Estimation of physical parameters of volcanic eruptions based on analysis of eruptive products –Toward understanding of eruption dynamics–

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'Volume' and 'mass discharge rate' of volcanic eruptions are fundamental parameters in understanding the spatiotemporal scale of magma accumulation and migration in the shallow crust and the type and nature of the surface phenomena accompanying the eruption. 'Volume' of one volcanic eruption is the most fundamental physical parameter for determining the scale of the eruption. Its mid- to long-term transition is related to the accumulation process of magma and the frequency of the eruption, as well as the entire volcanic activity. On the other hand, 'discharge rate' of magma is closely related to magma ascending process, and it is a parameter that controls diversity and transition of eruption styles, eruption intensity, and plume height, etc. The elucidation of 'volume' and 'discharge rate' of magma (physical parameter of eruption) is a key in understanding various volcanic phenomena occurring in the crust and the earth surface as the magma rises. The improvement of the estimation accuracy is indispensable to promote the understanding of the causes of diversity of volcanic activities and eruption phenomena, and the magma reservoir-conduit system. Also the magma discharge rate, which is one of the factors that dominates the diversity of the eruption, greatly influences the characteristics of the eruptive products caused by magma ascent and decompression such as the microstructure and texture, and the chemical composition heterogeneity. The elucidation of the relationship between such physical parameters of eruption and the characteristics of the products may enhance the understanding of volcanic eruptions. On the other hand, in recent eruptions, by comparing ejecta/deposit data with various remote observation data from the ground and satellites, it is possible to grasp the process from magma extrusion to deposition at high resolution. The knowledge obtained therefrom is expected to be an important constraint in the reconstruction of past volcanic events. Estimation of the eruption physical parameters is important not only for understanding the dynamics of volcanic eruption but also for predicting volcanic disasters and future eruptions. In this presentation, we will introduce the estimation of physical parameters of eruption in recent volcanic eruptions and the past gigantic caldera-forming eruptions and also describe the issues.

Keywords: volcanic eruption, eruptive volume, discharge rate, physical parameter

