B09

Microtremor Observation at Damaged Areas by the 2018 Hokkaido Eastern Iburi Earthquake

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1. Introduction

On September 6th 2018, an earthquake measuring M_{JMA} 6.7 (M_w 6.6) occurred at a depth of about 37 km in the eastern Iburi region of southern Hokkaido, Japan. The earthquake was named "The 2018 Hokkaido Eastern Iburi Earthquake" by the Japan Meteorological Agency (JMA). During the earthquake, JMA seismic intensity 7 was recorded in Atsuma town and 6+ was recorded in Abira and Mukawa towns. Some masonry structures had heavy damage and some wooded houses had severe damage in these towns, but the damage was scattered within the towns. In order to investigate the cause of the heavy or severe damage and the reason of the scatter, microtremor measurements were conducted to identify the subsurface structure in these towns. The site planning for this microtremor observation was based on the damaged areas, because of the great damage caused by the earthquake. As key areas of damage, Mukawa town, Hayakita and Oiwake districts of Abira town were selected as target sites. The overview of the microtremor observations and the preliminary results obtained from the analysis of the data will be presented.

2. The Overview of the Microtremor Observation

The microtremor observation at the target sites were conducted during November 22nd and 24th, 2018. The single-station measurement and array measurement was conducted in order to obtain the microtremor Horizontal-to-Vertical spectral ratio (MHVR) and the phase velocity, respectively. These information will be used to identify the subsurface structure at the target sites.

The designed single-station microtremor observation points was 147 points including K-NET and KiK-net sites. The points were designed so that the interval between points are about 100m on lines that go through the damaged and undamaged parts of the town. The duration of observation for each point was 15 minutes.

As for the array microtremor observation, small arrays composed of three equilateral triangles with three different sizes were used. There were two designed array sizes which the side length of 2m, 6m and 18m (one sort) and 1.3m, 4m, and 12m (another sort) from smallest to largest, depending on the size of the available space, which means radius of the inscribed circle of each triangle is 1.155m, 3.464m and 10.392m (first sort) and 0.751m, 2.309m and 6.928m, respectively. The total observation points for one array are 10 points.

3. The Result of Microtremor Observation

Because of the time constraints, designed points were not all observed and 107 points were actually observed. Figures 1 to 3 show the distribution of the single-station points and array observation sites at Mukawa, Hayakita and Oiwake districts, respectively.

Some of the points failed to obtain the data due to the malfunction of the seismometers.

3.1 MHVRs at the single-station points

The MHVRs were calculated from the observed microtremor data. Figure 4 shows an example of the MHVRs obtained at Mukawa. These sites show directional dependency, which is an indication of lateral heterogeneity in the subsurface structure.

Figure 1 Microtremor observation sites at Mukawa

Figure 2 Microtremor observation sites at Hayakita

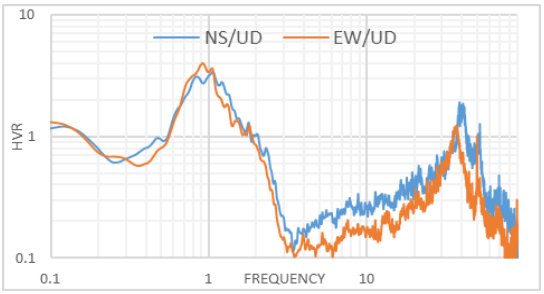
Figure 3 Microtremor observation sites at Oiwake

3.2 Phase velocity at the array observation sites

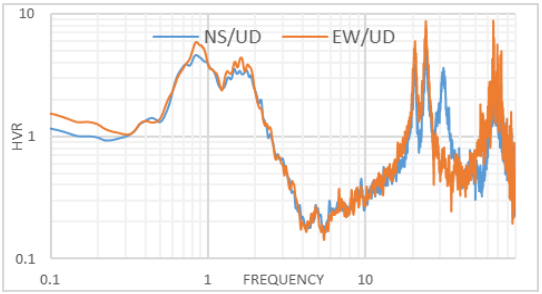
The phase velocity was obtained from the microtremor array observation data using BIDO (Tada et al., 2007) software.

4. Summary

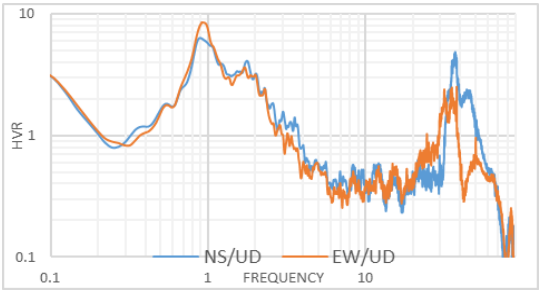
Microtremor observation was conducted in the damaged areas by The 2018 Hokkaido Eastern Iburi Earthquake. The MHVRs show complex characteristics, suggesting that the subsurface structure at the observed sites have complex subsurface structures. The identified phase velocity shows that there are low velocity layers in the shallow part. These preliminary results will serve as information for the further research.



(a) M1



(b) V3-5



(c) V7-1

Figure 4 MHVR at some points in Mukawa

Acknowledgments

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Reference

Tada, T., I. Cho, and Y. Shinozaki, 2007, Beyond the SPAC method: exploiting the wealth of circular-array methods for microtremor exploration, *Bull. Seism. Soc. Am.*, 97, 2080-2095, doi:10.1785/0120070058.