S146-011 **Room: 302** **Time: May 27 14:45-15:00**

Statistical variation characteristics of ground motion derived from spectral inversion of strong motion records

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Spectral Inversion is a technique to separate source, path, and site effects from strong motion records with the same precision. However, it is important to know how much variation should be expected in a predicted value obtained from the spectral inversion. In this research, we collect strong motion records from K-NET, KiK-net, JMA network, CEORKA, KKNetChiba, and SK-net and perform spectrum separation analysis for observed records of Mj g.e. 4.5, focal depth l.e. 60km, hypocentral distance l.e. 200km, and maximum acceleration l.e. 200 Gal to study their variations as a function of distance, peak level, or site category.

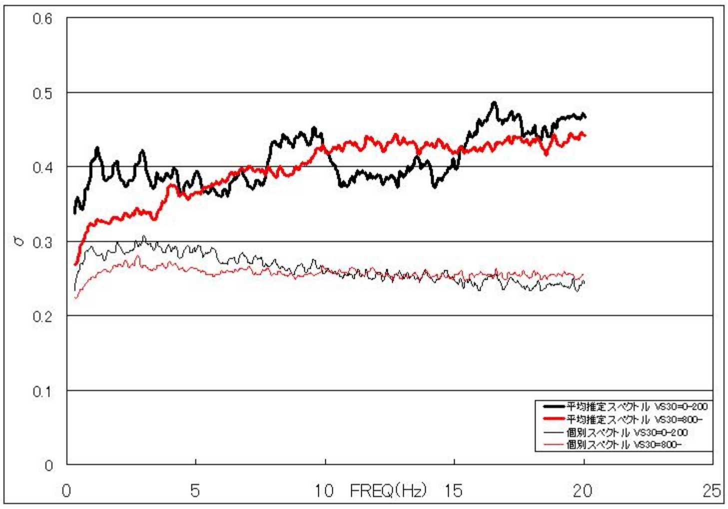
Separation analysis was carried out by using RMS amplitudes of Fourier spectra for the frequency range from 0.3 Hz to 20Hz. We also use strength indexes such as PGA and PGV and the filtered acceleration, A0, used in the JMA seismic intensity calculation. We use YMGH01 (Hofu) as the reference observation site, the only constraint condition for the spectral inversion. The weathered rock formation at this site was stripped off and make the site as rock outcrop. Since the S-wave velocity of the bedrock level at YMGH01 reaches 3,400 m/s.

Averaged Fourier spectra, PGA and PGV, and A0 are calculated backward using the separated strong motion characteristics. First, we calculate the logarithmic residuals averaged for all the site-station pairs, that is, the ratios between the observed and the inverted (predicted). We found that the averaged deviation is greatest, about 0.28, at 3Hz and smallest, about 0.23, at 0.1Hz.

In a similar manner we also conduct variation study for PGA, PGV, and A0. When the variations for all the stations were investigated as a function of hypocentral distance, variations for these peak values are gradually decreasing to about 100km in hypocentral distance. After 100km variation become constant. This tendency shows a good contrast with the previous study reported by Midorikawa and Otake (2003). We also found that, when the residuals of PGA or PGV are calculated in each range separated by 15km, it shows positive values for a short distance. This large observed value may be due to the directivity in the near field.

Although small fluctuation in the variation for all the data was seen in the small-amplitude regime, it becomes quite stable as amplitude increases. When we calculate logarithmic residuals as a function of amplitude, they become negative for high amplitude level for PGA and PGV. This may be a manifestation of soil nonlinearity for high amplitude input.

Next, using the site characteristics of the Fourier spectra, a deeper S-wave velocity structure is determined so that the amplification characteristics calculated from one-dimensional reflection theory would match the separated site characteristics. We trust the information of PS logging of K-NET and KiK-Net. Hereafter only the 668 sites will be used, where the observation site characteristics have reproduced well by the theory. Then the sites are classified based on the S-wave velocity of top 30 meters, VS30. All the sites are divided into four categories in terms of VS30, namely, 0~200 m/s, 200~400 m/s, 400~800 m/s, and 800 m/s or more, and averaged site characteristics for each category are calculated. Two model spectra are then calculated; a) using the individual site characteristics and b) using the averaged site characteristics for each category. By using these model spectra we compare the residuals. As shown in a figure the residual is larger for the category of VS30=0~200 m/s. When we use averaged site characteristics, in the low frequency range 0.1 additional variation is apparent and in the high frequency range 0.2 difference is observed. Therefore, if we add 1 residual to the averaged amplification factor for the corresponding category, then it can be used as the substitute of the real site characteristics with some safety margin.


0.6
0.5
0.4
σ 0.3
0.2
0.1
0
0
5
10
FREQ(Hz)
15
20
25
平均推定スペクトル VS30=0-200
平均推定スペクトル VS30=800-
個別スペクトル VS30=0-200
個別スペクトル VS30=800-