

Exploration of the velocity structure model in the Mukawa town, damaged area during the 2018 Hokkaido eastern Iburi earthquake

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The 2018 Hokkaido eastern Iburi earthquake (M_w 6.6, focal depth=37 km) occurred on 6 September 2018 at the Hidaka arc-arc collision zone, Hokkaido, Japan. The many building damages by strong ground motion were concentrated around K-NET Mukawa strong motion observation station (HKD126). Strong motion records had strong power in 1-2 second periods of the response spectrum to destroy the timber frame buildings. It is an important examination to know the cause of the generation of this destructive strong motion.

To understand the site effects of this strong motion, we estimate the velocity structure models by using the microtremor array and multichannel analysis of surface wave measurements at three sites; around HKD126 site, a hillside site located about 6 km north from HKD126, and midpoint between both sites. We carried out the microtremor array measurements ($R=1-2000$ m) on 14-16 December 2018. We used servo type velocity sensor (Le-3D/5s) and 24-bit data logger (DATAMARK LS-7000XT) with GPS time calibration. At small arrays ($R < \sim 10$ m), we used moving coil accelerometer (JEP-6A3, 10V/g). The fundamental Rayleigh wave phase velocity is examined with the spatial autocorrelation method. We also carried out a multichannel analysis of surface wave to emphasize the high-frequency side phase velocity. We set 24 channel 4.5 Hz geophones in interval 1 m with GEODE and 10 kg wood hammer. The phase velocity is examined with the Frequency-wavenumber method. The shear wave velocity structure models are estimated to fit the dispersion curve of the fundamental mode of Rayleigh wave using the genetic algorithm inversion method (Yamanaka and Ishida, 1998). The phase velocity data of the large array ($R=2000$ m) were used in common to the three sites.

Comparing the velocity structures, the $V_s=1300$ m/s layer's depth of HKD126 is shallower than the hillside site ones and midpoint depth is mid of both. This tendency of depth variation is the same as the seismic bedrock and subsurface structure depth variation of AIST model (Yoshida *et al.*, 2007) and J-SHIS V2 model (Fujiwara *et al.*, 2012). On the other hand, about the shallow part, engineering bedrock depth of hillside site is shallower than the HKD126. The midpoint's seismic bedrock is mid for the others, however, the surface soft soil deposit is detected as richer than the HKD126. These features of the shallow part structure's variation are able to confirm by the surface geology or V_s30 values of J-SHIS.

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