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Analysis of explosive eruption of Kirishima-Shinmoedake volcano using MODIS and Simulcast Viewer

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An explosive eruption occurred at Kirishima-Shinmoedake volcano on Japan's southern island of Kyushu on 26th January, 2011. The last explosive eruption of this volcano occurred 52 years ago. Intermittent ash eruptions of considerable magnitude have continued since the explosion, and an ash plume rose to a maximum altitude of 3,000 meters above the crater rim on 27th January and 2nd February (Japan Meteorological Agency 2011). Airborne volcanic ash has impacted farm production and the daily lives of residents downwind from the volcano, and heavy rainfalls may cause secondary disasters from mud flows. For these reasons, a time-series understanding of Kirishima-Shinmoedake eruptions is vital. Terra/MODIS and Aqua/MODIS (500m resolution) acquire data two or three times a day, while thermal infrared images (resolution 1km) can be acquired both day and night, and can be useful in understanding patterns of volcanic ash spread (Watson et al, 2002; Kinoshita et al, 2001, 2003). The objective of this study is to monitor the eruptive activity from Kirishima-Shinmoedake using Simulcast Viewer in real time and MODIS satellite images from three stations (Abashiri in eastern Hokkaido, Chiba in central Honshu, and Miyakojima in the southern Ryukyu Islands) operated by Tokyo University of Information Sciences.

MODIS is a key instrument aboard the Terra (EOS AM1) and Aqua (EOS PM1) satellites. Terra/MODIS and Aqua/MODIS view the entire Earth's surface every 2 to 3 days, acquiring data in 36 spectral bands. At the Chiba campus of Tokyo University of Information Sciences, located just east of Tokyo, MODIS data has been periodically acquired and archived since 2000. Since 2002, data from the Aqua satellite has been added to that of Terra, allowing acquisition several times daily. In addition, in 2009 antennas were established at the Abashiri and Miyakojima Island facilities.

In this study, geometric correction was implemented using MOD02 and MOD03 of Terra/MODIS and Aqua/MODIS acquired day and night from the start of the eruption on January 26 through February 4, 2011. Using bands 28, 29, 30, 31 and 32 of thermal infrared images, volcanic ash smoke can be detected by calculating Aerosol Vapor Index (AVI), allowing monitoring of eruptive activity both day and night (Kinoshita et al, 2001, 2003). In addition, the simulcast technology provided by NASA can be accessed at Tokyo University of Information Sciences, enabling monitoring of all East Asia. This system is being used to monitor changes of explosive eruptive activity at Kirishima-Shinmoedake. The scale of the volcanic eruption began to increase from about 15:30 JST on 26th January, and an ash plume rose to a maximum altitude of 2,000 meters above the crater rim about 19:00 JST drifted to the southeast (Japan Meteorological Agency 2011). By calculating AVI using thermal infrared images of Aqua/MODIS acquired at 22:00 JST on the 26th January, the volcanic ash smoke was confirmed to have diffused about 750 km to the southeast of the crater rim.

Acknowledgement

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