

Estimation of subsurface structure using microtremor H/V spectral ratio in Unzen hot-spring region

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The Shimabara peninsula in Nagasaki Prefecture, located on the west edge of the Beppu Shimabara graben which cross the center part in Kyushu in the east and west. And 70 percent of the peninsula is composed by volcanic product of Unzen volcano. It is pointed out by the Central Disaster Prevention Council (2008) that the long-period strong ground motions are amplified like the plains part in the peninsula though the sedimentary layer of Quaternary Era is not thick. Especially, the result that the long-period strong ground motions amplify to the same extent as Kanto plains is obtained in the Unzen hot-spring region in the center part in the peninsula. It is a little violent to say that the amplifying characteristic in this region where inhomogeneity is strong from the record of only one seismometer station though it is thought that the soft ground because of the volcano fumarolic field is a cause of the increase of the long-period strong ground motions. Then, the our study attempted the presumption of a peculiar amplification ground structure that differed from the plains part by paying attention to the microtremor as an evaluation method of the ground structure, observing the microtremor at large number of sites in the Shimabara peninsula including the Unzen hot-spring region using the wideband seismometers. First of all, the microtremor observations using three components seismometer were carried out in August and September 2009 to understand the ground structure in the Unzen hot-spring region. Moreover, a continuous observation was carried out at rock site, Ikenohara observation point, where was covered with thick new period Unzen volcano lava to confirm the change in the microtremor movement level during moving observation. The microtremor observation measured for about 40 minutes in each observation point by wideband seismometer of characteristic period 120 seconds (Trillium series Compact made by the Nanometrics company). Power spectrum of UD, NS, and EW was calculated, make the ensemble average of eight times, and power ratio of the horizontal and vertical spectrum (H/V spectrum ratio) was estimated. Here, the horizontal component was assumed to be a square root of the second power harmony of the NS component and the EW component.

Moreover, it is confirmed that the H/V spectrum ratio doesn't depend on the measurement time of the day and seasons, evaluating a temporal variation at Ikenohara observation site. In addition, to compare seismic strong ground motion H/V spectrum ratio with microtremor H/V spectrum ratio at the Ikenohara observation site can understand whether microtremor H/V spectrum ratio adequately show the site effect in the Unzen hot-spring region. If it is possible to use it as a technique to which microtremor H/V spectrum ratio presumes the seismic strong ground motion, the measurement of the microtremor is effective for the understanding of the site effect of strong ground motion during a large earthquake.

Though spectrum ratio of peak frequency 0.1-0.2Hz of H/V spectrum ratio obtained at a lot of observation sites in the central part of the hot spring of Unzen, the difference is very intense in each site. So, it has been understood that horizontal inhomogeneity of the subsurface structure is very high. The inhomogeneity is caused by consisting of wetland area and sulfurated rock area within a big old volcanic crater of Unzen hot-spring region. It is required to increase microtremor observation sites in order to make the contour map of a detailed H/V spectrum ratio and estimate

the subsurface structure in the Unzen region.

Keywords: H/V spectral ratio, microtremor