The formation process of a 100m thick basaltic lava flow in the Kitamatsuura basalts, northwestern Kyushu

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Kita Matsuura basalts cover the Northwest Kyushu Kitamatsuura Peninsula widely and they were the eruption activities of basaltic lavas which were one of the largest in the Cenozoic in Southwest Japan. The volcanic activity of this basaltic rock had erupted sub-alkaline basalt lavas from multiple sources from the late stage of activity, and ended at about 6.5 Ma. There is a mountain composed of basaltic lavas called Senryu Shiradake that was formed at the end of the eruption in the Senryu Area (Matsui et al., 1989; Sakuyama et al., 2009). Although Senryu Shiradake has a specific height of about 100 m, the boundary of the flow unit has not been confirmed (Fukuyama, 1960, 1961; Kurasawa, 1967). The lapilli tuff layers are sandwiched between this basaltic lava and the lower basalt plateau widely cover the upper surface of the lower basalt plateau and are distributed in a narrower area above it (Matsui et al. 1989). It is difficult to think that basaltic lava which are thought to be more robust against weathering and erosion than erosion of the lapilli tuff are selectively eroded, and that valley buried basaltic lava was eroded Selectively, It is unlikely that the mountain body had remained. From this, it can be considered that Senryu Shiradake is a single basaltic lava flow.
The thickness and length of the lava flow forming the volcanoes are systematically varied in general depending on the chemical composition. Basaltic lavas have low viscosity, so the run length of the basaltic lava flows are longer than that of the andesitic and rhyolitic lava flows, and the average thickness is at most about 30 m (Walker et al., 1973). On the other hand, Senryu Shiradake is formed a basaltic lava flow but its height is about 100 m. In this study, we investigated the lava flow that formed the mountain body of Senryu Shiradake from a petrological point of view.
Analysis of whole rock chemical composition of samples taken from Senryu Shiradake was performed by a fluorescent X-ray analyzer. It was confirmed that Senryu Shiradake basaltic lava has SiO_2 = 50 to 53 wt%, MgO = 7 to 11 wt%, FeO * / MgO = 0.87 to 1.5, and it is formed of undifferentiated basalt. The phenocrysts are predominant in olivine and contain a small amount of clinopyroxene, orthopyroxene, and the total phenocryst amount was 3 to 15 vol%. There was a correlation between the sampling altitude and the total rock chemical composition. As the height from the foot increased, the total rock SiO2 amount tended to increased and the MgO amount tended to decrease.
First, assuming that only the phenocrysts were crystallized at the time of lava eruption, the viscosity of lava flow was calculated using the model of Pinkerton & Stevenson (1992) for the effect of crystals on magma viscosity and the model of Hui & Zhang (2007) for the influence of the viscosity of melt. Melt composition was estimated using total rock chemical composition, phenocryst mode composition, and mineral composition. We assumed that all the water in the magma was volatilized and the magma temperature at the time of squirting was 1320 K estimated using pyroxene thermometer. the lava flow model used the flow of magma is stopped by solid shell formation by cooling by Griffiths & Fink (1993).
In this study, we investigated the conditions that can explain the thickness and radius of circulation of the basaltic lava of Senryu Shiradake, considering three variables of volume of erupting magma, time change rate of eruption volume and magma temperature. As a result, even if the rate of change of the first eruption amount and the eruption rate were changed, the thickness was only about 20 m at most which did not reproduce 100 m thick lava flow of Senryu Shiradake. Next, the same study as above was carried out assuming that the degree of crystallization at the time of erupting was 50%, but the thickness was about 30 m at most. From this, it is possible that a 100m thick basaltic lava flow was formed by erupting at

a lower temperature.

Keywords: Kita-matsuura Basalts, lava flow thickness, magma viscosity

