Ellipse approximation method for a prompt recognition of ash fall distribution -a case study at Sakurajima volcano-

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Some eruptions at the Sakurajima volcano commenced from 3 February 2008. We have developed a method for drawing isopachs and estimating the volume of volcanic ash produced during the February 2008 eruptions (Tajima et al., 2008). In the present study, we use this method to estimate the volume of ash produced during continuous small eruptions occurring at the Sakurajima volcano. From 24 to 25 April, we set approximately 50 traps (e.g. trap shown by Nihon University, HP) around the volcano. We retrieved them on 27 April, 28 April, 1 May, 7 May, 9 May, 18 May, 29 May, 5 June, 14 June, 4 July, 12 July, and 1 August, because ash fall occurred at the volcano nearly 60 times during this period (JMA web records). The weight of ash obtained from the traps was measured carefully under dry conditions.

The measured weight data provided information on some of the eruptions. We classified the directions of these eruptions according to the period in which they occurred. For this purpose, we first obtained information on column direction, provided online by the Japan Meteorological Agency (JMA). Then, in order to determine the column direction, we examined web camera videos of the eruptions captured from Osumi-Sabo Works and Tarumizu city and referred to the web camera archives of Kagoshima University. It was difficult to determine the column direction from the information obtained on cloudy and rainy days. Hence, we used wind information available in the JMA database or the data obtained by the Atmospheric Environmental Regional Observation System (AEROS) of the Ministry of the Environment, which is available online. We could determine the column direction from these data.

We drew isopachs using the method developed by Tajima et al. (2008). In this method, we used two-point data for drawing isopachs. In cases where ash distributions overlapped each other, we first used weak effective point data for drawing isopachs and then reduced the weight of the obtained ash from a previously drawn isopach at the overlapping points. We estimated the volume of the obtained ash from the isopachs by integral calculus (Tajima et al., 2008). We obtained data for a small eruption that occurred at 1256 on 28 April; these data were recorded under stable conditions. This eruption occurred after new traps were set around the volcano; the trap replacement process began in the afternoon on 26 April and ended in the morning the next day. The traps contained only fresh volcanic ash and no other materials, e.g. dust and pollen. Observation data revealed that the minimum weight of the obtained ash was approximately 0.2 g/m^2, which is equivalent to 0.000001 t/m^2. The error values were 70%-110% and 25%-250% when the data for verification were sufficient and insufficient, respectively. The volume of ash deposited at the Showa crater during the eruptions that occurred on 8 and 17 May and at the Minamidake crater during the eruption that occurred on 20 May was estimated to be approximately 10^4 tons. From 17 to 20 May, the eruption rate was maximum during the day. The average ratio of the major axis to the minor axis of the ellipses drawn using data on some of the eruptions was approximately 0.21. These data are used to draw isopachs of automatic ash fall, whose weight is measured using a machine. Furthermore, the abovementioned method can be used to draw isopachs from historical records of ash fall.

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