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Satellite Observation of Floating Volcanic Ash Discharged at the 2011 Shinmoedake Eruption

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Volcanic ash discharged into the air from volcanoes, especially that consisting of smaller particles, often remains in the air for a long time and affects the Earth's climate through modification of radiation processes. Even for a shorter time scale, it could disrupt air traffic, as in the case of the 2010 Eyjafjallajokull eruption, due to its potential to stop jet engines attached to aircrafts and to scratch their windshields. Thus, detecting actual distribution of floating volcanic ash is important from the view point of both climate prediction and disaster prevention. Here, an example of deriving such distribution of volcanic ash utilizing the infrared split window imagery of geostationary satellites is introduced. We analyze the behavior of spreading volcanic ash emitted in the case of the 2011 subplinian eruption of Shinmoedake, a volcano located in Kyushu, Japan.
Floating volcanic ash is discriminated as the region of small or negative brightness temperature difference (BTD) between 11 μm and 12 μm channels (Prata 1989). In addition to the distribution of floating volcanic ash discharged at the event, which has also derived by Marchese et al. (2014) and Lee et al. (2016) based on the same technique, we further investigate and quantify the details of spreading volcanic ash by calculating the time variation and statistics of relevant quantities.
According to the successive images of discriminated fields, three major eruptions occurred within two days and the volcanic ash roughly extended southwestward advected by prevailing Westerlies. Calculations show that the maximum areas covered by floating volcanic ash in the first, second and third events reach 50,000, 60,000, and 20,000 km$\hat{}$2, respectively when we discriminate the volcanic ash with BTD < -1.0 K. Under the same threshold, the volcanic ash is revealed to reach more than 2,300 km and to spread over 400,000 km$\hat{}$2 in the end. The time variations of areal coverage, diffusion rate, direction of diffusion, etc. are also computed and will be introduced at the conference.