

Estimation of site-dependent spectral decay parameter from seismic array data

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The kappa (κ), attenuation of acceleration amplitude at high frequencies, is one of the most important parameters in ground motion evaluation and seismic hazard analysis at sites. κ simply indicates the high frequency decay of the acceleration spectrum in log-linear space. The decay trend can be considered as linear for frequencies higher than a specific frequency, f_e which is starting point of the linear regression at the acceleration spectrum. The κ has been investigated using the data from seismic arrays in the south-eastern part of Korea in which nuclear facilities such as power plant and radiological waste depository are located. The seismic array consists of 20 seismic stations and it was operated from October in 2010 through March in 2013. A classical method by Anderson and Hough (1984) and a standard procedure recently suggested by Ktenidou et al. (2013) were applied for computation of κ . There have been just a few studies on spectral attenuation characteristics for Korean Peninsula so far and even those studies utilized small amount of earthquake events whose frequency range was lower than 25 Hz. In this study, the available frequency range is up to 60 Hz based on the sampling rate of 200 and instrument response. This allows us to use a large range of frequencies for κ computations. It is outstanding advantage that we couldn't obtain from earlier κ studies in Korea. In addition, we investigate the regional κ characteristics through calculating the κ using data of 20 seismic stations which are highly extensive seismic array. It allows us to find the more specific attenuation characteristics of high frequencies in study area. Distance and magnitude dependence of κ has also been investigated. Before calculating the κ , the corner frequency (f_c) has been checked so that the f_e can lie to the right of f_c to exclude source effects in the computation. Manually picked f_e is generally in the range of 10 to 25 Hz. The resulting κ_R is $9.2e-06$ and κ_0 is 0.0079. It is found that κ has no significant correlation with magnitude but it slightly depends on the distance. The site kappa (κ_0) of 0.0079 is similar with κ_0 from hard rock sites of Central and Eastern North America (CENA). The estimated site κ could be used as an input parameter in ground motion evaluations, site amplification studies, and seismic hazard studies for specific sites in the studied area especially for nuclear facility sites.