Mechanism of the Miyakejima 2000 eruption inferred from the temporal change of the essential materials in ejecta

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Series of phreatomagmatic eruptions occurred from the collapsed caldera during the Miyakejima 2000 eruption and produced a pile of tephra around the collapsed caldera. Juvenile materials of fresh scoria fragments are recognized in the eruptive materials of 14-15 July, 13 August, and 18 August, showing the temporal change during the eruption. Groundmass of the juvenile materials of the July eruption is heterogeneous in crystallinity and vesicularity: crystallinity ranges 10-50 vol.% and the vesicularity 9-34 vol.%. Juvenile materials of the August eruptions are, by contrast, relatively high crystallinity more than 60 vol.% and vesicularity around 35 vol.%. These textural differences of the juvenile materials may reflect the change of the cooling condition of magma in aquifer during the caldera collapse. Composition of the juvenile materials sifted from basaltic andesite to basalt during the caldera collapse. Judging from the compositional difference between these two magmas and the lack of the evidence for mixing each other, these two magmas were driven from different storage system disconnected each other. Petrological character of the basalt in the eruptive materials of August, by contrast, is different from the previous lavas of the Miyakejima volcano. This shows that a new basaltic magma ascended to the shallow magma system after the caldera collapse. Migration of the andesite magma from the shallow reservoir beneath the summit to northwestern off of the volcano caused the decrease of magmatic pressure, and the roof of the reservoir collapsed into the reservoir. At the same time, the basaltic magma stored in the deeper system migrated upward and erupted. Chaotic collapse of the caldera floor entrained both the underground water and intruded magma, and caused explosive phreatomagmatic eruption during the caldera growth.