B21

Estimation of Subsurface S-wave Velocity Structure using Microtremor Array Records in Kumamoto City

Mona IZADI, ○Shinichi MATSUSHIMA

In order to estimate the subsurface S-wave velocity structure at the target site of the Blind Prediction exercise for the 6th IASPEI/IAEE International Symposium on Effects of Surface Geology on Seismic Motion, the BIDO program (Tada et al., 2010) was used to estimate a phase velocity dispersion curve of Rayleigh wave from the passive array data. For each array, by adjusting the program parameters, the UD component of microtremor data was divided into segments with timespan of 40.96 sec. The coefficient analysis was done for each segment and the result was averaged over every ten segments. The curve fitting was then done for average of each group of ten segments and the final curve was obtained as the average of that of each group. The results of different analysis methods for each array were compared and results of SPAC method were the most stable for all of the array sizes. In order to eliminate possible effects of higher mode Rayleigh wave, Ballard's method (Ballard, 1964) was used to estimate an initial subsurface structure. The number of layers and layer thicknesses were taken from the subsurface structure model data JIVSM, provided by HERP, but the S-wave velocity values were changed to match the result from Ballard's method. P-wave velocity values and layer densities for this structure were determined by empirical equations (Ludwig et al., 1970) using the S-wave velocity values. This initial model was used to calculate theoretical phase velocity dispersion curves of Rayleigh wave. By comparing the theoretical phase velocity curve to the curves from the observation, portions from each array size were extracted and combined by eye-sight to estimate the final curve of Rayleigh wave fundamental mode. Also, the first higher mode was used to estimate the lowest frequency that can be derived from the observed data. Figure 1 shows the phase velocity dispersion curve obtained by combining the microtremor data analysis results of different arrays, as well as the theoretical phase velocity dispersion curve for the final adjusted structure.

A theoretical microtremor Horizontal-to-Vertical spectral ratio(MHVR) for this structure was calculated based on the diffuse field assumption (Sánchez-Sesma et al., 2011). On the other hand, the 3-component data of KUM-M-No4 station was used to obtain the observed MHVR for NS and EW components separately, near the K-NET station. Finally, the initial model was adjusted to fit the theoretical MHVR to the observed ones while maintaining the layer thicknesses as much as possible. Figure 2 shows the observed MHVR spectra for NS and EW components as well as the theoretical MHVR spectra for the final S-wave velocity structure. Figure 3 shows the final S-wave velocity structure as well as the JIVSM model and initially estimated structures.

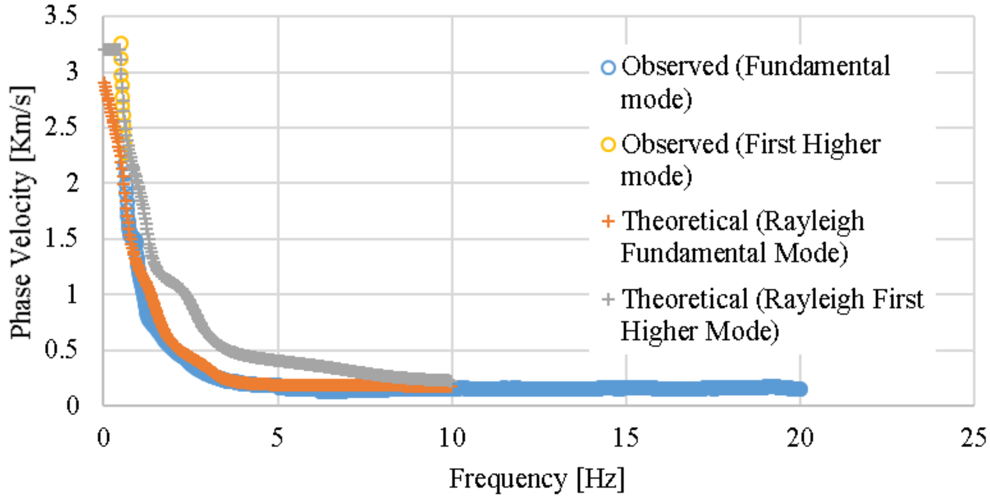

Figure1. Phase velocity dispersion curves

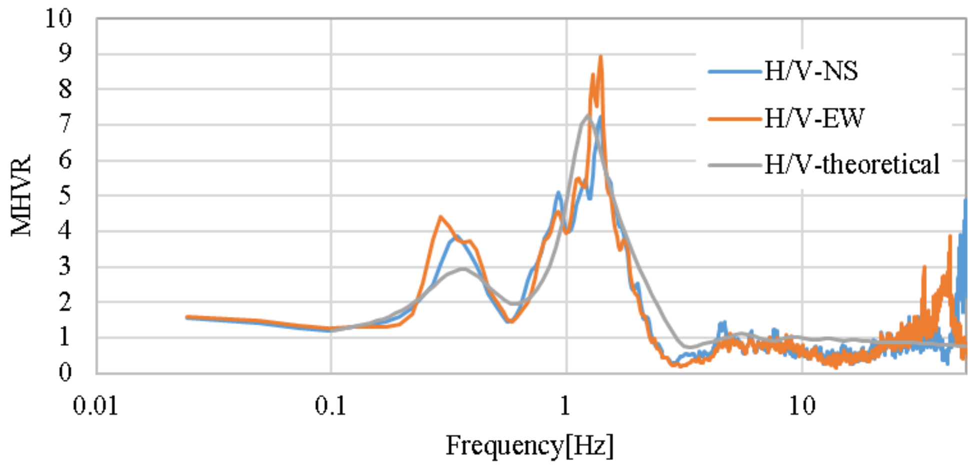

Figure 2. MHVR spectra

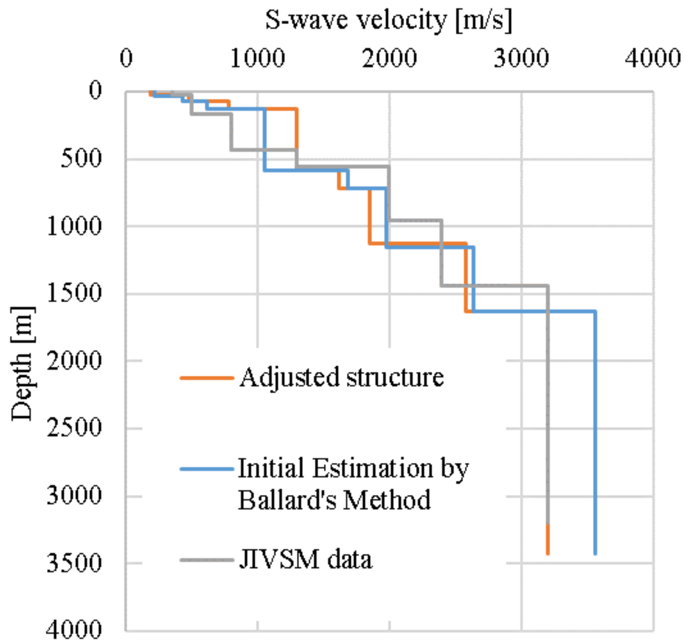

Figure 3. S-wave velocity structures