

Emplacement processes of Takayubaru lava flow which actived before Aso-4 pyroclastic flow

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Eruption of Omine volcano and effusion of associated Takayubaru lava, just before large-scale Aso-4 pyroclastic eruption, formed a pyroclastic cone 200 m high, and lava plateau of block lava with ca. 100 m thickness and an area of 28 km². Both Aso-4 pumice and Takayubaru lava are dacite in composition and are similar, however, the former made an explosive eruption, whereas, the latter, an effusive eruption.

We made a cross section of Takayubaru lava plateau, using the drill-core data of Kumamoto Office of River and National Highway (1994). We found that the basement is inclined from the base of Omine cone (200 m in elevation) toward 3 km west (15 m in elevation), where depression occurs. The thickness of Takayubaru lava becomes maximum of 140 m at the depression, and decreases toward further west to become minimum of 10 m at the western end. The surface of lava is nearly flat. The N-S crossed section shows that the land surface is inclined toward south. The southern end is 50 to 100 m lower than the northern end, after 3.5 km in distance. This tilt was supposedly caused by Futagawa active fault.

The drilling core include, from the top to bottom, soil, Aso-4 tephra, (no soil), upper auto-brecciated part of lava (15 m thick in the middle part), massive part of lava (80 m thick), and lower auto-brecciated part of lava (2 m thick), which were underlain by Futa Formation.

Massive part is homogeneous, and has no interstitial auto-brecciated part. Modal composition of phenocryst minerals does not show much difference from top to bottom. Vesicles are observed in all positions at the fore front of lava flow, however, they are only observed in the upper and bottom part of the lava from the middle and near-source area. Silica content of bulk lava from all position varies within 2 wt.%. It is especially homogeneous (<1 wt.% SiO₂) in the middle massive part. Plagioclase crystals show lineation. The standard deviation in angle does not change from top to bottom. Plagioclase crystals show characteristic honey-comb texture, or melting texture. The degree of melting is greater at the upper portion. All these observations strongly suggest that Takayubaru lava flow does not represent multiple flows but a single flow unit.

We estimated lava effusion rate from the equation relating single lava flow length (L) and effusion rate (E), i.e. $L=10^3 \cdot 11 \cdot E^{0.47}$ (Calvari & Pinkerton, 1998). The length of Takayubaru lava flow, 7.5 km gives the effusion rate of 42 m³/s. Because the volume of Takayubaru lava flow is 2.0 km³, the period of flowing event was calculated to be 1.4 year. If we assume a constant rate of flow, then the velocity was ca. 0.6 m/hr.

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