

P-wave velocity structure of Sakurajima volcano using data of seismic survey at 2008

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Sakurajima, located at south Kyushu, is andesitic volcano. The eruptive activity at the summit crater Minamidake began in October 1955 and explosive eruptions have frequently occurred at the summit crater, producing more than 7800 explosive eruptions as of the end of 2008. In June 2006, May 2007 and February and after April 2008, eruptions occurred at east flank of Minamidake (Showa crater). In hypocenter distribution determined by permanent seismic stations operated by Sakurajima Volcano Research Center (SVRC), Disaster Prevention Research Institute, Kyoto University, the hypocenters of A-type (Volcano-tectonic earthquakes) and eruption earthquakes were located beneath the summit crater, depths ranging from 1 to 3 km during activity of the Showa crater. The hypocenters were same location during activity of the Minamidake summit crater (Tameguri et al., 2008).

In case of shallow volcanic earthquakes around the active crater at Sakurajima volcano, the events have been determined by using arrival time of the first motion, assuming a homogeneous half-space with P-wave velocity of 2.5 km/s. Permanent seismic stations operated by SVRC are combined with seismometers installed on the surface in vaults and in borehole (depths ranging 85-355 m). The seismometer at the closest station of the crater is installed on the surface. Residual of observed arrival times and synthetic ones at the surface station was usually positive value. In contrast, the residual of the arrival times in borehole station at the southern part of the crater was mostly negative value. Seismic velocity near the surface may be slower than assumed velocity of 2.5 km/s due to pyroclastic deposit. And, the velocity towards to the borehole station at the southern part may be faster than the assumed velocity, because the seismic wave may propagate faster velocity zone near southern edge of Aira caldera. It is possible that location error of hypocenter determination is caused by the difference between assumed seismic velocity and propagation velocity of the station from the hypocenter. In order to improve the location error of the hypocenter determination, we have to use three-dimensional P-wave velocity structure.

Seismic experiment was carried in order to research seismic structures of Sakurajima volcano and Aira caldera in November, 2008. The seismic experiment was used by 15 shot points of dynamite and installed about 640 temporary seismic stations. In this study, the three-dimensional P-wave velocity structure in the Sakurajima volcano is estimated using arrival time of the first motions at 425 stations of 8 shots. And, we determine the hypocenter of A-type and eruption earthquakes during activity of Showa eruption using the obtained three-dimensional P-wave velocity structure. We discuss spatio-temporal change of hypocenter distribution beneath the active crater using the relocation data.