Frequency Dependent Site Effects Estimated from the Observed Seismic Records in the Kanto Plain

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When considering about the earthquake disaster prevention, it is important to evaluate how much the earthquake ground motion affects the target regions. The ground motion receives a large effect according to the site amplification. And this becomes a great factor to decide the ground motion regionality. In recent years, the structures have various cycle characteristics, so it is necessary to evaluate suitable site amplifications for them. In this report, the site amplifications around Kanto Plain are evaluated from the observation records by the use of linear inversion technique in spectral domain. And we examined the relations between the geographical classifications and the site effects.

The earthquake records used for this analysis were 31 events (M4.6-6.1, D24-96km) that obtained at the K-net and SK-net stations around Kanto Plain. The ground motions observed at surface are expressed by crossing the sources, the paths and the site amplifications. In this report, the Qs value was evaluated separately by the earthquake occurrence regions in consideration of the complex zone structure of deep underground in Kanto Plain. It separated concretely to four categories, in the Pacific Plate, boundary between the Pacific and the Philippine Plate, in the Philippine Plate, boundary between the Philippine and the North American Plate. The utilized constraint conditions are the site amplifications from seismic bedrock to surface of the stations that Vs around the surface are comparatively high.

The obtained Qs value of the earthquakes that occur in the Pacific Plate showed the strongest frequency dependent than the other occurrence regions. As concerns the obtained source spectra, we could apply to the experience rule that decrease by the omega-square. We calculated the value of the site amplifications in the short period range (average of 0.1-0.5sec) and long period range (average of 0.5-1.5sec) of each station, and associated them with the geographical classifications where the stations were located, and then we calculated the averages of each geographical classification. In the mountainous land, the amplifications of the high frequency regions are distinguished because of the thin surface layers, and the low frequency regions are small. Oppositely, as the ground conditions become worse, the amplifications of the low frequency regions grow, and the high frequency regions become small. However, it is still imperfect to deal them systematically because of the large variations. We considered that the reasons of the large variations in the low frequency regions are the effect of the thick humus-decay accumulative layers in Kanto Plain that cannot appear to the geographical classifications, and that the large variations in the high frequency regions are the effect of the surface layers that cannot be classified by the geographical classifications. It will be necessary to separate the deep ground effects and the surface layer effects from the site amplifications obtained by spectral inversion. And we will examine to use these separated amplifications.