

Very long-period seismic pulse associated with small eruptions at Suwanosejima Volcano

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Suwanosejima is one of the most active volcanoes in Japan. The volcano is located 240km SWW of Kagoshima. The eruptive activity has been repeated at the summit crater in the caldera with Vulcanian- Strombolian. In December 2000, new crater pits were formed beside the cinder cone of the crater. Since then, the eruptive activity has been repeated with the time interval of a few weeks.

In order to make clear process of the explosive eruptions, we installed 4 broadband seismometers, 4 tiltmeters and an infrasonic microphone around summit crater in 2003, and observed many minor eruptions in early November. The eruptions were accompanied with ash ejection and weak infrasonic wave. Displacement records observed by the broadband seismometers typically show very long-period pulse associated with eruption. Upward movement in vertical component and horizontal outward movement from the center of crater began 50-90 s before the eruptions. At the time of beginning of eruptions, the movements turned to downward and inward in vertical and horizontal components, respectively, and the downward and inward movements continued for 20-30 s. The very long-period pulse appeared clearly at the closest station to the crater (400m apart from the eruptive center). The amplitudes range 10-20 microns. Upward and outward movements prior to the eruptions and downward and inward movements associated with eruptions were detected at all the station except the furthest station. At the furthest station, movements before the eruptions were not so clear, and upward and inward displacements were observed associated with the eruptions. The difference in polarity in vertical components during eruptions may be caused by difference in relative elevation. The furthest station is located at lower elevation than crater and the other stations are higher. This fact suggests that pressure source casing deflation is located at quite shallow depth. For simplicity, Mogi's model was applied to vertical and horizontal displacement at the 4 stations during eruption deflation stages, to estimate locations of the pressure source. The sources are estimated to be located at depth of around 100m beneath the crater.

On November 2, 2003, eruptions were repeated with time intervals of 3-5 minutes around 11h05m-11h25m, 14h35m-15h35m,16h59m-17h39m. At Sakurajima volcano, inflation tilt and strain changes were observed 5 minutes to several hours before explosive eruptions and deflations were recorded associated with occurrence of the explosive eruptions. Inflations and deflations were caused by pressure increase and decrease of pressure source at depths of 3-6 km. Displacement seismograms of vertical component at Suwanosejima are quite similar to the tilt records at Sakurajima. Although the intensity and depth of the pressure and durations of pressure increase and decrease at Suwanosejima are smaller than those at Sakurajima, displacement seismograms revealed that minor inflation and deflation were repeated at quite shallow depths beneath the crater of Suwanosejima volcano.