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Suitability aero-geophysical methods for generating conceptual soil maps and their use in the modeling of process-related susceptibility maps

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In the past years, several times large-scale disasters occurred in Austria, which were characterized not only by flooding, but also by numerous shallow landslides and debris flows. Therefore, for the purpose of risk prevention, national and regional authorities also require more objective and realistic maps with information about spatially variable susceptibility of the geosphere for hazard-relevant gravitational mass movements.
There are many and various proven methods and models (e.g. neural networks, logistic regression, heuristic methods) available to create such process-related (e.g. flat gravitational mass movements in soil) suszeptibility maps. But numerous national and international studies show a dependence of the suitability of a method on the quality of process data and parameter maps (f.e. Tilch & Schwarz 2011, Schwarz & Tilch 2011). In this case, it is important that also maps with detailed and process-oriented information on the process-relevant geosphere will be considered. One major disadvantage is that only occasionally area-wide process-relevant information exists. Similarly, in Austria often only soil maps for treeless areas are available. However, in almost all previous studies, randomly existing geological and geotechnical maps were used, which often have been specially adapted to the issues and objectives. This is one reason why very often conceptual soil maps must be derived from geological maps with only hard rock information, which often have a rather low quality. Based on these maps, for example, adjacent areas of different geological composition and process-relevant physical properties are razor sharp delineated, which in nature appears quite rarly.
In order to obtain more realistic information about the spatial variability of the process-relevant geosphere (soil cover) and its physical properties, aerogeophysical measurements (electromagnetic, radiometric), carried out by helicopter, from different regions of Austria were interpreted. Previous studies show that, especially with radiometric measurements, the two-dimensional spatial variability of the nature of the process-relevant soil, close to the surface can be determined. In addition, the electromagnetic measurements are more important to obtain three-dimensional information of the deeper geological conditions and to improve the area-specific geological knowledge and understanding. The validation of these measurements is done with terrestrial geoelectrical measurements. So both aspects, radiometric and electromagnetic measurements, are important and subsequently, interpretation of the geophysical results can be used as the parameter maps in the modeling of more realistic susceptibility maps with respect to various processes.

Within this presentation, results of geophysical measurements, the outcome and the derived parameter maps, as well as first process-oriented susceptibility maps in terms of gravitational soil mass movements will be presented. As an example results which were obtained with a heuristic method in an area in Vorarlberg (Western Austria) will be shown.

References:

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