Recent eruptive activity at Sinabung Volcano, repeating explosive events

*Setsuya Nakada[1], A Zaennudin[2], Fukashi Maeno[1], Natsumi Hokanishi[1], Mitsuhiro Yoshimoto[3], Masato Iguchi[4]

1. Earthquake Research Institute, the University of Tokyo, 2. Center for Volcanology and Geological Hazard Mitigation, Indonesia, 3. Mount Fuji Research Institute, 4. Sakurajima Volcano Research Center, Kyoto University

Since the end of 2013, the eruptive activity has continued at Sinabung, North Sumatra, Indonesia, changing from continuous lava dome growth for the first 2 years into weak dome growth with periodical small vulcanian explosions later. Dome growth still continues and the explosion crater locates on the center of growing lava dome. Failures of lava domes were occasionally triggered by those explosions, generating pyroclastic density currents.

These explosive events are small vulcanian explosion which occurred normally 2 to 3 times a day and in maximum more than 10 times according to the data collected by the Indonesian Center of Volcanology and Geological Hazard Mitigation (CVGHM). The ash column was normally about 2 km or less above the crater, and reached 8 km in maximum. The event interval was much variable with the average of about 400 seconds. The compositions of the bulk, minerals and glass of lava and volcanic ash samples collected irregularly show no significant changes within the errors of analysis since the vulcanian event started.

More explosive vulcanian events occurred at Unzen and Soufriere Hills volcanoes when the magma discharge rates increased rapidly. However, the events at Sinabung repeated at the discharge rate as low as ~0.1 m^3/s. The explosions similar to Sinabung have repeated at Semeru, Indonesia, and Caliente dome of Santiaguito, Guatemala. Holland et al. (2011) proposed the model for Caliente dome, that small crack-network developed near the margin of dacite conduit would close by healing, leading ill-degassing of magma which generates explosion. However, this model cannot be applied to Sinabung and Semeru, because the time scale of healing of high temperature andesite to basaltic andesite magma is much different from those of the event intervals, and this model cannot explain the temporal development from dome growth to the explosive events. A possible model for Sinabung is that gaseous parts develop in different levels within the viscous and sluggish lava interior that behaves as a plug of the conduit, and explode when approach the surface. The reason that Sinabung does not end by forming a spine as in common lava dome eruptions, may be insufficient load of lava accumulated above the crater which could behave as the cap rock against the explosion from slow ascending magma.

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