

## Estimation of site amplification from observation of aftershocks and microtremor explorations near KiK-net Haga station

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Strong shaking was experienced in the wide area of the northern part of Japan during the 2011 off the Pacific coast of Tohoku Earthquake of 11 March, 2011. Seismic intensities at some of the sites reached the maximum value of 7 in the intensity scale of Japan Meteorological Agency (JMA). K-NET Tsukidate in Miyagi prefecture is one of these sites where the observed PGA is more than 2G. Several studies investigated the reasons for the large PAG and distribution of the ground motion features in the vicinity (Hayakawa et al., 2011; Matsushima et al., 2011; Yamanaka et al., 2011). The Kik-net Haga (TCGH16) in Tochigi prefecture is also the site with a seismic intensity of seven during the main shock. Tanaka and Nobata (2011) compared strong motion data at the sites around the Haga station to know effects of shallow and deep soils.

In this study we investigated site amplifications of S-waves in shallow soils near the KiK-net Haga station. We first conducted aftershock observations in the vicinity of the site by installing temporary 8 stations within 1 km. One on the sites is located with relatively good soil conditions in a hill. This site is used as a reference site in this study. The other sites are situated in plain area. We also conducted microtremor array explorations to deduce shallow S-wave velocity profiles at the aftershock observation stations. From the observed data we estimated the local site amplifications of S-waves in the shallow low-velocity layers.

It is found from analysis of aftershock records during moderate events with magnitudes less than 5.3 that the predominant period of the amplification for all the sites are 0.2 to 0.3 seconds except for the reference site. This predominant peak can be identified in strong ground motion records at the TCGH16 station. The SPAC analysis of the array records from the microtremor explorations revealed S-wave velocity profiles down to 20 meters at all the sites. The average S-wave velocity of top 30 meters in the S-wave velocity profile was compared to know the differences of shallow soil amplifications. The average velocity distributes from 220 to 300 m/s at the sites except for the reference site. The reference site has an average S-wave velocity of 500m/s. We concluded from the investigations that the site amplifications due to shallow soils in the vicinity of the TCGH16 station are characterized by a dominant peak at a period from 0.2 to 0.3 second. The site effects can be also expected during the main shock in the area.

Keywords: 2011 off the Pacific coast of Tohoku Earthquake, strong ground motion records, aftershock observation, microtremor exploration, site amplification, shallow soil