

Relationship BH-type earthquake swarms and ground deformations prior to eruptions at Showa crater at Sakurajima volcano

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Vulcanian eruptions have occurred at the Minamidake crater at the summit since 1955 at Sakurajima volcano. Principal eruptive activity shifted to the Showa crater at the eastern flank of the summit in 2006. The eruptions at the crater become active and minor vulcanian eruptions occurred about 1,000 times per year in 2010-2013. Ash plume height of the eruptions sometimes reached to 3000m in 2013. The eruptive activities at the Showa crater gradually increase.

Inflationary strain changes are observed by extensometers a few tens of minutes to several hours prior to the eruptions and are caused by pressure sources located at depths of 0-1.5 km (Iguchi et al., 2013). The inflation rates decrease or sometimes suspend about 30 minutes before the eruptions. Small earthquakes dominated by high frequency components (5-6 Hz) swarm when duration of inflation is longer than 1 hour. The hypocenters of the earthquakes are located at a depth of 0.5 km beneath the crater and are close to depth of the pressure source. The earthquakes begin to occur a half hour to 1 hour after the start of the inflation. The amplitudes and number of the earthquakes further increase when the inflation rates decrease or suspend. And, the occurrences of the earthquakes suddenly stop at the start of the eruptions. The occurrences of the earthquake swarms are related to the decrease of inflation rate and the long inflation.

Seismic energy releases of the precursory earthquakes related to every eruption accelerate before eruptions. There are all kinds of large and small seismic energy releases in the eruptions. The accelerations of the seismic energy releases before eruptions with explosive events tend to be larger than those with non-explosive events. And, the accelerations of the seismic energy releases are rapid in the case of large deflations after eruptions. The precursory earthquakes may be generated by release of excess pressure accumulated by inflation of the pressure source. We might be able to predict eruption types and scales from occurrence patterns of the precursory earthquakes.

Keywords: Sakurajima volcano, precursory earthquake, ground deformation