Application of high definition data for analysis of topographic and vegetation changes
using UAVs and SfM photogrammetry
-A case study of shallow landslides around Mt. Aso-
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Abstract
In the last few years, SfM-MVS (Structure from Motion and Multi View Stereo) photogrammetry based on photographs taken from UAV (Unmanned Aerial Vehicle) has attracted a tremendous amount of interest for the creation of DSM (Digital Surface Model) and other morphometric products. The purpose of this study is to detect temporal changes of topography and vegetation around shallow landslides using UAV and SfM-MVS photogrammetry. Study areas are the Sensuikyo area (1.2 km²) and the Saishigahana area (0.06 km²) around Mt. Aso where many shallow landslides occurred due to heavy rainfall in July, 2012. We conducted a field survey using UAV from 2014 to 2015. We then interpreted the photographs, and analyzed the topography of landslides comparing LiDAR based DSM on 2004.

As the result, we obtained ortho-photograph and DSM with spatial resolutions of 4 cm and 10 cm, respectively. In the Saishigahana area, 20 landslides (20 ~ 4,600 m²) occurred, and ratio of total landslide area reached 30 % of the area. These landslides tended to occur in a specific slope which had 40 degree. The landslide depth was ca. 1.0 m, and the estimated total landslide volume was 0.9 ~ 1.7×10⁴ m³. In the Sensuikyo area, 300 landslides (10 ~ 16,000 m²) occurred, and the estimated total landslide volume was 1.1 ~ 1.4×10⁵ m³ / km². The distribution of landslides was not uniform in the Sensuikyo area. Our results indicated that topography and past landslide history affected these landslide occurrences. Vegetation intrusions into the landslide area were also detected in both study areas. Further study is necessary to detect temporal changes of topography and vegetation around landslides based on multi-temporal ortho-photographs and DSMs.

Fig. 1: Satellite image and relief maps.

(1) Study area

(2) Methods

(3.1) Results: Saishigahana

(3.2) Results: Sensuikyo