

Estimated pressure source and vertical deformation in Tatun volcano group, Taiwan, detected by precise leveling in June 2006-August 2007

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Tatun volcano group including more than 20 volcanoes is located in the 15 km northeastward from Taipei, Taiwan. Although Chihsing-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 Chihsing-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. It is generally accepted that the swarm activity around volcano is often accompanied by vertical deformation (Hill et al., 2003; Oris et al., 1999; Kimata et al., 2004). The relationship between the micro-seismic activity and hydrothermal activity is an important consideration and can be investigated by using precise leveling data.

In this study, therefore, we established 10km leveling route from south part to north part of the Chihsing-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 Chihsing-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. It suggested same mechanism is continued throughout the year and it also shows the high accuracy of our observation. Since seismic activity was low in the period of our precise leveling, we believe that volcanic fluid was not supplied to the shallow portion around the volcano in this period.

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 and we need constrain search area using other data for getting an appropriate result. One of the leveling results, conducted for a research of Jinshan fault at the period from 2004 to 2005 by Central Geological Survey in Tiwan, shows the subsidence around Len-Shuei-Keng. We assume the spherical source might exist around Len-Shuei-Keng located at the center of the swarm area. We estimate the location of pressure source on that condition by employing a genetic algorithm (GA).

In order to give better constraint to our estimation and compare the pressure-source with the swarm 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.

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