

Vertical deformations revealed by laser scanning surveys in the Muro no mud volcano

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In order to reveal the land surface deformation in the Muro no mud volcano area located in Tokamachi city, Niigata prefecture, we have conducted the laser scanning surveys two times in June and October 2013, using TOPCON Imaging Station IS-301, which can obtain 3D point cloud data by the automatic laser scanning mode without reflector. In the same survey area, Toyama University has been conducting successive leveling surveys at 61 benchmarks so far. We also conducted the height measurements at the benchmarks using the precise ranging mode.

The obtained cloud data have been interpolated on regular grids for the two data sets, respectively, and the surface deformation has been calculated by comparing the gridded data. The obtained result showed a clear concentric uplift pattern in a part of the survey area. We thus modeled the uplift using the Mogi source model. The maximum amplitude estimated from the model was about 1.5 cm and it was almost coincident with the uplift obtained at the nearest benchmark. The result showed that the scanning mode was really beneficial to search for the spatial deformation pattern and the source of the deformation as well, even though its accuracy would be lower than the one of the precise ranging mode.

Keywords: LaserRangeFinder, LaserScanningSurvey, Mud Volcano, Vertical Deformation, Mogi Model