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Seismic velocity model in the northeast part of Sakurajima Volcano

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Seismic velocity structure is constructed beneath reflection lines in Sakurajima Volcano, south Kyushu, Japan, from the first arrival of the seismograms obtained in the project Sakurajima 2008, controlled seismic experiment through the forward modeling.

Aira caldera as a back ground of Sakurajima Volcano had appeared after the huge pyrocrastic eruptions, those of Osumi pumice deposits and Tsumaya pyrocrastic flow, ca. 29ka ago.

Sakurajima Volcano had appeared at the south margin of the caldera on ca. 13ka ago. Sakurajima Volcano has been still active and is one of the most active volcanoes in Japan. Its magma chamber and evolution history have been presented in previous geophysical and geological studies.

However, Detail structure of the volcano and the caldera is still unknown. This study can provide a new view point on relationships between the volcano and the caldera.

The forward modeling has been constructed with ray-tracing method with the basis of trial and error. The targets of the modeling are the lines S1-S6 and S6-S4 striking NW-SE, and the line S6-S5 striking in order to determine velocity structure beneath the reflection lines in the northeast part of the volcano.

The observed travel time curve includes progressive arrivals which can reflect stair-like structure at the exact wall of Aira Caldera. The models were updated through the basis of trial and error. SEIS88 seismic ray tracing code is used in the modeling. Assumptions of each layer in the models are as follows; Boundaries are described as velocity contours for the top and the bottom. Velocities are given at the top and the bottom boundaries.

The final models are obtained for three lines, S1-S6, S6-S4, and S6-S5 and they show following distinguish features. Steep depressions are observed in the sections S1-S6 and S5-S6 and steeply dipping high velocity layer are observed towards Kagoshima bay beneath the shot point S6. Low velocity layers are presented in 3-4km depth beneath Sakurajima Volcano and beneath Wakamiko Caldera, north east of the volcano.

Steep depressions can be inferred as sections of funnel-like depression structure in the north of the volcano. Steep dipping structure can be correlated with the exact wall of the caldera. Both low velocity layers are located beneath volcanic activity zones such as Sakurajima Volcano and geothermal activities in the bottom of Kagoshima bay. It is significant that the low velocity layer beneath the volcano is coincident with the magma pathway presented by previous study and with low impedance zone presented in reflection study.

Keywords: Sakurajima Volcano, Crustal structure, Aira Caldera, Seismic velocity structure, Seismic survey