

The deformation source revealed from leveling surveys in Jigokudani valley, Tateyama volcano, Japan

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Leveling surveys have been done in Jigokudani valley, Tateyama volcano, since 2015. Benchmarks, which were set along the walkway of the valley, showed subsidence up to 2.9 cm during the one-year period from September 2019 to September 2020. A dislocation source model by Okada (1992) was applied. Using a grid search method, optimal location, depth, dip, strike, length, width and opening/closing of the dislocation source, which minimize weighted residual sum of square of observation and calculation, were determined. A closing dike was located in southeast area of the valley at a depth of 50 m from surface. Its dip, strike, length, width and closing were 84° from horizontal, N128°E, 300 m, 100 m and 86 cm, respectively. The deflation volume was 25,800 m³. The location of the dike was near the gas chamber estimated by Seki et al. (2016) from AMT surveys. The dike was directing the Koya Jigoku (fumarolic areas) where the largest subsidence was detected and the new fumarolic areas at east side of the Koya Jigoku. The obtained dike might correspond to the hydrothermal fluid pass from the gas chamber to surface. Recent violent fumarolic activity in these fumarolic areas might lead deflation in the hydrothermal fluid pass. Applying the obtained dike to previous vertical deformation during 2015–2016, 2016–2017, 2017–2018 and 2018–2019, openings of the dike were obtained to be 29 cm, 10 cm, –97 cm and 1 cm, respectively. The deflation due to fumarolic activity started from 2017, but the deflation rate is not constant. This may be caused by changes in fumarolic activities and/or intrusion amount of thermal fluid from deeper level.

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