Oral | Symbol S (Solid Earth Sciences) | S-CG Complex & General

[S-CG62_2AM2]Geofluids and dynamics in subduction zones

Convener:*Atsushi Okamoto(Graduate School of Environmental Studies), Tatsuhiko Kawamoto(Institute for Geothermal Sciences, Graduate School of Science, Kyoto University), Ikuo Katayama(Department of Earth and Planetary Systems Science, Hiroshima University), Chair:Tatsuhiko Kawamoto(Institute for Geothermal Sciences, Graduate School of Science, Kyoto University), Atsushi Okamoto(Graduate School of Environmental Studies)

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Fluids from subducting slabs trigger earthquakes and low frequency tremors, and return back as springs in for-arc regions and produce magmas beneath volcanic arcs. Geofluids can be present everywhere and migrate in subduction zones and produce spatial and temporal variations in physical and chemical properties of materials. Thus the geofluids play an important role in the subduction-zone dynamics. This interdisciplinary session aims to promote the exchange of knowledge from cutting edge studies on geofluids and give perspectives to each participant. We continue to strongly encourage young researchers to participate in this session, because understanding geofluids can be essential in many geological and geophysical processes.

12:30 PM - 12:45 PM

[SCG62-P05_PG]Water content in arc basaltic magma in northeast Japan and Izu-Mariana arc estimated from melt inclusions in olivine and

3-min talk in an oral session

*Masashi USHIODA[1], Naoki IKEGUCHI[1], Eiichi TAKAHASHI[1] (1.Dept. Earth and Planetary Sciences, Tokyo Institute of Technology)

Keywords:water in magma, melt inclusion, equilibrium between plagioclase and melt

Primitive arc basalt magma is generated by partial melting of sub-arc mantle with adding aqueous fluid which was derived from dehydration of subducting slab. Aqueous fluid has profound effects on melting temperature of the mantle, crystallization pathways of generated magmas, and explosivity of magmas. Precise estimation of H_2O content in arc basalt magma is important to evaluate the effect of water on generation, differentiation, and eruption of magmas in subduction zones. We estimated variation of water content of arc basaltic magmas in the northeast Japan arc and the Izu-Mariana arc using a simple plagaioclase phenocryst hygrometer and melt inclusion analysis of olivine phenocrysts. A simple plagaioclase phenocryst hygrometer was constructed by high-pressure and high temperature experiments using internally heated pressure vessels: SMC-2000 and SMC-5000 installed at the Magma Factory, Tokyo Tech (Ushioda et al., 2013, VSJ fall meeting). High-pressure and high-temperature experiments were conducted for relatively primitive basalt from Miyakejima volcano under hydrous conditions. OFS (Ofunato scoria: Tsukui et al., 2001; Niihori et al., 2003) is one of the most primitive basalt in the last 10,000 years. All experiments were conducted near the liquidus of plagioclase (± magnetite) and therefore the composition of melt is essentially the same as the starting material. H_2O content of melt was calculated by weight ratio of melt using mass balance calculation of all phases assuming that water was concentrated only in melt. Partition coefficient $K_D^{\text{pl-melt}}{}_{\text{Ca-Na}}$ is proportional to H_2O content in melt. In the experimental conditions, both pressure and temperature effects are negligible. We then chose geochemical data sets of relatively primitive basaltic rocks (with no evidence of magma mixing) and most frequent Ca-rich plagioclase phenocrysts from 15 arc basaltic volcanoes, which includes both frontal arc

volcanoes and rear-arc volcanoes from literature. In 15 volcanoes, plagioclase phenocrysts of high anorthite content (An>90) are commonly observed, whereas plagioclase phenocrysts in rear arc volcanoes usually have lower anorthite content (90>An>80). Estimated H_2O content of basaltic magma is 3 wt.% H_2O or higher. We also analyzed H_2O content of melt inclusions in olivine phenocrysts using FTIR micro reflectance measurement (Yasuda, 2011) and FTIR micro transmission measurement (absorption coefficient: Yamashita et al., 1996) in order to compare H_2O content between melt inclusion analysis and this simple plagioclase phenocryst hygrometer. For example, melt inclusions of olivine phenocrysts in scoria from Ko-Fuji volcano had up to 3.7 wt.% H_2O which was consistent with estimate from our simple plagioclase phenocrysts hygrometer. In Miyakejima volcano, melt inclusions of olivine phenocrysts from OFS contained up to 3.3wt.% H_2O although H_2O content was 5.2 wt.% estimated from this hygrometer. In either case, basaltic magmas in volcanic front have 3 wt.% H_2O or higher.