[JJ] Evening Poster | S (Solid Earth Sciences) | S-VC Volcanology

[S-VC41]Active Volcanism

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This session discusses various aspects of active volcanisms including, but not limited to, recent and historical eruptions, various phenomena associated with the volcanic activities, underground structures of the volcanoes, and developments of new instruments based on geophysical, geochemical, geological, and multidiscipline approaches. We also welcome studies on understanding and predicting the transitions of the eruptive activities from observational, theoretical, and experimental approaches.

[SVC41-P51]Estimation of viscosity of erupting magma from lava flow morphology analysis

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Eruption types of volcanoes and morphologies formed by lava depend on magma viscosity, so it is meaningful to investigate viscosity of extruding lava flow viscosity in studying volcanoes. Rock composition is one of the factors that determine lava flow viscosity, and Shaw (1972) suggested prototype of the method of calculating viscosity using it. However, some lava morphologies show quite different forms in spite of similar chemical compositions, and some studies indicate that crystallinity and water contain causes such disagreement (Sato et al., 2013). In this case, when difference of viscosities estimated by rock composition and lava morphology becomes clear, it may help studying factors that change viscosity before eruption by clearing the reason of its difference.

In this study, we focus on morphological features of lava flow formed by volcanic eruptions, and aim to establish the method of estimating erupting viscosities and restore them of various volcanoes.

Formulas of calculating viscosity from morphology are suggested in previous studies such as Stevenson et al. (1994). In this study, we used aspect ratio which indicates the ratio of height to square of area. We calculated aspect ratio from the results of lava flow simulation that Earthquake Research Institute, The University of Tokyo offers, and derived relationship between aspect ratio and erupting viscosity.

We applied this formula to several real lava flows. As a result, the error by effusion rate was no more than one digit, so this method was confirmed to be useful. When we compare viscosities estimated by aspect ratio and rock composition, we found that the ratio of them was bigger when magma viscosity was higher. It is thought that it is because high viscosity magma effuses in low temperature. According to the study of Sato (2005), the crystallinity of lava makes this ratio bigger. When we consider the effect of crystallization, we gain the result which previous studies show. However, we cannot explain individual lava flows enough, so we have to consider the effects of water content and foam forming.