

# Shallow Velocity Structure Beneath the Aira Caldera and Sakurajima Volcano as Inferred from Refraction Analysis of the Seismic Experiment in 2008

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We performed refraction analysis for the first P-wave arrival time data observed in the seismic experiment in 2008, and estimated a shallow velocity model up to 3 km depth beneath the Aira caldera and Sakurajima volcano. We found that a basement layer with a velocity of 4.6–5.0 km/s, which corresponds to geologically the Shimanto Group, inclines toward the central part of the Aira caldera. A low velocity zone with a velocity of 4.2–4.4 km/s is located in a depth range 1.5–3 km in the central part of the caldera. This low velocity zone suggests high activity of the magma plumbing system from the deep magma reservoir distributed beneath the caldera. It is found that the basement layer steeply falls down from 1 km to 2.5 km in depth along the northwestern boundary of the Kagoshima graben. The velocity structure in Sakurajima volcano is characterized by a zone with a velocity of 3.6–3.7 km/s. Moreover, we present a possibility that the underground structure strongly restricts an expanse of a focal region of each different type of the volcanic earthquakes.

**Key words:** Sakurajima, Aira caldera, velocity structure

## 1. Introduction

The Kagoshima bay occupies the southern part of Kagoshima graben (Tsuyuki, 1969). The Aira caldera, approximately 20 km in diameter, is located at the northern end of the Kagoshima bay. As presented in Fig. 1, Sakurajima volcano, located at the southern rim of the caldera, is well known to be one of the most active volcanoes in Japan.

Many geological investigations have been carried out in and around Sakurajima volcano. Kobayashi (1988a, b) described detailed geology of Sakurajima volcano, and published a geological map of the volcano. According to Hayasaka *et al.* (1978) and Aramaki (1984), the Cretaceous Shimanto Group, a basement composed of alternation of

strata of sandstone and mudstone, steeply inclines along the boundary of the Kagoshima graben and is considered to be located at a depth more than 1 km beneath Sakurajima.

Yokoyama and Ohkawa (1986) carried out gravity measurements in the Aira caldera and showed the regional gravity anomaly distribution. Their result shows that the gravity basement beneath Sakurajima volcano is located at a depth of about 2.5 km. Miyamachi *et al.* (2000) presented the detailed gravity anomaly distribution in Sakurajima island from the high dense gravity measurements and estimated the location of a vent of “Satsuma (P14, Sz-S)”, which is the most voluminous pumice fall deposit from Sakurajima volcano (Kobayashi, 1988a). Komazawa *et al.*

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