A new approach of mapping soils in the Alps - Challenges of deriving soil information and creating soil maps for sustainable land use. An example from South Tyrol (Italy)

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Nowadays sustainable land use management is gaining importance because intensive land use leads to increasing soil degradation. Especially in mountainous regions like the Alps sustainable land use management is important, as topography limits land use. Therefore, a database containing detailed information of soil characteristics is required. However, information of soil properties is far from being comprehensive. The project "ReBo - Terrain classification based on airborne laser scanning data to support soil mapping in the Alps", founded by the Autonomous Province of Bolzano, aims at developing a methodical framework of how to obtain soil data. The approach combines geomorphometric analysis and soil mapping to generate modern soil maps at medium-scale in a time and cost efficient way. In this study the open source GRASS GIS extension module r.geomorphon (Jasciewicz and Stepinski, 2013) is used to derive topographically homogeneous landform units out of high resolution DTMs on scale 1:5.000. Furthermore, for terrain segmentation and classification we additionally use medium-scale data sets (geology, parent material, land use etc.).

As the Alps are characterized by a great variety of topography, parent material, wide range of moisture regimes etc. getting reliable soil data is difficult. Additionally, geomorphic activity (debris flow, landslide etc.) leads to natural disturbances. Thus, soil properties are highly diverse and largely scale dependent.

Furthermore, getting soil information of anthropogenically influenced soils is an added challenge. Due to intensive cultivation techniques the natural link between the soil forming factors is often repealed. In South Tyrol we find the largest pome producing area in Europe. Normally, the annual precipitation is not enough for intensive orcharding. Thus, irrigation strategies are in use. However, as knowledge about the small scaled heterogeneous soil properties is mostly lacking, overwatering and modifications of the regional water balance are often involved. Therefore, a rudimentary approach to involve these anthropogenically influenced areas in soil maps can be based on expert decision trees. In it the potential soil inclusive the kind and degree of the anthropogenic degradation is presented. The aim of this approach is to give the map user suitable soil information itself.

References: Jasiewicz, J. & Stepinski, T. F. (2013): Geomorphons - a pattern recognition approach to classification and mapping of landforms. Geomorphology 182, 147 - 156.