

## Airborne survey of active volcano using portable infrared thermal camera - Usu, Noboribetsu and Tarumai -

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As a part of the joint geophysical and geochemical observations of Usu volcano in 2006, airborne infrared thermal surveys were conducted at Usu volcano, Noboribetsu geothermal area and Tarumai volcano. The observation was operated by a helicopter which has a hole on the floor for aerial photo of vertical direction. A portable infrared thermal camera (AVIO TVS-620) was fixed on the hole to face the ground perpendicularly using the stand designed for this survey. The position and horizontal direction of the camera were measured by GPS. The vertical angle of the camera was determined by two crossing electronic clinometers placed on the stand. The thermal images (one second interval) were transferred directly from the camera to computer through the USB cable. The number of the pixel of each frame is 320 for horizontal direction and 236 for vertical direction. The instant view of one pixel is 1.4 mrad. The altitude of the flight was 2300m so that the temperature at a pixel represents the mean temperature of about 3 m<sup>2</sup> and the each frame corresponds to the area of 1030 m \* 730 m. The detective wavelength of the camera was 8 -14 micro meters and the signal attenuation by the atmosphere was ignored in the analysis of the surface temperature. The helicopter kept the constant height during the measurement. The thermally active areas were covered by 6, 2 and 3 measurement lines in Usu, Noboribetsu and Tarumai, respectively. The selected thermal images with suitable condition were combined (about 90 frames in Usu volcano) considering the horizontal orientation, vertical angle and the position. The resultant image represents the overall surface temperature distribution at respective fields. The surface temperature distribution of Usu volcano shows that the thermally active area is mainly composed from four parts: Nishi-yama crater, Kompira-yama crater, summit crater and Showa-shinzan. Nishi-yama and Kompira-yama craters were newly formed craters at 2000 eruption activity. The surface temperature distribution of Noboribetsu shows the fumarole activity at Ohyu-numa and Jigoku-dani thermal area and that of Tarumai shows the fumarole activity associated with A and B craters, respectively. The detailed thermal structure at respective fields is cleared by this observation. It is confirmed that this convenient observation system satisfy the practical use for volcano monitoring.