

Vertical deformation in Tatun volcano group, Taiwan, detected by precise leveling in June 2006-August 2007

Masayuki Murase[1]; Keita Ishikawa[2]; Cheng-Horng Lin[3]; Jui-Jen Lin[1]; Hsin-Chieh Pu[4]; Fumiaki Kimata[5]; Rikio Miyajima[6]; Haruhisa Nakamichi[7]; Atsuo Suzuki[8]

[1] IES, Academia Sinica; [2] Nagoya Univ; [3] IES, Academia Sinica; [4] NCU, Taiwan; [5] Res. Center Seis. & Volcanology, Graduate school of Environ., Nagoya Univ.; [6] TRIES; [7] Environmental Studies, Nagoya Univ. ; [8] Inst. Seismology and Volcanology, Hokkaido Univ.

Tatun volcano group including more than 20 volcanoes is located in the 15 km northeastward from Taipei, Taiwan. Although Chihshing-shan, the highest peak of the Tatun volcano group, has no record of volcano eruption in history, it has a hydrothermal activity characterized by some strenuous fumarolic activities and hot springs. Seismological network installed in 2003 detects a micro-seismic activity such as the volcano-tectonic earthquakes, tremors, monochromatic events and long-period earthquakes in and around Chihshing-shan (Lin et al., 2005; Konstantinou et al., 2007). Since those volcano-seismic swarm occur just around some fumaroles, it strongly suggests that the micro-seismic activity and the hydrothermal activity are closely related. Konstantinou et al., (2007) proposed a model that the earthquake swarm is caused by volcanic fluid supplied to the shallow area. It is expected that deformations are induced by volcanic fluid supplied to the hypocentral area of earthquake swarm and they can be investigated by using a precise leveling survey.

In this study, therefore, we established 10km leveling route from south part to north part of the Chihshing-shan volcano to detect the vertical deformation and the leveling surveys were conducted in June 2006, March 2007 and August 2007. We detected the deformation with the maximum subsidence of 5 mm in the east part of the Chihshing-shan volcano for 9 months from June 2006 to March 2007. The result of the observation between March-August 2007 is similar to the preceding observation and the total subsidence of 10mm was detected for 14 months from June 2006 to August 2007.

Although we tried to estimate simple modeling, the distribution of the leveling route is not good enough to estimate the exact location of pressure source and its shape based on these data. Therefore we constrained search area using other data for getting an appropriate leveling result, conducted for a research of Jinshan fault at the period from 2004 to 2005 by Central Geological Survey in Taiwan. We assume a spherical source for simplicity. We estimate optimal parameters of spherical source on that condition by employing a genetic algorithm (GA).

An optimal geometry of spherical source was estimated to be at the 1km depth around Tayoukeng which is the most active fumarole in this area. The estimated deflation change is consistent with low seismic activity in this period.

In order to discuss the deformation source in detail, we made a new leveling route over a distance of 10 km on August 2007. We will be able to discuss the detail relationship between earthquake swarm and deformation in the near future.