Precise leveling survey in Aso volcano, 2018

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In Aso volcano, leveling survey has been conducted since 1937 by Kyoto University. As a result of these surveys, subsidence in Kusasenri about 3km west-southwest of Naka-dake crater has been observed. And this subsidence was considered to be caused by a contraction source located at about 3km west of Naka-dake crater with a depth of 4 to 6 km (Sudo et al. 2006). A seismic tomography study showed a low velocity zone of a 2 to 3 km diameter located at a depth of 6km in Kusasenri (Sudo and Kong, 2001), almost in accordance with the position of contraction source. Therefore, this low velocity zone is considered to correspond to a magma chamber.
We conducted a first-order leveling survey at Aso volcano during the period from Sep.30 to Oct.6 2018, for the first time since 2012 and after the 2016 Kumamoto Earthquake. As a result, mean square errors of the conducted survey were ranging from ±0.18 to ±0.21 mm/km.
From the obtained survey data, we calculated the relative height of each bench mark referred to a bench mark (960701A) which corresponds to GEONET 960701 GNSS station, located at the south-western foot of central cones of Aso volcano. We also calculated the height difference of 960701A between September 2012 and September 2018, using F3 solutions of GEONET, resulting in the vertical displacements of the benchmarks during the period from September 2012 to September 2018.
It was found that the obtained displacements show ground accordance with 2.5-D surface deformation of the 2016 Kumamoto earthquake detected by SAR interferometry. Therefore, we can conclude that the vertical displacements in Aso volcano detected by leveling survey are attributed to the surface deformation during the 2018 Kumamoto Earthquake.

Keywords: Aso volcano, Crustal deformation, the 2016 Kumamoto earthquake

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