Aerial geothermal survey at some volcanoes in Satsunan Islands, South Japan

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There are some active volcanoes in Satsunan Islands south off Kyushu, Japan; those are Satsuma-Iwojima, Kuchierabujima, Nakanoshima and Suwanosejima. Aerial geothermal survey has not been conducted at the volcano. In this paper, the results of the aerial geothermal survey by using infrared scanners will be presented.

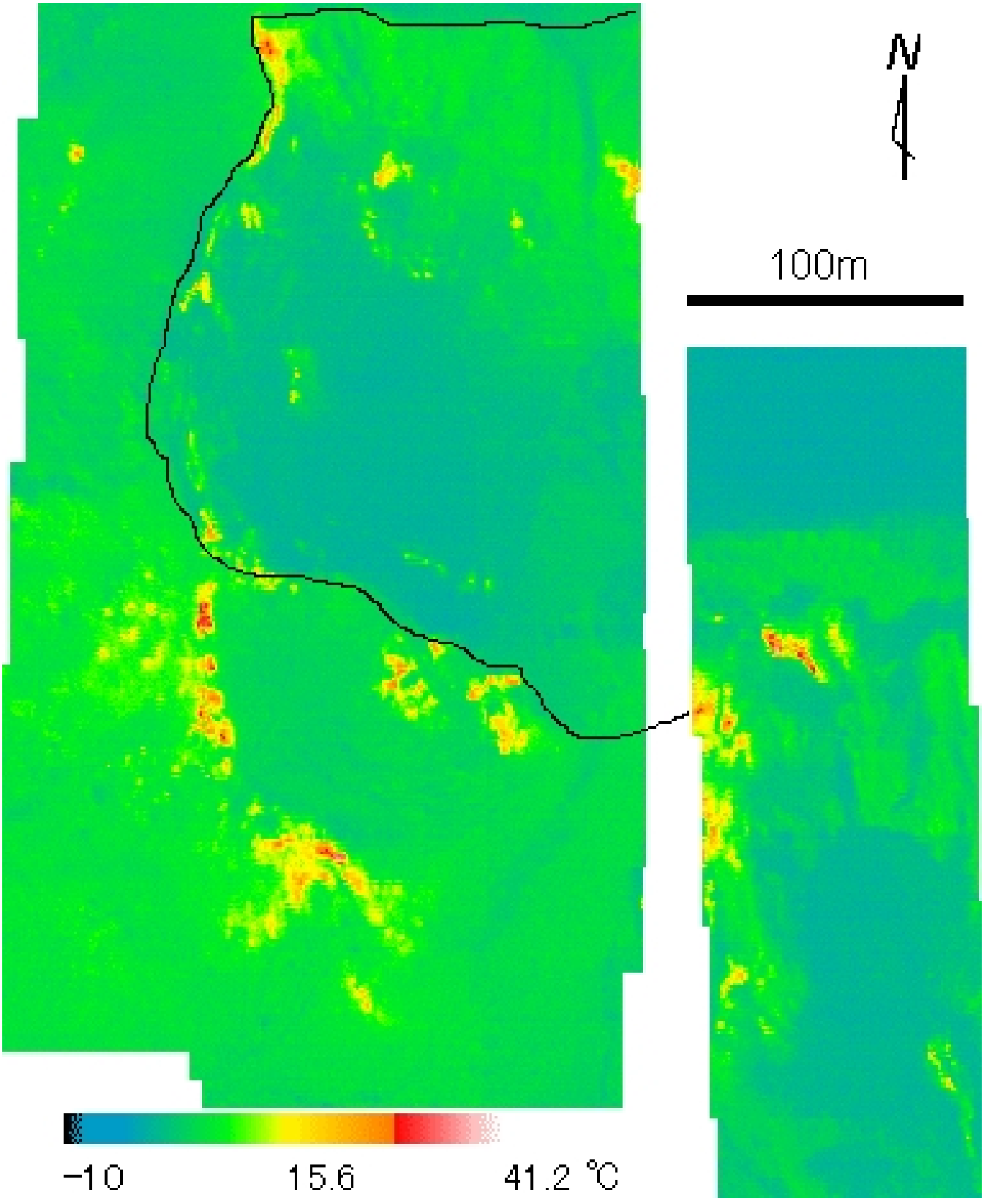
The geothermal survey at the volcanoes was conducted on February 2, 2001. Infrared images were taken from a hole of the bottom of the cabin of a helicopter by using the infrared scanner TVS2000MKII. Elevations of the flights were 1000-1600 m, which is 500 to 800 m above the summit craters. An image of 130-200m length and 90-140m width was taken by a shot.

Here, we reported the results of the survey at Kuchierabujima volcano. Two remarkable craters exist at the summit of the volcano; Shindake and Furudake craters. Strong phreatic eruptions have been repeated at Shindake crater causing hazards to residential areas by volcanic bombs. It is inferred that hydrothermal system is active because of its strong phreatic eruptions and many hot spring at the foot of the volcano. In 1999, seismicity beneath the summit crater increased after 19 years-dormant period since the last eruption in 1980.

High-temperature areas were detected around the Shindake crater and inside Furudake crater. Distribution of the surface temperature around Shindake crater is shown in the figure. Geothermal anomaly with the maximum temperature of 39.1 degrees is distributed around the NW to SE rim of the Shindake crater and no high temperature was detected at the bottom of the crater. The area with anomaly corresponds to weak fumaroles. No high temperature was also observed at the east fissure where phreatic eruption occurred in 1980. There are some spots of geothermal anomaly in Furudake crater. The maximum temperature was observed at 34.1 degrees. The anomaly coincides with the fumaroles with continuous emission of volcanic gas with the temperature of 113 degrees.

Heat discharge rate is estimated based on the method by Sekioka(1983). Heat discharge rate around Shindake crater is estimated to be 14MW. Heat discharge rate in Furudake crater is 4.1MW which is 1/3 of that around Shindake crater. Totally, it is estimated that 18MW heat is discharged from the summit area of Kuchierabujima. Kagiyama et al. (1996) estimated heat discharge rate from the summit area of Kusatsu-Shirane volcano which has large crater lake and fumaroles. The rates are 1-2 MW from fumaroles and 20 MW from the crater lake. Although temperature and height of the fumaroles at Kuchierabujima volcano has decreased since the last eruption in 1980, geothermal activity is still active, compared with the other volcanoes with active geothermal area.

Eruptive activity of Strombolian style has continued at the summit crater of Suwanosejima since 1957 and the eruptivity declined in 1994. In 1999, seismicity of A-type earthquakes increased including two felt earthquakes and emission of volcanic gas increased. Such phenomena showed resume of eruptive activity. On December 19, 2000, it was found that two new vents were formed at flank of the scoria cone in the summit crater and large amount of volcanic ash was ejected. Aerial geothermal survey was conducted five days after and the maximum temperature in the scoria cone attained 450 degrees and the temperature in the new vents was 270 degrees. After the resume of the eruptive activity, explosive eruptions have been repeated in the time interval of 2-4 weeks. Aerial geothermal measurement on February 2, 2001 shows decrease in temperature to 82 degrees in the scoria cone. Weak emission of volcanic gas was observed at the time. Temperature in the crater strongly depends on the eruptive activity.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