

Petrological characteristics of Takayubaru lava flow, which extruded just before Aso-4 pyroclastic flow

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Takayubaru lava flow was extruded during the formation of Omine pyroclastic cone which is located 5 km from the western caldera rim of Aso. Aso-4 pyroclastic eruption occurred just after the extrusion of this lava with a short interval time. It was confirmed by the fact that Aso-4 pyroclastic deposit overlies Takayubaru lava without recognizable soil formations. It was also confirmed by nearly identical K-Ar ages for Takayubaru and Aso-4 volcanic products. Takayubaru lava flow has a thickness of 80-120 m, width of 9 km east west, 4 km north south and a volume of 2.0 km³.

We collected lava samples from the edge of Takayubaru lava flow, and scoria samples from Omine pyroclastic cone. We were also provided drilling core samples by Kumamoto River National Highway Office. We analyzed their chemical compositions and made petrological descriptions. Observation of drilling core samples shows that Takayubaru lava has upper clinker part, massive part and lower clinker part. The upper clinker part is overlain by Aso-4 tephra without intercalated soil. The upper massive part has jointing at and weathering. Clinkers are not observed inside the massive part indicating that Takayubaru lava is a single flow unit. Takayubaru lava contains about 20 vol.% phenocrysts. They are clinopyroxene (<1.8 mm, about 1.5 vol.%), orthopyroxene (<2.0 mm, about 2.2 vol.%), plagioclase (<1.5 mm, about 13 vol.%) and opaque minerals (<0.6mm, about 1.4vol.%). Takayubaru lava also contains hornblende microphe-nocryst (<0.3 mm, about 3.9 vol.%). Most of plagioclase phenocrysts show characteristic fractured texture, indicating melting along cleavage and fractures. The hornblende microphe-nocrysts vary from fresh to completely opacitized. Formation of hornblende and decomposition of plagioclase suggest physical and chemical changes just before eruption. The groundmass consists of microlites of plagioclase, mafic minerals, opaque minerals, and glass. It sometimes shows flow structure and inhomogeneous appearance. There is no correlation between phenocryst abundance and chemical composition of Takayubaru lava. Takayubaru lava and Omine scoria show no clear difference in phenocryst abundance and in chemical composition. They both have greater abundance of phenocryst than Aso-4 pumice. Silica content varies from 63 to 66 wt. % for Takayubaru lavas, and 61 to 66 wt. % for Omine scoria samples. The upper to middle part of drilling core samples have less than 1% variation in silica content. In contrast, the samples from the lowest part and the farthest part have less silica than others, with about 2% variation. Aso-4 pyroclastic deposits contain basalt to basaltic andesite scoriae (SiO₂=49-56 wt.%) and dacite pumice (SiO₂=65-72 wt.%). In comparison, Omine scoria and Takayubaru lava do not show mafic magma as observed in Aso-4 eruption. Compositional trend of Takayubaru lava is the same as that of the silicic member of Aso-4 deposit, although they are slightly silica-poor than the latter. It seems that the injection of mafic magma was not a possible mechanism to trigger the eruption of Omine cone and Takayubaru lava.

Keywords: Takayubaru lava, Omine pyroclastic cone, Aso-4 pyroclastic flow