



A semiautomated mapping of landslide volume displacements using UAV aerial imagery

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The current study is focused on assessing the spatial and temporal patterns of landslide volume displacements using a semiautomated method and Unmanned Aerial Vehicle (UAV) aerial imagery. The case study is located in the Livadea village from Curvature Subcarpathians, Romania, where a landslide was triggered on May 3, 2021. Three separate flights were flown on May 6, May 25, and July 10 using DJI Phantom 4 and Phantom 4 RTK drones. Even though there is a difference in camera resolution, each flight plan was created to correspond to a 4cm/pixel spatial resolution, meaning that the constant height above ground was different between the first flight and the next two flights. For the first flight, because the UAV equipped with the RTK receiver was not available, a graded consumer UAV equipped with a Non-RTK receiver was used. A maximum overlap with the smallest errors possible between all the flights was obtained by orthorectifying the first and the third flights with GCPs collected from the second flight. The method is based on using aerial imagery collected with UAV and their derived products obtained by applying the Structure from Motion (SfM) technique. Because it is an area with dense forest, the Visible Atmospherically Resistant Index (VARI) was used to filter out all the pixels with vegetation from the digital surface models (DSM). The gaps were filled by using the Empirical Bayesian Kriging interpolation method, implemented in ArcGIS Pro. The results show volume displacement rates of 0.005 cubic meters/meter for the period between the first and second flights and 0.05 cubic meters/meter for the period between the second and third flights. The overall displaced volume was approximately 406000 cubic meters with approximately 41000 cubic meters for the period between the first and second flights and approximately 365000 cubic meters between the second and the third flight. This approach proved quick and efficient for assessing landslide volume displacement when fast response and measures are necessary to reduce landslide consequences.

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