

火砕物粒度特性を用いた単成火山活動における爆発度の試験的評価

A trial for evaluation of explosivity in monogenetic volcanism using grain size characteristics of pyroclasts

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Monogenetic volcanoes are formed in relatively small and short-duration eruptions, but some of them with explosive phenomena due to magma-water interactions (e.g., Wohletz and Sheridan, 1983). In 1983, Nippana tuff ring in Miyakejima Island was formed by small but explosive magma-water interaction in half a day (Aramaki and Hayakawa, 1984). That was a violence event with base surges (Sumita, 1985). As noted below, this kind of eruption style (i.e., phreatomagmatic) is not included in Volcanic Explosivity Index (VEI) originally. Also, VEI has no resolution in small-scale eruptions. Therefore, we should focus on magnitude-free parameters to assess dangerousness of monogenetic volcanism.

Explosivity in monogenetic volcanism is not well evaluated in the previous work. In the first place, what is "explosivity"? Volcanic eruption can be divided in two types: explosive and effusive. According to Wohletz and Heiken, 2002, the explosive eruption is "in which the expansion of gases determines mass transfer processes" in the point of mass transfer system. The mainstream of classification for the explosive eruption is "Walker diagram" which typed by fall-out tephra thinning rate and grain size (Walker, 1973). Walker, 1980 showed five parameters for explain "bigness" of explosive volcanic eruptions: magnitude, intensity, dispersive power, violence, and destructive potential. Taking into account these parameters, Newell and Self, 1982 proposed VEI to explain explosive character of an eruption in historical times. The specific criteria of VEI are volume of ejecta, column height, and descriptive terms. In this index, phreatomagmatic eruptions including Surtseyan have never been considered originally. Hickson *et al.*, 2013 added Surtseyan at VEI 4--5, but it lacks in detail. Furthermore, VEI does not include characteristics of ejecta, such as grain size and shape which represents features of explosions.

This study focus on grain size characteristics of pyroclasts to evaluate the explosivity of monogenetic volcanism regardless of the magnitude of eruptions. I compare the characteristics among three type: magmatic, phreatomagmatic, and rootless. To characterize the grain size, I use fractal fragmentation theory which was applied to a scoria cone by Perugini *et al.*, 2011, and median grain size which relates with energy conversion efficiency in the magma-water interaction (Wohletz and McQueen, 1984). In this presentation, I will show a result of trial evaluation of explosivity in monogenetic volcanism especially focusing on a role of external water in eruptions.

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