

Seismic refraction and wide-angle reflection experiment in southern Kyushu, Japan: (1) the 2017 exploration report

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[1] Primary Objective

Southern Kyushu is a typical island arc region: subduction of Philippine Sea plate under Kyushu off Hyuganada with high seismic activity, the Aira caldera with active volcanic activity, the extending Okinawa trough, and the East China Sea. It is important to recognize the crustal activity in the individual activity to be caused by interaction between each area. Our project is aimed at clarifying the detailed velocity structure of the crust beneath southern Kyushu.

It is also concerned about the occurrence of large-scale eruptions at the Aira caldera larger than the 1914 Taisho eruption in Sakurajima volcano. Accordingly, we also intend to reveal the caldera structure of the Aira caldera in order to deepen the understanding of the present magma supply system beneath the Aira caldera.

[2] Report of Seismic Exploration in 2017

Seismic exploration using artificial sources was conducted in November 2017, in order to clarify the detailed velocity structure in the crust beneath southern Kyushu. Our seismic profile runs transversely across the Osumi Peninsula, the central part of the Aira caldera, the Satsuma Peninsula, the Koshiki Strait and the Koshiki Islands. On the about 165 km long profile, we deployed 864 temporary seismic stations at about 110 meters intervals in the land area, 18 OBSs at about 1 km intervals in the sea area of the Aira caldera, 24 OBSs at about 2 km intervals in the Koshiki Strait, and 9 shot points in the land area with charges of about 200 kg dynamite or hydrous explosive.

The land seismic stations in the Satsuma Peninsula and the Koshiki Islands equipped a 4.5 Hz vertical

seismometer and a portable data logger ” LS-8200SD” . The other stations located in the Osumi Peninsula had a 5 Hz vertical seismometer and a portable data logger ” GSX” . Seismic waves were digitally recorded by these loggers with 250 Hz sampling. The locations of the stations and the shots were basically measured by handy GPS instruments. The OBSs were equipped with a 4.5 Hz or 1.0 Hz three components seismometer.

We successfully observed the seismic refraction and reflection signals generated from each shot. It is difficult for the stations located in the Satsuma Peninsula to identify the first arrivals of seismic waves produced by the shots located in the Osumi Peninsula. This fact implies that the signals are greatly attenuated passing through a shallow area in the Aira caldera. On the other hand, reflection phases were observed in the whole profile.

[3] Plan for Seismic Exploration in 2018

The exploration aimed at revealing the detailed velocity structure beneath the sea area will be conducted in November 2018. In a plan, we are planning to install two non-explosive sources: (1) a seismic airgun blasting system in sea area and (2) seismic vibrators in the land area. A distribution of the land stations and the OBSs will be basically same as that in 2017. In addition, we have a new seismic profile to deploy the land stations surrounding Sakurajima volcano.

Acknowledgements : This project is mainly funded by Kyushu Electric Power Co., Inc.

キーワード : 速度、構造、九州

Keywords: velocity, structure, Kyushu