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Influence of (relict) rock glaciers on the discharge behavior of alpine catchments applying a rainfall-runoff model – example of the Niedere Tauern Range (Austria)

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Debris accumulations and / or extensive surface weathering within a stream catchment are said to have a possible buffer action concerning flood propagation and might therefore be of interest in geological hazard assessments. Moreover, these deposits might act as (important) groundwater storage components and should therefore be of interest for water management purposes especially during periods of droughts. Although this is plausible, the actual quantification of these "phenomena" is scarce.
Here we investigate a number of catchments in the Niedere Tauern Range (Austria) concerning the contribution of relict rock glaciers (and other debris accumulation) in regard to the runoff behavior. Rainfall-runoff models are applied for various (sub-) catchments with different amounts of rock glacier (or debris) coverage. In a first step, the hydrologic modeling is kept simple using a parsimonious lumped-parameter rainfall-runoff model on a daily time step. The variation in model parameter values from (sub-) catchment to (sub-) catchment should ideally correlate with the various degrees of relict rock glacier / debris coverages if their influence is significant. If so, their physical relevance could be helpful to on the one hand aid in catchment characterization and application in neighboring ungauged catchments, and on the other hand to evaluate future changes in the forcing climatic parameters (such as temperature and precipitation) and in the debris accumulations itself on the discharge behavior of alpine catchments.

Preliminary results show that catchments with a difference in relict rock glacier coverage but similar other catchment characteristics show differences in the discharge behavior which becomes noticeable in the storage- or routing-related parameters of the model. Analyses of a single catchment including strongly rock glacier influenced sub-catchments indicate a significant storage capacity for the rock glacier itself compared to the average storage capacity of the whole catchment. In addition to an obvious impact of the snow accumulation in these alpine catchments other influences such as lithological differences or microclimatic variations are likely to be important and the interpretation so far is ambiguous and will be further investigated applying (semi-) distributive models.