Japan Geoscience Union Meeting 2019

Pseudo thermal anomalies in the shortwave infrared bands of the Himawari-8 AHI and their correction for volcano thermal observation

*Takayuki Kaneko[1], ATSUSHI YASUDA[1], Yoshizaki Yoshito[2], Takasaki Kenji[3], Yoshiaki HONDA[4]

1. Earthquake Research Institute, University of Tokyo, 2. Meteorological Satellite Center, Japan Meteorological Agency, 3. Japan Fisheries Research and Education Agency, 4. Center for Environmental Remote Sensing, Chiba University

Volcanic eruptions bring high-temperature gas or magma to the surface. Therefore, thermal observations of volcanic eruptions can be used to investigate the timeline of eruptive sequences. Eruptive activity includes processes that can change over short periods of time, which is sometimes related to the eruptive mode or the timing of its transitions. If we could observe short-term eruptive processes by detecting thermal changes, this would be beneficial for analyzing the eruptive sequence of volcanoes. Himawari-8 is a meteorological geostationary satellite operating above the equator at a longitude of 140.7 deg E and carrying a newly developed sensor, the Advanced Himawari Imager (AHI). With its improved performance, the Himawari-8 AHI enables the collection of high-frequency thermal observations that had never been obtained before. However, while observing volcanoes with the AHI, we noticed a frequent thermal anomaly in the nighttime 1.6-um and 2.3-um images. Because this anomaly occurred regardless of volcanic activity, it was considered to be a pseudo thermal anomaly. In-depth examination of the AHI observation data for several inactive volcanoes showed that the pseudo thermal anomaly was often seen around the vernal and autumn eclipse periods, and its in?uence persisted for about 6 months of each year. Further, daily variation of the anomaly peaked when it was midnight in the areas around 140 deg E. At this time and position, the AHI was facing the sun, suggesting that the anomaly was caused by stray light. We devised a correction method by assuming that the observed thermal radiance in a pixel consists of components from the radiating volcanic ground surface and stray light contamination. The latter can be estimated using values from nearby inactive pixels. Thus, the component from the radiating volcanic ground surface can be obtained by subtracting the estimated stray light from the observed thermal radiance. We evaluated the validity of this method using data from the 2017 Nishinoshima eruption and found that it satisfactorily removed the stray light component. An adoption of this correction allowed us to use all nighttime 1.6-um and 2.3-um images obtained by the AHI, half of which were formerly unusable due to the degradation caused by stray light.

Keywords: observation data correction, thermal anomaly, volcanoes