寄　書

火山 第51巻 (2006)
第4号 273–282頁

MODIS夜間赤外画像による浅間山2004–2005年活動の熱観測

金子隆之*・髙﨑健二*・安田　敦*・青木陽介*

（2006年1月16日受付，2006年5月19日受理）

Thermal Surveillance of the Asama 2004–2005 Activity Using MODIS Nighttime Infrared Images

Takayuki KANEKO*, Kenji TAKASAKI*, Atsushi YASUDA* and Yosuke AOKI*

Asama volcano, located in the central part of Japan, repeated medium to small scale Vulcanian eruptions, from September through December 2004. We analysed the activity between January 2004 and April 2005 using nighttime infrared data from MODIS -Moderate Resolution Imaging Spectroradiometer -onboard Terra and Aqua satellites, in conjunction with the data from ground-based instruments obtained simultaneously and chemical composition of the ejecta. The observed period is divided into four stages, S-I, S-II, S-III and S-IV, based on the relationship between thermal anomalies observed by MODIS and eruptive activity. S-I (second half of August) is the thermally active period preceding to the series of eruptions. This may have been caused by a magmatic supply to the shallow level of the conduit, resulted from dyke intrusion at a deep level (1 km bellow sea level) in July, as suggested by the ground deformation monitoring. This magmatic supply probably resulted in initiating the eruptive activity of S-II. S-II (1 September -mid-December) is the thermally active period during the series of eruptions, which is sub-divided into two stages, S-IIa (1 September -10 October) and S-IIb (10 October -mid-December), by the two thermally active pulses in this period. Similar pulses are also recognized in the time-series variation of eruptive amount of S-II, as well as seismicity and SO_2 discharge rate. A deep dyke intrusion observed in the late S-IIa may have resulted in a new supply of magma to the shallow level, which caused the IIb activity. After two months of inactive period of S-III(late December 2004 - February 2005), S-IV (March-at least April 2005), the post eruptive thermally active period, started. Although this stage did not involve eruptive activities, SO_2 discharge rate, level of volcanic glow and height of plume raised. This may have been caused by the third magmatic supply to the shallow level in late January. At the volcanoes possessing open to semi-open passages between the summit crater and shallow level of the conduit like Asama, MODIS may detect pre-eruptive thermal anomaly, which can be utilized for monitoring those distributing in remote areas, such as east Asia.

Key words: MODIS, Asama volcano, thermal analysis, infrared, remote sensing

1. はじめに

火山は地球内部からもたらされる高温物質–マグマ，ガスなど–が地表へ噴出する場所であり，火山表面の熱的状態は，その活動状況を知る上で重要な情報源となる．噴火の際マグマが地表に噴出することによって大きな熱異常が生ずる．一方，マグマが直接噴出しない場合でも，噴火に繋がる地下のマグマの動きや火口・火道域の構造変化に関係してガス放出に変化が起き，火口周辺の熱的状態が変化することもある．例えば，熱異常が噴火に先行して拡大（鍵山・辻，1987; Dehn *et al.,* 2002）あるいは縮小する場合 (Wooster and Rothery, 1997; Wooster, 2001)，噴火後に発生する場合（金子・ウスター，2003）など，様々なパターンが報告されている．このような熱変化から，逆に地下のマグマの動きや火道域の状態を知ることができれば，噴火の発生や活動推移を予測する上で重要な手がかりとなる．しかしながら，まだ観測例が少なく，系統的な研究はなされていない．熱異常の情報を噴火予知に活用するためには，まず観測データを蓄積

* 〒113–0032 東京都文京区弥生 1–1–1
東京大学地震研究所
Earthquake Research Institute, University of Tokyo, 1–1–1 Yayoi, Bunkyo-ku, Tokyo 113–0032, Japan.

Corresponding author: Takayuki Kaneko
e-mail: kaneko@eri.u-tokyo.ac.jp