

Nonuniform spatial distribution of S-coda wave energy in Japan

Kazuo Yoshimoto[1]

[1] Integrated Science, Yokohama City Univ.

We analyzed the spatial distribution of coda-wave energy of 16 local earthquakes occurred in Japan. We selected the earthquakes with very few aftershocks to accurately investigate the coda-wave characteristics. The velocity seismograms recorded by the Hi-net were used in this study. We calculated the coda-wave energy in frequency bands of 2-4, 4-8, 8-16, and 16-32Hz as the squared sum of the coda-wave amplitudes on horizontal components. The coda waves at lapse times after the 1.5 times of the S-wave travel time were analyzed. To compile the results obtained from 16 events with different earthquake magnitudes, we normalized the coda-wave energy of each event by using the average of the largest ten percent of these values and then took the average of the normalized values over these events.

The results of this study obtained from new data are roughly consistent with those of our previous study (Yoshimoto 2004), and, despite of the random scatters due to the effect of site amplifications, show clear regional variations of coda-wave energy, especially in the high-frequency range of 16-32 Hz. The magnitude of coda-wave energy is systematically small in the area where the Quaternary volcanoes exist (central and northern Hokkaido, western Tohoku, Hokuriku, in and around the Izu peninsula, and central Kyushu). The difference in magnitude reaches up to 40 dB. In addition, our new result with high spatial resolution reveals local variations of coda-wave energy in Hokuriku: coda-wave energy is especially small in Joetsu where large crustal strain rate had been reported by GPS monitoring (Sagiya et al, 2000). Central Kyushu is another distinct region that is newly recognized as a region of small coda-wave energy with high spatial resolution.

Our result obtained in this study shows that the coda-wave energy does not distribute uniformly in Japan. The magnitude of coda-wave energy is systematically small in the area where the Quaternary volcanoes exist. The spatial correlation between the Quaternary volcanoes and the high heat flux suggests that the thermal structure (or intrinsic attenuation structure) of the crust and the uppermost mantle characterizes the regional variation of coda-wave energy.

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