

Very Dense Seismic-Array-Observation in Furukawa District, Miyagi, Japan

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On March 11, 2011, off the Pacific coast of Tohoku Earthquake (Mw9.0) hit eastern part of the main land, Japan, and killed more than ten thousand of persons mainly due to great Tsunami. On the other hand, strong ground motions during the earthquake were observed in almost the whole region in Japan by K-NET, KiK-net organized by NIED, and the other seismometer networks. At least 17 of K-NET and KiK-net stations observed over 980 cm/s² of PGA in horizontal components, and two stations observed over 6.5 of seismic intensity on JMA scale. However, damaged areas due to the ground motion do not correspond to either the large PGA or seismic intensity sites.

We focus on Furukawa district of Osaki city, where severe residential damages occurred at the downtown. Ground motion records are available at two stations, MYG006 (K-NET) and JMA Furukawa (JMA), located in the area. They observed about 550 cm/s² of PGAs, whereas the peak value of pseudo-velocity response spectra with 5% damping are about 250 cm/s at 1.5s of period, which were almost similar to JMA Kobe and JR Takatori records during 1995 Kobe earthquake. The damage level was different between the areas within several hundred meters from MYG006 and JMA Furukawa stations, which are about 1 km away from each other. The severe damages were concentrated within the area about 1x1 km² including the JMA station. This implies that the ground motion characteristics were not uniform in sub-kilometer scale, and the existing two stations are not enough to clarify the distribution.

We scattered dozens of low-cost seismometers, namely ITK sensor, around the area about 2x2 km² in Furukawa district. The observed data are sent to the remote server through the Internet connection in real time. The seismometers were installed beside the volunteer's houses introduced by Osaki city office. The volunteers can access the interactive information service, e.g. real-time seismic intensity.

In this study, we analyze the ground motion data of aftershocks, and show the differences of ground motion characteristics. We also performed gravity survey and microtremor observations in order to identify the underground structures. The mechanism causing difference of the ground motion characteristics is discussed based on the survey results.

Keywords: off the Pacific coast of Tohoku Earthquake, Ground motion, Furukawa, Seismic array observation