Comparison of wide-range topographic data derived from UAV-SfM and airborne lidar: a case study at Taal Volcano, the Philippines

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Frequent acquisition of topographic data for a wide area is fundamental for studies on volcanoes because volcanic activities often cause changes in topography, and other properties, including gravitational anomalies, needs to be calibrated based on the topographic data. Airborne laser scanning (ALS) by a crewed aircraft is a standardized approach to acquire topographic data in a wide area, but its high cost limits its frequent applications. Measurements using an unmanned aerial vehicle (UAV)-based structure-from-motion (SfM) photogrammetry is becoming more popular in recent years for geoscientific studies, but its accuracy is often found to be relatively low particularly if ground control points (GCPs) are unable to be set in the areas of interest. However, the use of low-accuracy data can still be beneficial for some specific research purposes such as geomorphological mapping and gravity mapping. To validate the usefulness of low-accuracy data, we compare ALS-derived and UAV-SfM-derived topographic data of the island of the Taal volcano in the Philippines. Although the UAV-based data shows significant inaccuracies and errors, the data can be instantly obtained at a low cost and is found to be enough for a rough geomorphological mapping and calibration of gravitational data for the wide area. Further assessments and compilation of acceptable resolution and accuracy of various topographic data are encouraged.

Keywords: digital elevation model, airborne laser scanning, unmanned aerial vehicle

