

## Spatial distribution of land surface displacements in the crater of Tateyama Midagahara Volcano using high-definition topographic data

\*Yuichi S. Hayakawa<sup>1</sup>, Shigekazu Kusumoto<sup>2</sup>, Takuro Ogura<sup>3,4</sup>

1. Faculty of Environmental Earth Science, Hokkaido University, 2. Graduate School of Science and Engineering for Research, University of Toyama, 3. Graduate School of Frontier Science, The University of Tokyo, 4. Graduate School of Environmental Science, Hokkaido University

Detailed monitoring of land surface displacements is crucial for the assessment of activities of a volcano, especially in its crater area. Close-range remote sensing of high-definition topographic data is advantageous in the detection of centimeter-scale ground-surface displacements in a wide spacial extent, whereas the conventional leveling method is capable of detecting millimeter-scale displacements along a measurement line. We investigated the spatial distribution of land surface displacements in the Jigoku-Dani crater area of Mt. Tateyama Midagahara Volcano in Toyama Prefecture, central Japan by high-definition topographic measurements including terrestrial laser scanning and unmanned aerial vehicle-based structure-from-motion photogrammetry. The annual measurements were performed for three years (2015 to 2017). The range of uplift detected by terrestrial laser scanning corresponds with that by leveling. Together with the analytical results of the leveling data, the spatial pattern of the uplift suggests the extent of an underground pressured zone to cause the exhumation. For the prediction of the volcanic activities, further monitoring is required to reveal the spatiotemporal patterns of the displacements.

Keywords: terrestrial laser scanning, unmanned aerial system structure-from-motion, point cloud