

Self-potential distribution on Kaimondake Volcano, Japan

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Kaimondake volcano is located on the southern tip of the Satsuma Peninsula. Eruptive activity started about 4000 years ago and 12 major eruption deposits were recognized. During historic age, 2 large eruptions were occurred in 874 and 885. It has been dormant for more than 1100 years (Fujino and Kobayashi, 1997). In December 2000, a fumarolic activity was found on the summit area, although the temperature of steam was 14 degrees and the activity was temporal one. In the 885 eruption, the central cone was formed inside the summit crater (Hachikubo). A lava dome capped the uppermost part of the cone.

A self-potential (SP) anomaly of about a few hundreds to more than a thousand millivolts was observed on many active volcanoes. Electrokinetic effect associated with subsurface fluid upflows is considered to be the most probable cause of such a large anomaly, so that the SP data are often used as an indicator of the hydrothermal activity of volcanoes. However, Kaimondake has been dormant for a long time and remarkable geothermal activity is not observed, which can bring us a base knowledge that is essential to understand the SP anomaly on active volcanoes

We conducted self-potential surveys on Kaimondake volcano 3 times, in May and December 2000 and in December 2001. In addition, near surface resistivity, which is closely related to the appearance of SP, was measured by a VLF-MT method in November 2000. SP distribution showed decreasing tendency of about $\sim 3\text{mV/m}$ as the altitude of measurement point increases. The lowest potential showed less than $\sim 1400\text{mV}$. Three negative peaks were found at about 450m a.s.l., 750m, and the summit area. Those areas correspond well to the distribution of lava flows or lava dorm. Relatively high SP areas were formed between them, although those scales were small. Surface resistivity showed about a few hundreds ohm-m over the edifice, although higher resistivity was found around areas corresponding to the negative SP anomalies.

In order to investigate the cause of relatively high SP anomalies, typical volcanic rocks were collected at 11 points along the SP measurement route in April 2002 and zeta-potentials of those rocks were measured (Hase, 2004). Results showed that zeta-potentials of ~ 1 to -20 mV were measured. The rocks at the foot of the volcano showed nearly constant value, while the other showed variations corresponding well to the SP distribution. Based on those observational and experimental results, we will present the cause of SP anomaly on Kaimondake volcano.