Estimation of site effects and Q structure beneath the Japan Islandsderived from NIED Hi-net data

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The attenuation structure beneath the Japan Islands should hold 3-D complexities similar to those in the velocity structure. For example, we often observe abnormal distributions of ground motion amplitudes, which are very different from a circular distribution about an epicenter. Seismic attenuation implies inelasticity or scattering in the Earth's materials, while seismic velocities imply their elastic properties. We can assume high attenuation under the volcanic fronts, and low attenuation along the subducting Philippine Sea plate similarly to the velocity structure. However, this similarity is not always expected in other parts of the Japan Islands.

Information on the seismic attenuation is also important for the simulation of strong ground motions.

National Research Institute for Earth Science and Disaster Prevention (NIED) has observed at Hi-net stations distributed in the whole Japan Islands. In this study, the vertical components of ground velocity amplitudes reported from August 2000 to September 2002 will be used. The seismic attenuation will be represented with the indexes called Qp and Qs, and their 3-D Structure will be obtained for frequency bands between 1 Hz and 10 Hz. Amplitudes from 3830 earthquakes are used for tomography. The number of stations where amplitudes were observed is 664.

There are three characteristic results in this study. First of all, clear low-Q zones can be found beneath the volcanic front in the northeastern Japan, and the distinct high-Q is recovered in the east of the front. This high-Q area coincides with the strata of 100 Ma or older. Low-Q zones appear only just below volcanoes in the upper and lower crust, while the low-Q area extends continuously along the volcanic front at a depth of 40 km.

The Qp distribution show similar tendencies zone, but the averaged Qp in the crust is significantly lower than the averaged Qs, so that corresponding low-Qp zones are not obvious. The tendencies can also be found along the volcanic front related to the subduction of the Philippine Sea plate.

Secondly, a distinct low-Qp area is found at a depth of 65km in the Chubu region, central Japan. However, no low-Qs zone can be found in the area. This may imply a different attenuation process from that under the volcanic front in the northeastern Japan.

Thirdly, the high-Q area is found along the upper boundary of the Philippine Sea slab, which is determined from seismicity in the southwestern Japan. This area is more distinct in the Qp distribution with an average of 1000 than in the Qs distribution. In the Shikoku region, the low-Qp area does not extend beyond latitude of 34.2 N, and the area looks falling down into

a deeper part there. On the other hand, in the Kyushu region, the low-Qp area reaches a depth of 100km or larger coinciding with the slab boundary determined by the seismicity.