Seismic refraction and wide-angle reflection experiment in southern Kyushu, Japan ~ the 2017 exploration report ~

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[1] Primary Objective

South Kyushu is a typical island arc region: subduction of Philippine Sea plate under Kyushu off Hyuganada with high seismic activity, the Aira caldera with volcanic activity, the extending Okinawa trough, and the East China Sea. Our project is aimed at clarifying the detailed velocity structure of the crust beneath south Kyushu. It is also concerned about the occurrence of large-scaled 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.

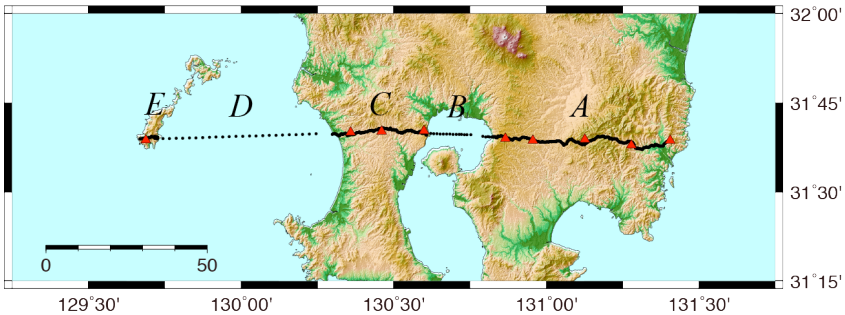

Figure 1. The whole seismic profile. (Black dots=stations, red triangles= shot points,)

[2] 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. As shown in Fig. 1, 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 100 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 with charges of 200 kg dynamite in the land area.

We successfully observed the seismic refraction and reflection signals generated from each shot. Figure 2 shows a cross section along the profiles obtained by applying the time-term method to the travel time data. Further travel time analysis such as a ray tracing procedure will be carried out after the 2018 exploration.

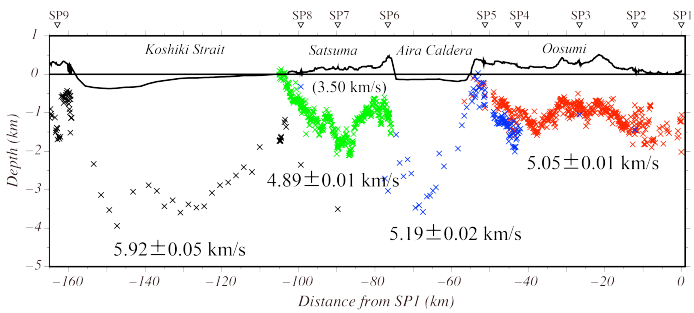

Figure 2. Cross section along the profile estimated by the time-term method.

[3] Plan for Seismic Exploration in 2018

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