

Continuous GPS measurement in Kuchinoerabujima volcano, Kyushu, Japan

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Kuchinoerabujima is a volcanic island, which is located about 80 km south of Kyushu, Japan. In recorded history, phreatic or phreatomagmatic explosions occurred repeatedly with dormant periods of about 30 years. Almost of the recent eruptions occurred at the summit area of Shindake, which is the youngest cone of Kuchinoerabujima. The latest eruption occurred in 1980 at a fissure located in the eastern side of the summit crater. Various phenomena, such as the increases of volcanic earthquake, crustal deformation, geomagnetic anomaly and discharge rate of volcanic gas have been observed from 1999, which indicate the change of underground condition for the next eruption.

In order to detect signals due to changes of volcanic activities, we have conducted continuous GPS observation since 2004 at five stations in the volcano. Two of them are located at 250m northwest (SDW) and 600m south (FDK) of Shindake. The data are sampled every 30 seconds and are sent by mobile phones. Referring a station located at 3 km NW of Shinadake, SDW and FDK show a trend of westward movement at the rate about 0.4 cm/year. Intermittent events overlapped the trend 4 times. They started in June 2005, September 2006, September 2008 and October 2010 lasting for more than a few months, and deformation caused by these events attained 2-4 cm in total. They are characterized by a cumulative northwestward and upward movement of SDW, and a slight southward movement of FDK. Such a deformation was only detected near the crater, and stations at foots of the volcano did not show significant movements. This crustal deformation indicates the inflation of a shallow source just under the summit crater of Shindake. Seismicity of volcanic earthquakes increased, and total intensities of geomagnetic field changed at the same time, showing increase in temperature beneath the crater (Iguchi, 2007; Kanda et al., 2010). Some of these events were also accompanied with the temporal increase of the discharge rate of volcanic gas. It is inferred that the intermittent deformations induced by an upward movement of volcanic fluid due to increase of a deep magmatic activity.