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Characterising hydrological behaviour of springs draining different alpine formations

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The project SACflood (Susceptibility of alpine catchment flood runoff to changes in meteorological boundary conditions) concentrates on alpine areas and wants to identify catchments that show a damped reaction to runoff but may react unexpectedly strong to increased precipitation as observed in 2005 in the Schächen. The catchment showed a delayed and damped behaviour for smaller precipitation events but reacted with strongly increased discharge when a threshold amount of rainfall was reached, causing a flood with high damages. This is attributed to the complex interaction of storage and drainage mechanisms that are not yet well enough understood.

Typical alpine geomorphic formations are identified that are likely to be associated with large storages which could considerably delay runoff reaction but still contribute to flow within a timescale relevant for flood formation. From these geomorphic formations deep drainage is measured as outflow from several springs. In addition natural tracers are measured in the springs. On a steep hill slope, associated to one of the observed springs, ground water levels are observed. Geoelectric profiles were recorded to depict the structure of the underground.

Discharge measurements from the springs show remarkable differences between the sites. After long dry periods certain springs do not react to rainfall immediately but need considerable amounts of rain to increase discharge. Even steep slopes as well as large talus areas can substantially delay runoff. Observations of the groundwater levels reveal an unexpected picture of the underground. The water table is not as often assumed above the bedrock but at a depth of several meters within the highly fractured bedrock material. This can result in a much higher storage capacity of such slopes despite the steepness of the surface.

On the basis of the results from field work conceptual ideas are developed. The influence of parameters such as the depth of the unsaturated zone and the length of the slope are explored. This leads to the development of a model to describe runoff behaviour of springs that can be used to predict runoff behaviour of landscape units using parameters easily assessed in the field.