

Seismic activity and stress field in and around Tarumae Volcano

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Tarumae Volcano, which is located in the southern part of Shikotsu caldera, is an active volcano that has repeated various volcanic activities since historical records. Although the volcanic activity has recently been inactive in and around the volcano, crustal deformation accompanied with volcanic activity was found in the deeper region in the northwest part near the summit from the end of June, 2013 through the beginning of July and following then the seismic activity has also increased in the western part around the summit at a depth of 3-5km from the beginning of July, 2013 through August. It is considered that these activities have been the most active since the installation of the seismic observation of 1967 in and around the volcano (Report of Coordinating Committee for Prediction of Volcanic Eruption, 2013). Furthermore, the event of $M=5.3$ occurred in the western part around the summit at 18:05 (JST) on 8 July, 2014 and then many aftershocks were also observed. It is expected that examining the seismic activity and the stress field in and around the magma chamber to understand the magma feeding system in the volcano leads to the improving the prediction of the volcanic eruption in addition to understanding the volcanic activity.

In this study, we especially focused on the seismic activities before and after the 2014 mainshock ($M_w=5.3$) and determined the hypocenter by using the method of the hypomh (Hirata and Matsu'ura 1987), taking account of the station correction of the observation stations in and around the volcano. The seismic activity after the mainshock is likely distributed to the west side of the volcano, compared to the distribution before the mainshock. On the other hand, the distribution of the seismic activity beneath the volcano did not change before and after the mainshock. We also determined focal mechanisms using S-wave/P-wave amplitude ratios in addition to P-wave first motion polarities, using the method of Hardebeck and Shearer (2003) and then performed the stress tensor inversion using of the code by Martinez et al. (2014). As a result, the stress fields before and after the mainshock did not significantly changed, showing the stress fields of reverse to strike-slip fault type with the maximum horizontal stress in WNW-ESE direction in both term. Furthermore, to clarify whether the seismic activity after the mainshock was affected by the static stress change by the mainshock, we calculated ΔCFS , referring to some focal mechanisms obtained in this study as a receiver fault. It was found that quite a few aftershocks occurred on the area with $\Delta CFS < 0$ and all the aftershock did not necessarily occurred only in the area with $\Delta CFS > 0$.

It is thus implied that although the seismic activity in and around the volcano has basically occurred under the regional stress field accompanied by the plate subduction, some factors except for the regional stress also contribute to the occurrence of the seismic activity in and around the volcano. In addition, it is thought that there is little influence in the volcanic activity in Tarumae volcano due to the 2014 mainshock since the remarkable change in seismic activity is not seen beneath the volcano.

Keywords: volcanic activity, hypocenter distribution, stress field, static stress change