pectrum Characteristics of MeSO-net seismograms –Site Amplification of MeSO-net stations -

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1. Introduction

In the Kanto district, a high-density seismograph network “MeSO-net” has been deployed, and the continuous record since 2008 has been accumulated. By integrating MeSO-net, K-NET and KiK-net data, we expect to image more precise attenuation structure beneath the Kanto district. However, MeSO-net is installed at a depth of 20 m and there is a problem to handle as a record at a free surface.
In this study, we carried out simultaneous inversion of site amplification and 3D Q by using MeSO-net, K-NET and KiK-net records to investigate the site effect of underground installation.

2. Examination of MeSO-net seismograph

In the case of the underground seismograph, since the reflected wave from the surface is included, a vibration node is formed, which affects spectrum shape; valleys are formed at the period of the node.
To investigate this phenomena, we use a large amount of waveform data recorded by MeSO-net for M4.0 - 7.5 earthquakes from 2011 to 2015. After calculating the geometric mean of response spectra for each observation station, we visually read period of 1st mode To1 and 2nd mode To2 of the valleys. Then, we compared those observations with theoretical periods predicted by AVS30 model of NIED J-SHIS. The reading of periods was categorized into four ranks from A to D depending on the degree of kurtosis. As a result, it was found that there was a correlation between the observed periods and the theoretical ones.

3. Simultaneous inversion of site amplification and 3D Q value

We investigated the site amplification characteristics of MeSO-net by using simultaneous inversion of site amplification and 3D Q structure.
To avoid the tradeoff between site and Qs, stations are divided into 10 groups from the theoretical dominant period and it is assumed that each group has the same amplification. Groups 1 to 8 are based on K-NET and KiK-net. The hard rock station with AVS 20 of 1000 m/s or more was classified into group 1 and the inversion in which the amplification factor was constrained to be 2.0 as the free surface was performed. Group 8 has no PS logging data and its dominant period is unknown. MeSO-net stations were divided into group 9 (<0.5s) and group 10 (>0.5s) based on the predominant period calculated from AVS 30 of J-SHIS.
Result of the ground amplification is shown in Fig. 1. MeSO-net amplifications were almost equivalent to group 1 of hard rock site. The ranges of corresponding dominant frequencies for the K-NET and KiK-net groups are shown at the top of Fig.1. They show the dominant frequencies calculated by the inversion well corresponding to theoretical frequency. Regarding MeSO-net, the amplification factor of Group 10 is smaller at 3 to 5 Hz compared to Group 9. Many of the observation points of group 10 correspond to AVS 30 = 200 m / s to 300 m / s. The 1st mode of theoretical frequency in this case become 2.5 Hz to 3.75 Hz.

4. Conclusion

It was found that valleys in the spectrum were generated for MeSO-net due to borehole underground installation. The amplification characteristics were investigated by using simultaneous inversion of site amplification and 3D Q value. As a result, it was found that the amplification of the MeSO-net record is

close to the free field hard rock site.

Keywords: MeSO-net, Borehole Seismogram, Site Amplification

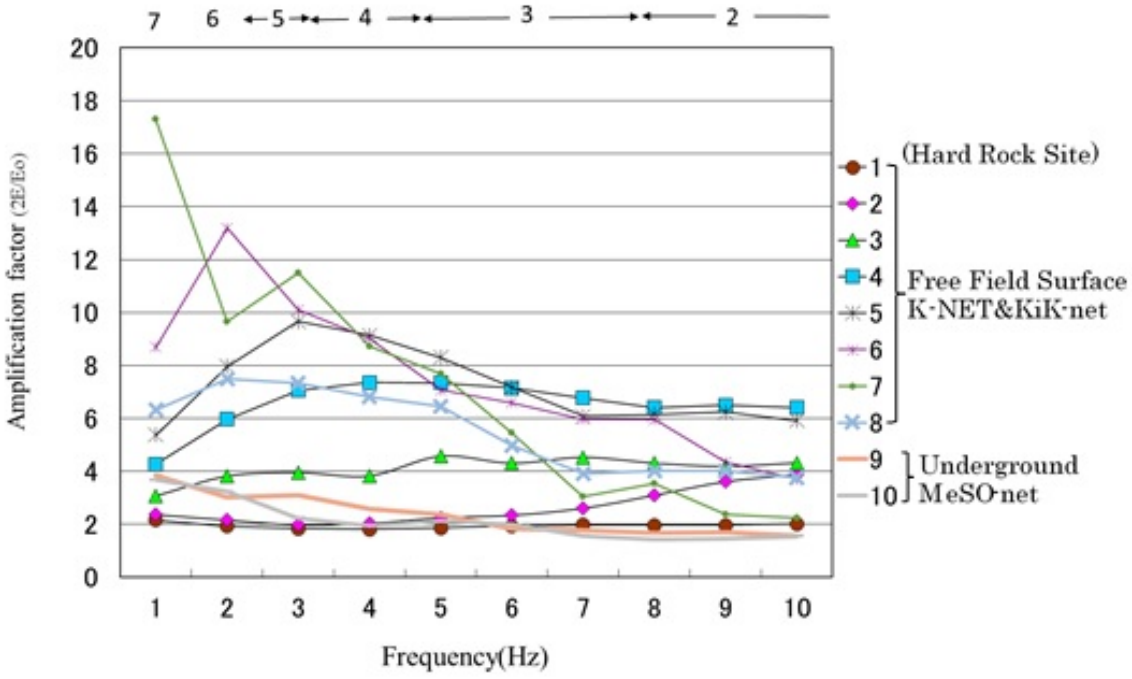

図 1 インバージョンによって得られた地盤分類ごとの増幅率
Fig.1 Amplification factor obtained by inversion

