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火砕物リサイクリングが支配する玄武岩質火山の小規模爆発様式
Recycling of pyroclasts controls style of small basaltic explosion at Stromboli Volcano, Italy

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Understandings of controlling mechanism on eruptive style is one of the most important subject not only for volcanology but also for hazard mitigation. Vesiculation, outgassing and crystallization that drive or break their ascent have been considered as essential factors for the controlling mechanism (e.g., Jaupart and Allegre, 1990; Houghton and Gonnerman, 2005). In contrast, recent studies have suggested that vigorous recycling of pyroclast into the vent occurs at basaltic volcano where small explosions are repeated (D'Oriano et al., 2014; Eychenne et al., 2014). The recycling of pyroclast that fills the vent can affect explosion dynamics such as shape and ejection speed of jet cloud (Goto et al., 2001; Ohba et al., 2002; Taddeucci et al., 2013).

This study examined component, texture, granulometry and chemical composition of ash samples from normal activity at Stromboli to discuss a controlling mechanism of explosion style of small basaltic explosion. Stromboli volcano has three vent regions as northeast (NE), central (C), and southwest (SW) craters. The three craters emitted white steam continuously that was interrupted by relatively strong explosion. During studied term (14:26-18:29, May 21th, 2014), different explosion styles were observed in each vents. The NE crater exhibited explosive emission of ash rich cloud, and the C and SW craters showed emission of glowing bomb with dilute ash cloud. We collected falling ash from the three craters every 4-18 minutes. Although the samples contain ash particles from the three craters, ash falling rate at sampling site becomes large after occurrence of ash rich explosion at NE crater. The ash particles are divided into Juvenile (glassy particle with elongate, spongy, or dense morphology), Recycled (non-glassy particles with highly crystalline which has similar texture with product of reheating experiment of basaltic ash; D'Oriano et al., 2013), Altered, and Crystal particles. The origin of the each type of particles are interpreted on the basis of their external and internal textures observed under stereoscopic and electron microscope (D'Oriano et al., 2014). We calculated bulk componentry using the componentry variations with grain size (125-250, 250-500, 500-1000, and 1000-2000μm) and grain size distribution. The bulk componentry shows that the volume fraction of recycled particles increases with ash falling rate at sampling site that concords the occurrence of ash rich explosion at NE crater.

The ash observation implies that burial of eruptive vent by recycled particles relates with occurrence of ash rich explosion at NE crater. The explosion occurs at which the gas rich magma from deeper conduit (e.g., Ripepe et al., 2001; Lautze and Houghton, 2007) reaches to the boundary between magma column and buried sediment. Emission of gas jet by the explosion blows the sediment which buries the vent-conduit (Patrick et al., 2007). Thick sediment can store large amounts of gas, magma and heat that generate ash rich cloud at the blowing. Therefore, we suggest that thickness of buried sediment is one of a controlling factor for the style of small basaltic explosion.

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