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Estimation of velocity structure using seismic interfenometry at Hsinchu, Taiwan

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Hsinchu is one of important areas in Taiwan, because there are many IT and IC industries are located and they are most important resources for Taiwanese economy. We can remember that the price of memories for computers has jumped up immediately after the 1999 Chi-Chi earthquake. This means that the business continuity plan (BCP) for the companies in this area is critical issue for the Taiwanese economy. For this purpose, we need an appropriate estimation of earthquake ground motion in a specific site, however, enough information is not available until now.

We have continued to model a ground structure around this area to apply to an estimation of earthquake ground motion. Shosaka et al. (2007) proposed three-dimensional shape of bedrock based on the gravity survey. In their model, the depth to the bedrock is deeper in the south-eastern mountainous area than in the north-western seashore area. To confirm this results, Kawatsure et al. (2009) and Iwahori et al. (2009) carried out array observation of microtremors, however, they could not reach the deepest bedrock because of the limitation of sensors.

Thus, to break this wall, we apply new observation systems and technique of seismic interferometry. We developed a new data logger with extremely low noise and applied simple moving-coil-type velocity sensors with 0.5-second natural period. We set 5 velocity sensors around the area with deep bedrock and observed continuously the microtremors for 50 days.

The technique of seismic interferometry was applied to the observed data, and Green's functions for vertical components are obtained among the sensors. Furthermore, applying multiple filter analysis for 7 sec to 1 sec, and the group velocities are estimated between 7 to 1 sec. In this time, although we can estimate an averaged structure between the sites, they suggested that a part of velocity structures estimated from microtremors does not agree with the density structure obtained from the gravity survey. For future analyses, we will try to explain the differences between the velocity and density structures around this area.

Keywords: Seismic interferometry, Green's function, microtremor