伝播経路の違いによって生じるQsの空間的変動に関する研究

A study on spatial variations of Qs-value caused by differences of propagation pass.

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Strong motions are expressed simply as products of source, pass, and site factors in the frequency domain. Researchers have been developing the prediction methods by evaluating these factors. The property of S-wave attenuation (Qs) is one of the most important factors for strong motions, because the amplitudes of strong motions change depended on Qs dramatically.
Iwata & Irikura (1986) introduced spectral inversion method which was able to estimate the source, pass, and site factor from strong motion records (e.g., K-NET or KiK-net managed by National Research Institute for Earthquake Science and Disaster Prevention (NIED)). This method gives us important knowledge about mechanisms and properties of strong motions. Nakano et al. (2015) performed spectral inversion methods to 6 regions of Japan, and obtained the source, pass, and site factors at each region by using the enormous amount of data (from 1996 to 2011). Please note that the values estimated by this method are just average values of target regions and assumed parameters.
On the other hand, we know the way to investigate Qs-value directly in the any area. That is called twofold spectral ratio method (TSRM) is provided by Matsuzawa et al. (1989). Kato (1999) assumed geometric spreading factor n was 1.04 (=constant) in the same manner as Ibanez et al. (1993), and applied TSRM to southern Kyushu region to evaluate Qs by crustal earthquakes. Izutani (2000), Izutani & Ikegaya (2002) and Maeda & Sasatani (2006) shows that Qs would be change in the space of regions. Noda et al., (2010) reports the probability of differences of Qs based on epicentral distance in the Kashiwazaki and adjacent region. Their studies suggest that we have to pay attention to select the appropriate propagation pass (in brief, it is earthquake-site pairs).
From the above, we investigate the effect of the difference of propagation pass has on evaluations of Qs. We performed TSRM to southern Kyushu and Hokkaido region in Japan. We were interested in the changes of Qs in the space of regions, so we needed comparison our results to previous studies. We used the strong motion records of K-NET and KiK-net provided by NIED. The Fourier spectra were calculated from the acceleration of strong motion records (0.1-20 Hz in frequency domain). We used taper window (0.4Hz) to smoothen Fourier spectra.

We obtain Qs-values depended on frequencies are comparable to ones estimated by spectral inversion methods (e.g., Kato, 1999; Nakano et al., 2015) at Kyushu and Hokkaido region. However those are different by each propagation pass. It would be supported previous studies. The results bring about the useful knowledge to configure Qs-value for strong motion predictions.
Such studies are depended on density of observation points and amount of data. We would continue to study about spatial variations of Qs-values, by increasing the amount of data and dividing the area (or depth) finely.

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