Development of the airborne hyperspectral sensor for the volcano monitoring

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The new airborne hyperspectral sensor for monitoring the volcano has been built by NIED in Mar. 2006. This sensor provides hyperspectral images for purposes of developing algorithms for the remote sensing of the geothermal distribution, the ash fall areas and the volcanic gasses columnar content from the air. This sensor will be used mainly for the assessment of volcano activity and the mitigation of volcanic disaster.

This sensor has three sensor head units (SHU). These SHU are visible - near infrared SHU, near infrared SHU, and infrared SHU. These sensor head units operate as a line scanner in the pushbroom mode from an aircraft. The visible-near infrared SHU measures the 380 to 1050 nm channels. This channel measures a spectrum with 288 points. The field of view (FOV) is 40 degrees and image of this channel is 1500 pixels wide crosstrack and thus the instantaneous field of view is 0.49 mrad. This SHU can be used for measuring brightness temperature from 900 to 1200 Celsius. The near infrared SHU measures the 900 to 2450 nm channels. This channel measures a spectrum with 100 points. The field of view (FOV) is 40 degrees and image of this channel is 600 pixels wide crosstrack and thus the instantaneous field of view is 1.2 mrad. This SHU can be used for measuring brightness temperature from 300 to 1200 Celsius. The infrared SHU measures the 8000 to 11500 nm channels. This channel measures a spectrum with 32 points. The field of view (FOV) is 40 degrees and image of this channel is 600 pixels wide crosstrack and thus the instantaneous field of view is 1.2 mrad. This SHU can be used for measuring brightness temperature from -20 to 1200 Celsius. This sensor has the precise position and attitude measurements systems (GPS/IMU). The direct accurate geo-correction of each SHU images can be done using this GPS/IMU systems.

This sensor will be used for the operational volcano observation from 2008. We are now conducting the validation of in-flight performance of this sensor. Until now, we validated the accuracy of the geo-correction systems. The results indicate that the geo-correction accuracy is typically less than 2 pixels difference (RMS) for each SHU (Flight altitude : AGL 800m). We will validate the radiometric performance of this sensor in 2007.