

## Validation for hyperspectral volcano observations using Airborne Radiative Transfer Spectral Scanner (ARTS)

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In 2006, we developed a new airborne hyperspectral sensor, the Airborne Radiative Transfer Spectral Scanner (ARTS), for hyperspectral volcano observations. ARTS is a push-broom imaging spectrometer covering wavelengths from 380 to 1100nm (VNIR; 288 bands), 950 to 2450nm (SWIR; 101 bands), and 8000 to 11500nm (LWIR; 32 bands) and has precise position and attitude measurement systems (GPS/IMU) to achieve direct geo-correction of the acquired image.

Before beginning the operational use of ARTS, it is important to validate its in-flight performance. Therefore, we have been conducting validation on the B200 platform. In this study, we present the results of the volcano observations flight over active volcano (Sakurajima volcano) just after its eruption on April 8, 2008. Through these observations, we tried to demonstrate the functions of ARTS, especially those for volcano observation.

At the Sakurajima volcano, the geo-corrected image was calculated directly using the data from the GPS/IMU system. This image can be superimposed onto the topographical map with sufficient accuracy for practical use. The trace area of the pyroclastic flow caused by the eruption can be measured using VNIR images. We could detect the geothermal activities of Sakurajima crater (Minamidake A-crater and Showa crater). The estimated maximum brightness temperature of Minamidake A-crater is 854 degrees C as measured from the radiance at 1001nm and 345 degrees C as measured from the radiance at 10260nm. The estimated maximum brightness temperature of Showa crater is 435 degrees C as measured from the radiance at 1625nm and 176 degrees C as measured from the radiance at 10260nm. These results indicate the existence of surface-temperature fields of subpixel resolution. Under these conditions, the shorter wavelengths of ARTS yield better maximum temperature estimation than the longer wavelengths. These results demonstrate ARTS' ability to estimate temperature. In addition, inside the Minamidake A-crater area, the sulfur dioxide gas abundance could be estimated from the LWIR data.

From these results, we conclude that ARTS can be used for operational volcano observations.