Spectroscopic colorimetry of volcanic ash particles for estimating ash componentry and eruption styles

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Volcanic eruption is not a stable phenomenon, but essentially changes from one styles to another. Thus it is important in most large eruptions to understand eruption sequence for mitigating disaster, and for predicting the more energetic phase during its precursory phases which are often much smaller in magnitude.
Small eruptions like violent strombolian, vulcanian and phreatomagmatic eruptions generally occur in the initial phase of large eruptions, and are characterized by emission of fine volcanic ash rather than larger particles. Although they are tiny, recent works on such fine ash particles revealed that they are quite diverse in color, shapes, density, crystallinity, porosity, and especially in componentry, and that these properties are distinct among eruption styles systematically. On the contrary, however, derivation of the componentry of ash is very laborious and time-consuming routine which had long been hoped to be replaced by other easier methods in terms of real-time monitoring.
This study will show the systematics of these properties (especially componentry) and correlation with sepectroscopic colorimetry using natural ash samples at Suwanosejima volcano and Sakurajima volcano, SW Japan. The procedure of color measurement is easy, and it is noteworthy that some color values a* and b*, or redness and yellowness, change with the increase in amount of vesicular scoria or pumice particles. The similar change occurred at the transition from phreatomagmatic to subplinian eruption at the 1813 Suwanosejima eruption significantly. Thus the continuous observation by spectroscopic colorimentry would help detecting eruption style change in much easier and faster way replacing the componentry analysis with microscope.

Keywords: eruption sequence, Volcanic ash particle, componentry, spectroscopic colorimentry

