C3S-ISLS (Climate induced system status changes at slopes and their impact on shallow landslide susceptibility) – the project's research plan

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Shallow landslides imminently endanger human living and infrastructure in mountainous regions of the world. As these areas are often densely populated - especially in the Alpine region - it is essential to fully understand the processes involved in order to prevent impacts. Shallow landslides are usually understood as translational, slope-parallel gravitational mass movements comprising of a mixture of earth and debris with a maximum depth of 1-2 m. Under certain circumstances the initial sliding can turn into a flow-like movement leading to high velocities and runout distances. Shallow landslide susceptibility is differentiated into three classes. Predisposing factors involving topography, slope, geology and regolith characteristics (material strength and hydraulic properties) are regarded as a slope's natural predisposition towards sliding. Variable factors such as meteorological pre-conditions i.e. the soil's degree of saturation as well as land cover, land use and vegetation period represent the varying system status of a slope. Finally, in the course of triggering events such as heavy or prolonged rainfall (in other regions also earthquakes or volcanic activity) highly susceptible slopes are increasingly destabilized until sliding sets on. The project aims at determining shallow landslide susceptibility in time and space by means of statistical and physically-based modelling with a high degree of automation. For the respective case studies two different scales were defined. Predisposing factors shall be modelled statistically area-wide within the districts Feldkirch, Dornbirn and Bregenzer Wald in Vorarlberg, Austria. Therefore a landslide inventory is set up based on semi-automated classification of multitemporal orthophotos and airborne laser scanning derivatives. In combination with meteorological data this inventory is also used to derive precipitation thresholds for the onset of shallow landslides. The physically-based approach involving the TRIGRS model, demanding for detailed knowledge about regolith characteristics, is applied for a slope in the Laternser valley. Field work and suited laboratory tests yield the necessary geotechnical and hydraulic input parameters. The model is calibrated for past landslide events with known meteorological pre-conditions. In order to quantify the impact of climate change on shallow landslide susceptibility the results of scenario-based simulations are evaluated against current conditions. Finally, potentially affected areas are identified and shown in hazard maps.

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[http://www.uibk.ac.at/geographie/lidar/c3s/c3s.html]

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