CLASSIFICATION OF SMALL ALPINE CATCHMENTS

A TOOL TO SUPPORT THE CHOICE OF RAINFALL-RUNOFF-MODELS

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Thanks to increasing computer capacities a large number of rainfall-runoff-models have been developed during recent decades in order to simulate discharge and to forecast flood events. Though most of these models yield good results in the catchments, the data of which were used in the model development process, their transfer to other catchments raises difficulties. This is due to site-specific simplifications in the model structure because of missing knowledge of the hydrological processes in detail or missing input data. At the current state of knowledge and data availability it is not possible to develop an entirely physically based model applicable to a wide range of catchments (Beven, 2002). As a consequence great effort has to be made to find out which one of the existing rainfall-runoff-models 'performs well, where and for what purpose' (Beven 2006).

The development of a catchment classification system may contribute to improve this situation. As catchment characteristics vary strongly within space and time a catchment classification can help to identify affinities regarding hydrologically relevant aspects. Catchments belonging to the same class are meant to show similar reactions to comparable current system conditions and precipitation events. Catchment classes can then be assigned to an appropriate rainfall-runoff-model type. This idea follows the suggestion of McDonnell & Woods (2004) who state that 'while not a panacea, classification may be a first step and one way to come at the challenges that catchment hydrology faces.'

CONCEPT OF A CLASSIFICATION OF SMALL ALPINE CATCHMENTS

As a first step it is tried to develop a catchment classification for small Alpine catchments regarding their flood-controlling characteristics. By using a Geographic Information System the properties of catchments will be surveyed. Rules of the type "if A then B" will be developed in order to identify dominant runoff processes for catchment subareas dependent on the catchment properties and the current system conditions (e.g. high water content of the soil due to antecedent rainfalls or frozen ground may raise overland flow).

For instance a catchment with extended reservoir areas such as debris slopes will presumably not react as quickly to a precipitation event as a catchment situated in clayey substrate. While the first catchment will hardly change its reaction under frozen conditions (as there are still enough pores within coarse debris even when frozen) a catchment with mostly sandy

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substrate will possibly show increased discharge. As a result, the rule based system is expected to give an evaluation on catchment response to (different types of) precipitation events dependent on the catchment properties and on how much the response is differing due to current system conditions. This will be the basis for the intended catchment classification system.

TEST SITES

For the development of the rule-based system, data of 23 study areas, collected by the Bavarian State Office for Water Management (now Bavarian State Office for Environment) during the project "Integrales Wildbachschutzkonzept" (Integral Torrent Protection Concept, see e.g. Bunza et al. 1996), will be used. In the course of this project, geological, geomorphological, pedological and vegetation maps (1:5.000, GIS-based) were produced for all study areas, which are small mountain torrent catchments (between 1 to 15 km²). As data availability is excellent for these test sites, in a second step the suitability of the rule-based system for use with generally available data will be tested in order to define minimum standards for input information.

The rules to identify dominant runoff processes for catchment subareas dependent on the catchment properties and the current system conditions will be defined a) on the basis of former findings (e.g. Markart et al. 2004), b) by transferring published rules (e.g. Peschke et al. 1999, Schmocker-Fackel et al. 2007) to alpine conditions and c) by own investigations. Information on past flood events will be collected and analysed in order to evaluate and calibrate the rule-based system and the resulting catchment classification. First results of this project, financed by the Austrian Science Fund FWF, will be presented at INTERPRAEVENT 2008.

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