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Use of Remotely Piloted Aircraft System and LiDAR for Alpine forested Landslide

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In the last decade Remotely Piloted Aircraft Systems (RPAS) technologies considerably evolved, improving flight stability, GPS positioning and payload. Recent researches shown that RPAS-SfM framework, combining high volumes data acquisition and fast treatments capacity, make it suitable for environmental monitoring. However, monitoring, in a short period, an active landslide with major land displacements in a context of unstable and vegetated mountainous area still represent a real challenge.
In this study, we aimed at developing a reproducible and optimized cost-efficiency method to accurately survey active terrain movements. The combined use of two RPAS allows to i)better visualize at large scale (1km2) the phenomenon dimensions and velocity in order to ii) focus our efforts on a safe topographic and photogrammetric data acquisition.
The study area is a re-activated landslide previously reported in 1966 by forest management services located near Beaufort in the French Alps. For six time steps between April and September 2017, we acquired aerial photos with two reflex camera (Visible and Near Infra-Red Bands) mounted on a hexacopter with a payload up to 4kg. A validation campaign with aerial LiDAR and Terrestrial Laser Scanner took place on June 2017.
Comparison of the digital Surface models and orthophotos derived from RPAS flights gave satisfactory results. Spatial analysis in a GIS allowed a quantitative evaluation of heterogeneous behaviors and dynamic distributions of materials (mineral and vegetal) along the slope.
Estimations of displaced volumes (500 000 m3) constitute a precious information for improving in emergency crisis the calibration of deposits place in order to avoid jam and flood on the road network.
In this research, we demonstrate the feasibility of a repetitive RPAS based data acquisition method but some limitations still remain. Research efforts will now focus on DEM under vegetation cover determination combining RPAS adapted LiDAR, improved RTK differential positioning systems and miniaturized Hyperspectral sensor.