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Mapping, Quantification and Analysis of Gravitative Processes Based on Repeat Airborne Lidar Datasets

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In recent years the use of airborne laser scanning (ALS) data are becoming increasingly important in geomorphology. In most cases the research is based on the analysis of morphometric parameters derived from a single high-resolution digital elevation model (DTM). In contrast to the aforementioned mono-temporal analyses, in this study gravitative process results are mapped, quantified and statistically evaluated by means of repeat ALS datasets. The study area is located in the western part of the Central Alps of North Tyrol (Oetztal, Pitztal, Kaunertal; Austria), covering an area of approximately 750 km^2. The therein developed methods are applied to the western part of South Tyrol (Ortler-Ceveldale group, Ultental, Schnalstal; Italy) with an area of approximately 100 km^2.

The mapping of the geomorphologic process areas is carried out on the basis of dDTM (differential DTM), whereas the timespan between the flight campaigns is four years (2006 to 2010 in North Tyrol) respectively six years (2005 to 2011 in South Tyrol). From these dDTM, areas with a decrease in elevation (erosion) as well as areas with an increase in elevation (deposition) can be identified and mapped. Based on their morphometric characteristics the mapped process results are thereafter classified into the gravitative process types: rock fall, land slide and debris flow. In the larger area of the North Tyrolean Central Alps 191 gravitative events (56 rock falls, 54 debris flows, 81 land slides) can be determined using the dDTM (2006 to 2010). In the smaller study area around Ortler-Cevedale group, Ultental and Schnalstal 22 debris flows and 11 landslides are detected on base of the dDTM (2005 to 2011).

As a result the regional and altitudinal (concerning permafrost) process distribution as well as the influence of varying raster resolutions (1 m, 3 m, 5 m and 10 m) on the detection of the concerning process results will be presented. Furthermore, the applied method and the workflow will be explained in detail.