

Study on vibrational characteristics of Mt.Fuji for applicability of monitoring volcanic activity

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Mt.Fuji is Japanese representative volcano. If it erupts, its influence is immeasurable. So it is important to predict its eruption to prevent the volcanic disaster. However, there are still many problems with a volcanic eruption prediction study, and we need to develop new observation techniques and establish it in the future.

In this study, as a method for monitoring Mt.Fuji activities, we attempted to apply the technique based on microtremor measurement which is used for vibrational characteristic evaluations such as buildings. First, we verify if we can estimate the frequency characteristics of Mt Fuji with microtremor observation. The microtremor observation was conducted from 6 to 9 August 2012. 7 locations are prepared in the observation at the 2nd and from the 5th to the 10th stations of Mt.Fuji. We temporarily installed a three-component accelerometer and a data logger at each station.

In the analysis, we made a spectral analysis of the observed records, and we found the predominant frequency around 0.21 Hz in the NS' component and around 0.20Hz in the EW' component. Amplitude distribution at this frequency is similar to fundamental mode shape of vibration. However, the vibration at the 6th station at the predominant frequency shows slight different features. We confirm from a cross-correlation function in the vicinity of the predominant frequency that delay time between the 6th and 10th stations is greater than others. The result suggests the influence of the higher mode is greater than that of lower mode in the area lower than the 6th station.

We also conducted FEM analysis for vibrational characteristics of the real model based on the digital elevation model data. The primary natural frequency of the model is about 0.22 Hz, and this is almost the same as the results with the observations. This shows that it is possible to estimate the frequency characteristics of Mt.Fuji with microtremor observation. Next, we conducted FEM analysis of the magma model, and we found that detection of the volcanic activity may be possible from the change of vibrational mode shape or the contribution ratio of higher mode. However, it is necessary to improve the accuracy of the observation.

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Keywords: Mt.Fuji, vibrational characteristics, volcano, microtremor observation