Degassing activity of Aso volcano, Japan, before the 8 October 2016 eruption measured by satellite and ground-based remote sensing techniques

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The flux of volcanic gases has been monitored as sulfur dioxide (SO_2) flux at many volcanoes by ground-based remote sensing measurements using a miniature spectrometer such as Mini-DOAS. A recent advance in satellite remote sensing techniques has also enabled for SO_2 amounts emitted by persistent degassing to be monitored at sufficient temporal resolution. In this study, we combined these two techniques with ground-based visible camera images to constrain the degassing activity before the 8 October 2016 phreatomagmatic eruption of Aso volcano, Japan. We compared the time series of atmospheric SO_2 mass in the lower troposphere above the volcano measured by the Ozone Mapping and Profiler Suite (OMPS) nadir mapper instrument to those of the ground-based SO_2 flux and plume height measured by the Japan Meteorological Agency. Our results between April and October 2016 showed similar temporal variations among these values. The SO_2 mass and the plume height increased to, respectively, about 1000 tons and 900 m above the crater rim two months before the eruption, and then gradually decreased. Both values again increased about a week before the eruption and reached their maximum values (> 1200 tons and 1010 m above the crater rim, respectively). These similar temporal variations between the SO_2 emissions and the plume height likely indicate that, although the degassing system of the volcano has been stable during the study period, the accumulation of volcanic gases in the shallow part of the volcanic conduit might trigger the phreatomagmatic eruption. Our result suggests that the satellite remote sensing techniques can be sufficient for monitoring SO_2 flux of the volcanic plume at low altitude.

Keywords: Volcanic gas, Aso volcano, Remote sensing, Sulfur dioxide flux, OMPS

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