Evolution of the magmasystem of Unzen volcano controlled by intermittent replenishment of basaltic magma

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Variation of the petrological characters of the boring core samples of USDP-1 shows the evolution process of the magmasystem of Unzen volcano. There are cyclic chemical changes with decreasing depth of USDP-1. As a whole, the whole rock SiO2 content becomes mafic upward, though several cycle were observed, in which essential lavas increased in whole-rock SiO2 upward. These chemical cycles were formed within a few tens of thousand years around 200 ka.

Individual chemical cycle is divided into three stages, early, middle, and late stage. Whole rock and groundmass SiO2 contents are minimum in early stage and increase upward during middle stage. Phenocryst abundance increased upward while the ratio of the plagioclase with dissolved rim against the phenocryst without dissolution decreases. The thickness of the high-An rim of the plagioclase with dissolved rim increase upward within a cycle.

The possible model for the cyclic change of the petrological character is the intermittent replenishment of mafic magma to felsic magma reservoir. At the start of a cycle, mafic magma poor in crystal injected to highly crystallized felsic magma reservoir and formed hybrid magma with dacite composition. Effective mixing occurred only around the interface of magic and felsic magma just after the injection. Continuous entrainment of felsic magma to hybrid dacite magma caused increasing of its SiO2 content and phenocryst abundance. Because the petrological character of the boring core samples of USDP-1 is same to the other Unzen dacite, evolution of the magmasystem of Unzen volcano might be driven by intermittent injection of the mafic magma that is inferred from the USDP-1.