Evaluation of Subsurface Structures at KiK-net Stations in Hiroshima Prefecture

Takumi Hayashida[1]; Fumiko Tajima[1]

[1] Hiroshima U. Department of EPSS

The KiK-net (KIBAN Kyoshin network) consists of strong motion instruments and each station has two sets of accelerometers, one set is installed on the ground surface and the other one is in the borehole. There are 18 KiK-net stations in Hiroshima prefecture. The depths of the borehole stations range between 100 and 205 m. Hayashida and Tajima (2007) investigated subsurface site amplification factors (peak amplitude ratio) between the borehole and the ground surface and found that the amplitude ratios exceed several tens at specific sites. It is reported that the PS logging data of the individual KiK-net stations, which are available from the NIED (National Research Institute for Earth Science and Disaster Prevention) web site, do not always explain the subsurface site amplification sufficiently (e.g. Noguchi and Sasatani, 2004). In this study we check the subsurface velocity structures of each PS logging data and modify the structures by trials and errors, comparing the spectral ratios of the coda portion of observed S-waves with the transfer functions (i.e. the theoretical spectral ratios) based on the multiple reflection theory of elastic response for the layered structure. We selected events whose depths are over 50 km and located at the epicentral distance of less than twice of the focal depth to calculate the spectral amplitude ratios. The parameters of density and Q_S are estimated using a simple empirical relationship (Gardner et al, 1974; Silva, 1976). Finally we evaluate subsurface soil structures at each KiK-net station. We confirmed that the theoretical spectral ratios derived from the modified structures are in good agreement with the observed ones in a frequency band between 0.1 and 10 Hz. These modified models are considered to explain the site amplification factors better than the initial models. The improvement of subsurface structures considering 2D/3D effects and nonlinear amplification due to the incident directions would help provide more accurate waveform modeling on the ground surface.

Reference;

T. Hayashida and F. Tajima (2007), Calibration of amplification factors using KiK-net strong-motion records: toward site effective estimation of seismic intensities, *Earth Planets Space*, 59, 1111-1125.