

Magma process of Kutcharo Volcano: Constraints from silicate melt inclusions and chemical zoning of the host phenocrysts

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In order to understand the magma accumulation processes beneath volcanoes that produced large felsic pyroclastic deposits, Kutcharo volcano, Northeast Hokkaido, Japan, was studied. The samples include felsic pisolitic air fall deposit of the Kutcharo KP1, bottom part of pyroclastic deposit of KP4, and younger air fall deposit from Mashu volcano. We examined backscattered electron images (BEIs) and obtained chemical composition data using electron microprobe analyzer from the polished section of handpicked phenocryst (Plagioclase, Orthopyroxene, Clinopyroxene, and Olivine in decreasing order of their abundance).

The BEIs showed that anorthite concentration (An) of plagioclase phenocryst from KP4 appears to decrease from core towards rim, while that from KP4 increase with oscillation towards rim. There is no chemical zoning in orthopyroxene and clinopyroxene except a few of them that show blurred normal zoning which may be result of chemical diffusion. Olivine phenocrysts showed flat core and mantle, and some of them reacted with surrounding melts and are with fayalite rich rims. The bulk rock chemistry of our samples is consistent with the data by Sumita (1993). While the bulk rock chemistry distributes from 55 to 75 % (SiO₂ wt), there is no glass inclusions in phenocryst between 52 to 72 % (SiO₂ wt), i.e., there are only basaltic and rhyolitic melts. The basaltic melt inclusions were found only in olivine and chromian spinel in clinopyroxene phenocrysts, rhyolitic melt inclusions were observed in orthopyroxene and plagioclase phenocrysts. In contrast to the Kutcharo volcano, melt inclusions from Mashu volcano distribute from 55 to 70 % (SiO₂ wt) without basaltic and rhyolitic melt compositions.

We found the evidence of basaltic magma input to felsic magma chamber of Kutcharo volcano. This basalt may play a key role to understand how the magma chamber of Kutcharo volcano maintain heat of the large felsic magma body over hundreds of thousand years. The magma system of Mashu volcano, which is only tens kilometers away, is clearly different from that of Kutcharo volcano.

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