

Site amplification characteristics in Nakayama and Sagae, Yamagata Prefecture

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The seismic intensity measured at Nakayama Town station, Yamagata Prefecture, is larger than surrounding cities and towns by about 1 JMA scale. It is desirable that the measured seismic intensity represents the shaking in the area. We set 3 seismic observation stations in the populated area in Nakayama Town in order to compare the site amplification between these stations. Four stations were also set in an adjacent area, Sagae City, to compare the amplification characteristics with Nakayama Town. Referring the J-SHIS map provided by NIED, the station sites were selected so that the engineering geomorphologic classification was different between stations in each area. The distance between stations was 1-2km in each area, and about 5km between two areas. 1Hz, three component velocity seismograph LBS3 (Clover tech Inc.) was employed, and waveforms were continuously recorded at 100Hz sampling. Sensors were put on a footing beam outside of a building at 4 stations, and on a concrete construction at 3 stations in public facilities.

Observation period was 4 months from the end of July to the end of November, 2017. Waveforms of a transverse component from 17 earthquakes were analyzed by using SAC. A Fourier spectrum was calculated for records of the ten seconds length starting from 0, 10, and 20 s after the S-wave arrival. After smoothed by applying a moving average over 9 samples, the amplitude spectrum was divided by that of the station on a gravelly terrace in Sagae, whose site amplification was expected to be the smallest among 7 stations. For 1Hz component, that is thought to greatly influence the seismic intensity, spectral ratios were mostly larger at stations in Nakayama than Sagae for the three time windows. For the time window starting from the S wave arrival, the spectral ratios at 1Hz averaged over 17 events were 4.9, 2.6 and 1.9 at natural levee, alluvial fan and gravelly terrace stations in Nakayama, and 1.7, 1.3 and 1.1 at back marsh and two alluvial fan stations in Sagae, respectively. According to J-SHIS, a high site amplification factor is assigned to the back marsh. However, the spectral ratio obtained was not high for the station on the back marsh. The station was put on the facility built on the embankment. The ground shaking may be weakened through the embankment. The station on natural levee in Nakayama and that on alluvial fan in Sagae were set at the site where the seismic intensity observation points are installed. The average of spectral ratio between these two stations was 4.4 at 1Hz. In the future, we will check the peak ground velocities and compare them with the site amplification factor by J-SHIS.

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