[EE] Evening Poster | S (Solid Earth Sciences) | S-VC Volcanology

[S-VC39]Pre-eruptive magmatic processes: petrologic analyses, experimental simulations and dynamics modeling

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Processes leading to volcanic eruptions are central and yet still enigmatic issues in volcanology. Recent advances in understanding thermo-mechanical and open-system behavior of magma reservoirs and mineral zoning stratigraphy allow us to take a step forward to reveal the complex incubation processes during volcanic dormancy and following magma chamber tapping. This session aims at putting together recent knowledge on magmatic processes including 1) magma chamber evolution through magma reintrusion, crystallization-induced volatile exolution, magma mixing and gas fluxing, 2) externally-driven eruption trigger mechanisms, and 3) conduit processes and controls on eruption styles such as outgassing, dehydration-induced crystallization, fragmentation and rheological transition of ascending magmas. We welcome contributions based on petrological, mineralogical and geochemical analyses of pyroclasts and volcanic gasses, experimental simulations of magma reservoir conditions and conduit flow dynamics, and numerical modeling to integrate the elementary processes.

[SVC39-P08]Plagioclase-hosted melt inclusions of the 1986 eruption at Izu-Oshima volcano, Japan: Implication for pre-eruptive process

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Izu-Oshima volcano is one of the active volcanoes located on the volcanic front of the Izu-Mariana arc. The volcano expressed latest magmatic eruption in 1986. This eruption started with strombolian eruption from the summit vent (A vent) at November 15 and it once decayed at November 20. After the decay, new fissure vent (B vent) opened in the summit caldera and subplinian eruption started at 16:00, November 21. Then, ∼20 minutes after B fissure eruption started, new fissure vent (C vent) opened and started eruption on the flank of the volcano. (Endo et al., 1988). As bulk chemical composition distinctly differs between magmas erupted from A vent and B and C vents, (the former and the latter are basaltic and andesitic, respectively), these magmas have been considered to come from different magma chambers (e.g., Aramaki &Fujii, 1988). However, understandings on pre-eruptive process generating A and B magmas are insufficient yet. The aim of this study is to clarify the pre-eruptive process of the A and B magmas of the 1986 eruption at Izu-Oshima volcano. For the purpose, chemical analyses were performed for plagioclase-hosted melt inclusions and their host minerals in the 1986 scoria. In addition, bulk rock compositions of the scoria were also measured.

Scoriae from the A and B vents of the 1986 eruption, sampled in the summit caldera, are investigated. Bulk rock compositions of A and B scoria were measured using a XRF (RIGAKU ZCX primus 2) at the Earthquake Research Institute, University of Tokyo (ERI). Compositions of plagioclase-hosted melt inclusions and their host plagioclase crystals, and groundmass glasses were analyzed using EPMA (JEOL8800R) at the ERI.

Bulk rock major element compositions of A and B scoria are consistent with those reported in previous studies. Bulk rock trace element compositions were almost the same between A and B scoria. Plagioclases in A and B scoria show similar ranges of An# [=100Ca/(Ca+Na)] and trace element compositions. SiO_2 and SO_3 contents of melt inclusions in A plagioclases are about 55-57 wt.% and <0.1wt.%, respectively; basaltic melt inclusion is not found. On the other hand, compositions of melt inclusions in S-rich, SiO_2-poor (SO_3~0.12-0.3wt.%, SiO_2∼49-53wt.%) and S-poor, SiO_2-rich melt inclusions (SO_3 <0.12wt.%, SiO_2~53-60wt.%) are found in B plagioclase crystals. The wide compositional variation of melt inclusions in B plagioclase is explained by mixing of basaltic and andesitic melts and post-entrapment overgrowth of their host plagioclase. In addition, compositions of groundmass glasses of the A and B scoria and A plagioclase-hosted melt inclusions are also explained by the two melt mixing.

The origin of A magma is explained by incorporating plagioclase and interstitial melt as a parental magma passes through the B reservoir. Bulk rock trace element compositions indicate that A and B magmas were derived from the common parental magma. The A plagioclase is thought to be crystallized in B reservoir and incorporated into the parental magma. This is because (1) it shows the same ranges of An# and trace element compositions to B plagioclase, (2) compositions of melt inclusions in A plagioclase are in the compositional range of B plagioclase-hosted melt inclusions, and (3) melt inclusions in A plagioclase have different composition from the groundmass melt in A scoria. The passing of the parental magma induces pressurization of B reservoir and might trigger the fissure eruptions from B and C vents.

The B magma is thought to be formed from combination of supply of basaltic melt from deeper source, magma mixing, and crystallization. S-rich, SiO_2-poor melt inclusions found in B plagioclases were entrapped at the depth deeper than B magma reservoir because of S enrichment. This suggests that basaltic melts have been supplied into the B magma reservoir from the deeper source. Also all melts found in the 1986 A and B scoriae are explained by mixing of the basaltic and andesitic endmember melts. Moreover, mixed melts of the two endmembers are found as inclusions in plagioclase crystals. This suggests that crystallization occurred after melt mixing.