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Geology and Petrology of the Post-caldera Stage Lava flows originated from Azuma-Kofuji cone, East Azuma volcano

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1. Introduction

Azuma volcano is situated at the central part of Quaternary volcanic front of the Northeastern Japan arc. Azuma volcano is topographically divided into the West Azuma, Naka Azuma and East Azuma Volcanos. The largest eruption of Higashi Azuma volcano in Holocene era occurred at 7ka built up the Azuma-Kofuji cone in the horse-shoe shaped caldera at eastern part of East Azuma Volcano, and magmatism had been active between 5ka B.P.to 6ka B.P., by ejecting fall out tephra and the Azuma-Kofuji lava flow (Yamamoto, 2005).

2. Topography and geology

Based on the stratigraphy of 17 individual lava lobes and their surface structure, the Azuma-Kofuji lava flow is divided into 3 groups. The Groups 1, 2, and 3 consist of 6, 6, and 5 units, respectively, in descending order of eruption. Mingling texture is observed only in the lava (Am5) erupted in the latter half of Group 2. The estimated volume of magma in the stages 1, 2, and 3 are 2-3$*10^{-1}$, 1.5$*10^{-1}$ and 1$*10^{-2}$ (DRE km^3), respectively.

3. Petrological features

The compositional variations of these lavas create a linear trend in the Harker's diagram. In several lavas of the group 1 (Al1, 2, 3, and 5), heterogeneity of more than a few square meter in size is recognized. One portion shows a compositional range from 59 to 61wt.% SiO_2 (1A), whereas the other covers 62-63wt.% SiO_2 (1D). The rest of the Group 1 lavas (Al4, 6) are consistently in the range for the 1A. In the group 2, later members (Am4-6) show evident petrological in homogeneity, compared with the earlier members (Am1-3). Group3 lavas are homogeneous through the members from Ah1 to Ah5.

Modal abundances of mafic minerals are higher in the 1A than in the 1D. Euhedral or subhedral olivine phenocryst of 0.9mm in maximum diameter is observed in 1A. The olivine in the 1D is generally corroded with 0.3mm in diameter. Although all the Group2 lavas contain olivine phenocrysts, the olivine in the latter lava samples tend to be large and highly euhedral, relative to those in the earlier lava samples. Only small amounts of olivine phenocryst of corroded shape were observed in every Group3 lava sample.

A mingled texture composed of light gray part and dark gray part is recognized in the latter members of the group 2 (Am5). The dark gray part shows glass-rich texture with high silica content, compared with the lighter colored part.

4. Magma pluming system brought Azuma-Kofuji lava flow

Azuma-Kofuji lava flow displays a linear variation trend on the Harker's diagram, with 1A and 1D samples come to the poorest and richest silica ends, respectively. Therefore, a variety of lavas were basically resulted from mixing of the two distinct magmas 1A and 1D. Also, mingled texture, and euhedral olivine observed in the later members of the group2 implies intermittent incorporation of mafic magma.

Sequential change of the magma plumbing system is summarized as follows:

Andesitic (1A) and dacitic (1D) magmas were erupted simultaneously in the stage 1 to make up heterogeneous lavas.

The magma in the chamber became homogeneous after Stage1 eruption.

In the latter half of the stage 2, mafic magma added to the homogenized magma chamber to cause disequilibrium petrological features.

Magma became homogeneous again in stage 3.

Keywords: Azuma volcano, lava flow, magma mixing, calc-alkaline