ASSESMENT OF STANDARD SITE EFFECTS IN ASHIGARA VALLEY, JAPAN USING STRONG MOTION RECORDS FROM LARGE BUT REMOTE EVENTS

Tomiichi Uetake[1], Kazuyoshi Kudo[2]

[1] Seismic Design Gr., TEPCO, [2] Earthq. Res. Inst.,Univ. Tokyo

Ashigara Valley, Japan is a sediment-filled valley of middle-size (12 km x 5 km). A strong motion observation network has been run by Earthquake Research Institute, the University of Tokyo and it recovered several large but far events, such as the 1993 Kushiro-oki (M7.8), the 1994 Vladivostok (M7.6), the 1994 Hokkaido-toho oki (M8.2), the 1994 Sanriku-oki (M7.6) and the 2000 Torishima-kinkai (M7.3). The epicenter distances of these events are longer than 700 km; therefore, assumption of a plane-wave incidence to Ashigara Valley will be permitted. That is, the source and path effects will be common with a sufficient approximation for a middle size valley.

(1) Average site effects

We obtained the spectral ratios with a reference rock site. Spectral ratios are very stable for the events. We have to pay attention that deviations of spectral ratios among the rock sites are factor of 2 in the frequency range of 0.1-10 Hz. While, the ratios or amplification factors exceed more than factor of 10 at some sediment sites, especially at the south of valley. Although the tendency of NS- and EW-component are almost the same, there are some observation points where positions of peaks are different in both components.

(2) The nature of the incident wave to the plain

Using the data set from the Torishima-kinkai event, we found the apparent velocity of the first S-arrival by the semblance analysis to be 8 km/s. This tells us almost vertical incidence of the first S-arrival part. On the other hand, latter arrivals show very low semblance values and it is difficult to identify proper velocities. This tendency is much distinct at high frequency range. These results may suggest that the later arrivals were not direct waves from the source but scattered or secondary generated waves. We checked the variation of spectral ratios using many time windows with same length of 40 s and different starting time. The properties of spectral ratios were approximately stable for different time windows. This result means that there is no significant difference between the amplification characteristics of the direct S arrival and the coda parts.

(3) Comparison with the spectrum ratio of near earthquakes

We calculated the spectral ratios of one sediment site to rock site using the data from small or middle class earthquakes (M4.0 to 5.7) that occurred in the area about 40km from Ashigara Valley. A distance between station pair is about 2km that is very short relative to hypocenter distances. The spectral ratios of near events have larger deviation than that of far events but the average of spectral ratios is almost the same as one evaluated from the data of far events. It may mean that the spectral ratios calculated using the data of the far but large earthquakes show standard characteristics.