the mantle.

Part of the P-wave relative travel-time residuals used in this work were chosen from the data collected by the previous studies (Zhao et al., 1994, 2012; Abdelwahed and Zhao, 2007). We selected 130 teleseismic events from the previous data sets based on the following criteria: (1) The epicentral distances range from 30 to 100 degrees from central Japan; (2) Each event was recorded by over 100 seismic stations on the entire Japan Islands. In addition, we newly collected data from 38 teleseismic events so that the event distribution becomes more homogeneous. Thus, our data set contains 168 teleseismic events which generated ˜60,000 P-wave arrivals. Our S-wave data set contains ˜40,000 arrivals from 56 teleseismic events.

We also selected ˜3,000 local shallow and deep earthquakes from the JMA Unified Catalog, each of which was recorded by over 100 seismic stations. We applied the tomographic method of Zhao et al. (1994, 2012) to invert the local and teleseismic data simultaneously.

Both of our P- and S-wave tomographic images show that low-velocity anomalies exist in the mantle wedge beneath the volcanic front and back-arc area, which reflect hot upwelling flow in the mantle wedge associated with slab dehydration. High-velocity anomalies are revealed, which reflect the subducting Pacific and Philippine Sea slabs where intermediate-depth and deep earthquakes are located. Beneath western Kyushu, dipping high-velocity anomalies are visible down to ˜400 km depth in both P- and S-wave tomography, suggesting that the Philippine Sea slab has subducted aseismically down to the mantle transition zone depth. In addition to the P- and S-wave tomography, we will also present images of Poisson's ratio and the R value (dlnVs/dlnVp), which provide additional information on physical properties of the Japan subduction zone.