Development of a helicopter-borne infrared imaging system and thermal imagery observation tests over Aso and Bandai Volcanoes

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We have developed a helicopter-borne infrared imaging system for the thermal imagery observation in the project supported by the Ministry of Education, Culture, Sports, Science and Technology, Japan. The great advantage of the observation by using a helicopter over that by a satellite or an airplane is a high spatial resolution of the image because of its slower flight velocity and its lower flight altitude. On the other hand, the lower flight altitude is a cause of a narrow observation area at a shot. Therefore, our objectives in this project are designing and constructing the observation system by using a helicopter-borne IR camera without any special apparatus (e.g. a gyrostabilized camera mount) and developing a data processing procedure for the system.

An experimental flight for the integrated airborne survey system over Aso Volcano was conducted in 2004, and the flights over Bandai and Aso Volcanoes in 2005. We had used an IR camera (NEC San-ei TH3102) for the flight in 2004 and changed to a brand-new TH9100MVI of NEC San-ei in 2005. The terrain clearance of the flight was set as about 500 m in 2004 and reduced to about 300 m in 2005, and more precise distance between the helicopter and the ground surface was estimated by using the coordinates data obtained by the GPS measurement and the ground surface elevation data. The infrared images were recorded every one second during the observation flight, which means a few thousands of image files were obtained in one flight. It is a huge labor-intensive work to handle these files manually. Therefore, we have developed several softwares and techniques to rectify the image data (resizing based on the distance to the target, seamless mosaicking of individual image based on the coordinates data, etc.) with reducing manual works.

By using the observation system and the data processing procedure, we obtained the ground surface temperature distribution images of the Aso and Bandai Volcano areas. However, some problems became clear. It is difficult to control the terrain clearance especially near the ridgeline in the observation flight. It is necessary to improve the flight specification for the infrared imagery observation. And the data processing technique development in this project is sensitive to the positioning data. Therefore it is necessary to examine the positioning data.