# DETECTING AND QUANTIFYING DEBRIS FLOW-RELATED GEOMORPHOLOGIC CHANGES IN AN ALPINE CATCHMENT USING LIDAR AND PHOTOGRAMMETRY DATA

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In June 2015, a debris flow event occurred near the village Sellrain in the Stubaier Alps (Western Austria), covering parts of the populated valley floor with a big alluvial cone. Detailed documentation of the geomorphologic changes caused by the debris flow in the catchment play an important role for hazard mapping, mitigation measure planning and process understanding. However, traditional debris flow event documentation is mostly limited to in-situ assessment of the deposition extent and height. Data assessment in the catchment area is very time-consuming, potentially dangerous and often hampered by limited accessibility to the affected area. This leads to a lack of comprehensive information of the process extent and magnitude. In this study, we present the results of a post-event UAS-mission realised in the catchment of the above-mentioned debris flow channel. We used a custom-built fixed-wing UAS, carrying a commercial off-the-shelf sensor (Sony NEX5). During four flights, the area of interest of about 2.5 km² was mapped. Orthophotos and digital terrain models (DTM) were derived using structure-from-motion photogrammetry software (Agisoft PhotoScan). The many narrow debris source areas along the channel could be located very precisely from these orthophotos. With the assignment of the origin and size of these sources to forested and non-forested terrain, conclusions regarding the influence of the forest on the process could be drawn. Previously active zones were deduced by the comparison with older orthophotos. Terrain height changes in the catchment were calculated by subtracting the pre-event airborne laser scanning DTM from a post-event UAS-DTM. The analysis of the volumetric sediment budget showed, that approximately 265,000 m³ (±42,000 m³) material was mobilised in the catchment, with erosion depths reaching up to 3-4 m in the lower part of the gully and 8 m in the central and upper sections. The photogrammetric reconstruction of the DTM was challenging, due to small bushes within the process zones. Other limitations included the time interval of the reference data. The results not only largely benefited the event documentation, but in succession contributed to a better process understanding.