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

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

convener:Michihiko Nakamura(Division of Earth and Planetary Materials Science, Department of Earth Science, Graduate School of Science, Tohoku University), Akihiko Tomiya(Geological Survey of Japan, National Institute of Advanced Industrial Science and Technology), Shanaka L de Silva (共同), Fidel Costa(Earth Observatory of Singapore, Nanynag Technological University)

Thu. May 24, 2018 5:15 PM - 6:30 PM Poster Hall (International Exhibition Hall7, Makuhari Messe)

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-P02]Hydrous magma differentiation in deep crust recorded in melt inclusions in hornblende-bearing cumulate xenoliths from Ichinomegata Maar, NE Japan

*Yasuhiro Yanagida[1,2], Michihiko Nakamura[1], ATSUSHI YASUDA[3], Takeshi Kuritani[4], Mitsuhiro Nakagawa[4], Takeyoshi Yoshida[1] (1.Department of Earth Science Graduate School of Science Tohoku Univiersity, 2.New Energy and Industrial Development Organization, 3.Earthquake Research Institute, University of Tokyo, 4.Graduate School of Science, Hokkaido University)

Keywords:hornblende fractionation, lower crust, cumulate xenoliths

The Ichinomegata maar, located in the back-arc side of the northeastern (NE) Japan arc, erupted calc-alkaline andesitic magma with abundant deep-crustal and mantle xenoliths ca. 60–80 ka. In this study, we show the relationship between the fractionated solids (i.e. cumulate xenoliths) and silicic melts differentiated at middle to lower crust conditions. We selected 16 hornblende-bearing cumulate xenoliths characterized by clear cumulus texture and divided them into 5 types (olivine-hornblende clinopyroxenite, clinopyroxene hornblendite, mela-hornblende gabbro, hornblende gabbro and leuco-hornblende gabbro) based on mineral assemblages. The crystallization sequence is determined to be olivine, spinel → clinopyroxene → hornblende, magnetite → plagioclase → apatite, based on the observation of texture and solid solution compositions. Of the 5 types of xenolith studied, the leuco-hornblende gabbro preserved interstitial glass and melt inclusions with silica content (SiO_2) of 63.9–74.0 wt% and high water content (up to 8.1 wt%). Hornblende geobarometry indicates an equilibrium pressure of 0.39–0.64 GPa. The delay of plagioclase crystallization due to high water content characterizes differentiation of the hydrous arc magma. We successfully constructed an internally consistent differentiation model of the corundum-normative calc-alkaline trend to the silicic melt inclusion compositions, starting from an assumed primitive basalt via successive fractionation of

calculated wherlite and cumulate xenoliths. In the middle to late stage differentiation, the dominant fractionation of hornblende gabbros efficiently increases SiO_2 in the melt. The crystallization sequence and melt composition trend show very good agreement with the results of recent differentiation experiments at lower crustal conditions (Nandedkar et al., 2014, Contrib. Mineral. Petrol.). As for major elements, the silicic end-member composition of the Ichinomegata host magma overlapped with the melt inclusion compositions and thus was reproduced by the differentiation model. The Sr and Nd isotope compositions are also similar to those of the host magmas, suggesting the cognate origin of cumulate xenoliths. This petrogenetic relationship provides a rare opportunity to elucidate pre-eruptive magmatic activity in the deep crust of NE Japan arc.