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The shallow structure imaging of the Sakurajima volcano with the Pseudo-Reflection method

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Pseudo-Reflection profiling is applied to explosion seismograms in Sakurajima Volcano, Kyushu, Japan. Shallow structure of the volcano will be discussed in this presentation.

Sakurajima Volcano which is one of the most active volcanoes in Japan is located at the south margin of Aira Caldera in south kyushu. Effusive activities have been recorded on 1914, 1946 which include lava flow since modern science had imported in Japan. Explosive activity continues at the summit crater of Minamidake since 1955, and revival of Showa crater was occurred on June 2006. A center of activity seemed to be altered to Showa crater since then. Therefore Sakurajima has been a target of scientific interest.

There are some significant depths in discussions about explosion mechanisms and about geodatic activity of the volcano, such as 1 to 4km depth for seismological events, 2.5km depth for the gravity basement, 5km depth for hypothetical magma chamber, and 1km depth for low and high resistivity layers. Some core samples are available from bore-hole construction of the stations in Sakurajima Volcano. Discussion on detailed shallow structure of Sakurajima Volcano is one of the most important task in volcanological studies.

Data used in this study are obtained through a controlled source seismic experiment, The 2008 Sakurajima project. The project included two dense seismic lines with 221 stations and 15 shot points. The seismic logger LS-8200SD and the 4.5Hz sensor is installed at a station on the line. Seismograms are acquired with 2ms sampling for nine hours.

The method, Pseudo-reflection Profiling, is a sort of correlation seismology. Multiple reflection components are extracted and processed into zero-offset reflection seismogram. The processing includes these steps, sorting, grouping, gain control, auto-correlation, coefficient of variance test, equivalent incident waveform estimation, deconvolutions, and static corrections. Two final profiles are obtained for the lines NS and EW.

Some prominent reflection horizons A to J can be recognized in the profile of the line NS and horizons I to IX can be recognized in the profile for the line EW. Some of these are correspond to the bottom of lava flows. Piled up pattern of the horizons is correlated as a cross section of Kitadake lava flows in the northern part of the line NS. However, less reflective zone appear in 100 to 800m b. s. l. in the profile. The less reflective zone corresponds to the low resistive layer in the AMT profile and inferred as pyrocrastic materials from ocean bottom eruptions. Two horizons are coincident in their depth with those from the conventional reflection analysis in the same lines. These results can be contributed to discussions on evolution history and explosion mechanisms.

Keywords: Sakurajima Volcano, Shallow structure, Seismic reflection profile, Pseudo-Reflection profiling, Seismic survey