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Image observation and satellite image analysis of eruption clouds at Kirishima-Shinmoedake volcano

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After small phreatic eruption at 01:27 on 19 Jan. 2011, continuous ejections of plumes were recorded on 22 and 25. Massive ejections of ash clouds started at 15:40 on 26 almost continuously mixed with eruptions until 27. These time variations can be seen by smooth interval records of a video camera with the NIR mode. Though the visibility condition was rather bad on 26 Jan. 2011, the upper parts of massive ash clouds could be seen in the visible camera records at 58 km SW from the volcano in Kagoshima city and also at 38 km north in Hitoyoshi basin. In addition to these fixed observation points, automatic recording cameras have been installed at near-by points in Kirishima city 9 and 11 km SSW from the volcano with visible and NIR modes.

Long distance observation has a merit to see the whole features of eruption clouds. Their advection and dispersion beyond the scope of ground observation can be studied by satellite images. Massive ash clouds on 26 and 27 Jan. 2011 could be recognized in NOAA-APT images with the scales 100-300 km extending over the sea. In the image data of MODIS on board of Terra and Aqua satellites obtained by the receivers of Tokyo University of Information Sciences, various dispersion images including a plume toward 750 km south-east were obtained [2]. In addition to visible and NIR images of satellite data in the daytime, thermal image data in the nighttime and their differences in the form of Aerosol Vapor Index enable to detect dispersed ash clouds over the sea. This method can be applied also to the MTSAT/VISSR data with frequent observation, to study time sequence of large scale dispersion of ash clouds. The behavior of ash dispersion depends on the meteorological conditions. Especially, the height dependence of the wind direction and speed is decisive, implying the importance of the ground observation of the ash clouds at the source volcano, as we are going to study further.

The understanding of volcanic topography is important to see the relation between an observation point and the volcano, to design plans to prevent volcanic hazards such as volcanic bombs, ash-fall, ash-mud flows, and educate people against the hazards. The SiPSE-3D satellite images of Kirishima volcanoes were prepared for these purposes.

The above results are displayed in the following web sites:
http://arist.edu.kagoshima-u.ac.jp/volc/kiri/kiri11/kiri11top.htm
http://es.educ.kumamoto-u.ac.jp/volc/shinmoe/index.htm

[1] K. Kinoshita et al., Image observations of volcanic clouds and Asian dusts and atmospheric environment in Kagoshima, Proc. Branch Meeting of Met. Soc. Japan, 2009, pp.7-8 (in Japanese).

[2] I. Harada et al., Analysis of explosive eruption of Kirishima- Shinmoedake volcano using MODIS and Simulcast Viewer, This Session, 2011.

Keywords: volcanic ash cloud, near-infrared image, interval record, NOAA-APT image, MODIS image, Aerosol Vapor Index