

Unzen Volcano : the 1900-1992 eruption

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13. Temporal Variation in Specific Gravity of the Lava Extruded from the Jigokuato Crater

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Introduction

The 1991-1992 lava had abundant vesicles which contained gas at excess pressures when it extruded from the Jigokuato crater (Sato, et al. 1991). Since it is possible to think that the gradual exsolution of a gas phase from magma may have cause successive extrusion of the excess volume of magma from the chamber, it is interesting to know how the vesiculation has progressed during the eruptive activity. The specific gravity reflects the vesicularity of lava. Therefore we report here how it has changed during a peiod from 24 May 1991, to 26 April 1992.

Analytical method and results

We employed a very simple method in which block samples of 200 to 1,200 g were suspended in water or alcohol to measure their volume. Weight gain due to the penetration of water into a sample during the measurement was very small. It was less than 0.05% of the weight of the block sample suspended in water. Figs. 13-1 and 13-2 show the results. A specific gravity of the solid part of the lava was determined on powdered samples with a 20ml pycnometer and found to be 2.584 ± 0.002 .

Similarly as in the case of temporal variation in chemistry of the lava (Yanagi. et al., this book), there were two phases. The first phase covered, at least, first 23 days from the start of lava extrusion. The start of the second phase could not be well defined because of a lack of sample from 12 June to 16 September 1991. The variation after 16 September belongs to the second phase.

Specific gravities of lava samples collected on

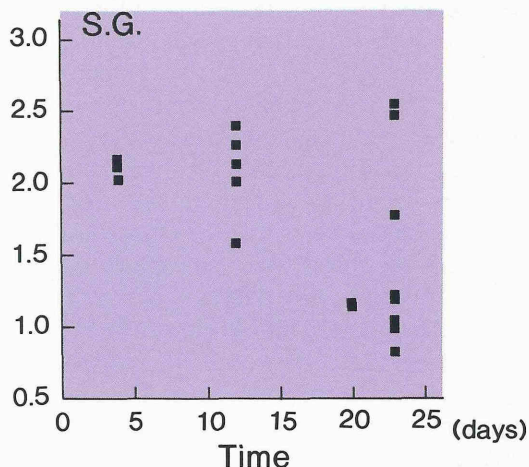


Fig. 13-1. First-phase temporal variation in specific gravity of the lava extruded from Jigokuato Crater.

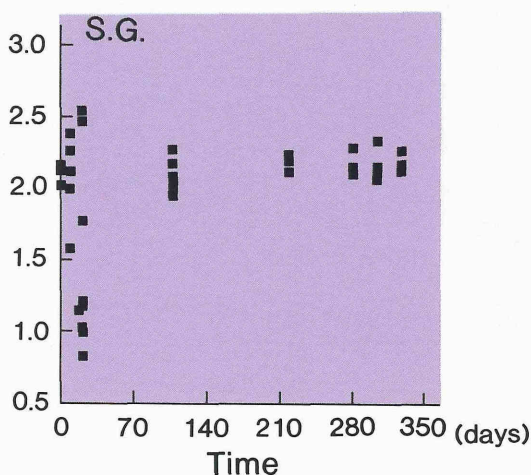


Fig. 13-2. Temporal variation in specific gravity of the lava extruded from Jigokuato Crater.

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24 May 1991, were limited in a narrow range with an average of 2.1. Then the lower limit progressively decreased to 0.8 with time. The upper limit increased a little to 2.5 in 23 days. Therefore the variation range expanded quickly. The change in specific gravity of the lava and the mode of eruptions are well correlated. The lava filled the Jigokuato crater by 23 May and then started overflowing toward the eastern valley on the Fugendake cone. The first pyroclastic flow occurred on 24 May. Then pyroclastic flows occurred intermittently, and they successively grew in scale with time. Ash clouds from the pyroclastic flows became high in temperature with time and started burning out trees along the Mizunashi River. The flow front progressively moved downward in the Mizunashi river and reached a point 3 km apart from the crater by the end of May. During this period, the lava dome continued to grow. Then a landslide collapse of the well-grown lava dome occurred on 3 June, and resulted in the formation of a large-scale pyroclastic flow. Its flow front reached a distance

of about 4 km from the crater. A vulcanian-type eruption occurred, associated with the formation of another large-scale pyroclastic flow on 8 June. The flow front reached a point 5.3 km from the crater. Blocks collected from the flow front were very light with the specific gravity of about 1.1. We had another vulcanian-type eruption on 11 June but at this time there was no associated large-scale pyroclastic flow event. Pumice blocks of 5 cm in the maximum size fell around Rout 251 at a distance of about 7 km northeast from the crater. The specific gravity of them range from 0.8 to 2.5, suggesting the vesiculation was very heterogeneous.

In the second phase an daily rate of lava extrusion remained constant at about 3×10^5 m³/day, and small to medium scale pyroclastic flows occurred intermittently, associated with frequent dome dollapses. There was, however, no vulcanian-type eruption. In the second phase, lava blocks showed no remarkable change in specific gravity but stayed within a limited range, as shown in Fig. 13-2.