Seismic activity beneath Kikai Caldera by using Ocean Bottom Observation

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Kikai submarine caldera located in the southern part of Kagoshima prefecture is located on the volcanic front of the southwestern Japan arc. It was recently revealed that a giant lava dome with a volume of 32km ^{3} is created after super eruption at 7.3 K.a. (Tatsumi et al., 2018). Seismic observation with the T/S Fukae-maru of Kobe University is conducted by five short-period ocean bottom seismographs (OBSs) which were in the deepest part of the caldera from October 19, 2016 to March 14, 2017. As the result, about 1100 volcanic tremors like as swarm with a fundamental frequency of around 2Hz were detected during the period and it was occurred very frequently beneath the caldera. In addition to these low frequency tremors, about 32 high frequency earthquakes with dominant frequency of over 5Hz and many monochromatic tremors were detected, but at the onshore station of Satsuma Iwo-jima no signals corresponding to these volcanic earthquakes have been detected.

In general, volcanoes are strongly inhomogeneous regions compared with ordinary crusts. The seismic waves propagate to stations under the influence of scattering and diffraction due to random inhomogeneities along the seismic ray paths. Actually, the monochromatic tremor observed in the Kikai caldera is detected only at the stations near the place where the hydrothermal activities were observed by the high-performance camera of the remotely operated vehicle (ROV) and multi-beam echosounder mapping, suggesting strong three-dimensional inhomogeneity in the volcanic body. An amplitude envelope method is powerful tool for analyzing seismic waves propagating through such a three-dimensional inhomogeneous medium. In this study, a method based on Takahashi et al. (2007) focusing on peak delay time from direct S-wave onset to the maximum amplitude arrival of its envelope was applied to about 1100 low frequency tremors and about 32 high frequency earthquakes.

For high frequency earthquakes and some low frequency tremors, we picked up the onset times arrival of P- and S-waves recorded clearly to determine the hypocenters. The hypocenters were vertically divided into two parts at a depth of around 10 km, most of which occurred at the shallower parts were laterally expanded within the lava dome. In addition, we measured the peak delay times for S-wave seismograms filtered at four frequency bands of 2-4, 4-8, 8-16 and 16-32 Hz and calculated root mean square envelope for the sum of two components in those bands to investigate a frequency. In this presentation, we will discuss characteristics of the obtained peak delay times.

