

Volcano-hydrothermal inflation revealed by the spatial variation of stress field at the Tatun Volcano Group, northern Taiwan

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To investigate the volcanic behaviors, the Taiwan Volcano Observatory at Tatun has deployed a dense seismic network in the Tatun Volcano Group (TVG), where the government and business metropolis-Taipei city is bounded and various phenomenon related to volcano-hydrothermal activity were found. This network is composed of 40 seismic stations for covering an area of ~10 km by ~10 km. Based on the seismic data recorded by this network, we have solved an extremely huge number of 1,016 earthquake focal mechanisms with depths less 5 km from 2012 to 2017. Then the detailed spatial variations of the local stress field near the surface are firstly inverted from these focal mechanisms. Overall, local earthquakes were dominated by both the sub-horizontal extensional stress striking ESE-WNW and sub-vertical compressional stress. In detail, the orientations of extensional stress formed the abnormal pattern of a couple of semi curves around the Dayoukeng area. In this particular area of Dayoukeng, the magnitude of compressional stress at the sub-vertical component was stronger than the others principle stresses based on the significantly lower σ values in local than the surrounding area. We ascribe these local variations to an inflating phenomenon buried in the Dayoukeng area. This inflating mechanism should be induced by the volcano-hydrothermal fluid. The current volcano-hydrothermal activity represented by inflation is principally concentrated at the Dayoukeng area and disturbs the faulting behaviors of local earthquakes in the TVG.

Keywords: focal mechanism, stress field, Tatun volcano group, inflation