

Continuous survey of ash particles by automatic sampling system and field survey

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There are many active volcanoes in southern Kyushu, Japan. Most of the recent eruptions are ash emission. Especially, activities in recent decades at Sakurajima and Suwanosejima volcano, are characterized by long-term successive ash emission such as vulcanian and strombolian eruptions. But in contrast, Plinian (or sub-Plinian) eruptions occurred at the two volcanoes in 1914 and 1813, respectively, as well as relatively large effusive eruptions in 1946 and 1884, respectively. Sub-Plinian eruption occurred also suddenly in 2011 at Shinmoedake volcano in Kirishima volcanic complex, without evident precursory phenomena. How do they evolve into such explosive phases from quiescent period or moderate ash emission? To solve this issue we have done two approaches in terms of petrological analyses; (1) Continuous survey of ash particles of ash emitting eruptions, and (2) reconstruction of pre-climactic phase by field survey of ancient deposits.

We started collection of ash fall at Suwanosejima at the end of 2000 when it became more active after a decade of quiescent period. We have analyzed several samples of different eruption styles and found two types of particles in each sample that differs in crystallinity. The ratio of crystalline and less-crystalline particles changed systematically. Less-crystalline particles were rich for eruptions with long duration and high plume height, whereas they decreased for intermittent eruptions with violent explosions and lower plume height. We also found temporal changes in surface phenomena (i.e., eruption styles, vent condition, etc.) with changes in morphological features of the products. However, as we collected samples by ourselves in this remote island, continuous chase of eruptive products was not possible.

Thus, we started collection of ash at Sakurajima in 2008 by establishing automatic sampling system. We have been successful in daily collection of samples for five years at one locality 2.3 km from active vent. Although petrological features are rather complex than Suwanosejima, they also consist of crystalline and less-crystalline particles. We firstly classified the particles into several types, and then analyzed chemical composition of matrix glass of less-crystalline particles and color of bulk ash sample in terms of photochrometry, in order of date. We found systematic temporal changes in these data with some geodetic observations.

We also analyzed pre 1813 ash deposit of Suwanosejima volcano for comparison with those of recent products. The deposit consists of the alternation of ash layers very similar to those of recent decades. The chemical compositions of matrix glass are also very similar that we could not find drastic change in petrological features between climactic sub-Plinian and preceded phases. But close look at of the chemical composition show relative enrichment of MgO content with time, although each sample has larger ranges in composition than that temporal change.