

## **Quantitative color spectroscopy of ashfall samples as an indicator of eruption styles: Comparison of vulcanian and strombolian eruptions in Indonesia and in Japan.**

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Volcanic products have long been described in terms of color because the colors change through important volcanic processes such as crystallization, oxidization, and vesiculation of magma. Here we describe quantitatively the colors of ash samples by vulcanian and strombolian eruptions to introduce indices of eruption style for continuous monitoring. We used spectrophotometer to describe in CIE  $L^*a^*b^*$  color system. The color of the ashfall of Sakurajima volcano, SW Japan, changes gradually but systematically with changes in dominant eruption style (with/without major explosion). Microscopic investigation of ash particles indicates that the change is due to changes in composition, and in relative amount of glassy, crystalline, and accidental particles. These facts would reflect the changes such as in magma discharge rate, and vent geometry in terms of long-term sequence of eruption. The ash color of Sinabung volcano, N Sumatra, also changes with transition in eruption style; vulcanian explosion, co-ignimbrite ashfall by lava dome collapse, or direct pyroclastic surge. Quantitative description of color enables also comparison among volcanoes. The results of vulcanian and strombolian ashfall in Indonesia and Japan are as follows; 1) Similar major variation trends exist with positive correlation among  $L^*$ ,  $a^*$ , and  $b^*$ . Increase of black dense blocky particles by vulcanian explosions lowers these values whereas increase of glassy brown vesicular particles by strombolian eruptions raises the values. 2) Some minor trends are distinct for each volcano or each event being unique and different from major one. For example, long lasting activity with frequent explosions leads to  $L^*$  (brightness) increase as a result of crystallization of microlites. Vent enlargement results in higher  $b^*$  value due to accidental particles. Thus, the database of the ashfall color would be useful for immediate assessment to monitor eruption styles.