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Modeling of hydrographs in torrent catchments by use of improved field data and adapted precipitation/runoff models

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For description of runoff formation in alpine catchments still often simple runoff formulas are used on the one hand. On the other hand many precipitation / runoff models for assessment of runoff characteristics in mesoscale and microscale catchments require detailed input data and some are using algorithms which don't describe runoff processes "process-oriented". This especially applies to lumped and to some conceptual models. Fully distributed models mostly require enormous effort for determining serious catchment description parameters.
As a first step into the direction of a time and cost sparing but still process based assessment of runoff development in alpine torrent catchments a two column-procedure has been developed at the BFW in cooperation with university scientists and in cooperation with the Austrian Avalanche and Torrent Control Service and the Bavarian Environmental Agency:
1) Based on the results of about 700 simulations of torrential rain on various soil vegetation complexes and land-use forms in the Eastern Alps a code of practice for assessment of surface runoff coefficients in torrential rain has been developed. By use of three indicator groups (soil conditions, sort and condition of plant cover, way and intensity of land-use / cultivation) runoff coefficients and surface roughness coefficients can be easily attributed to runoff contributing hydrological vegetation units. The big advantage: Dominant infiltration and runoff controlling processes are integrated in the assessed runoff and surface roughness coefficients. The manual is freely available under: http://bfw.ac.at/rz/bfwcms.web?dok=4342 (in German language).
2) The coefficients derived from field studies and/or GIS analysis form input parameters for the precipitation / runoff model ZEMOKOST (The runtime Method of ZEller MOdified by KOhl and STepanek), an MS-EXCEL based calculation tool which can be used with or without GIS-environment. The approach is permanently improved by addition of new features like a linear reservoir approach, antecedent moisture index and torrent control structures like flood retaining basins. The transformation in a GIS-based time-area-approach for a more efficient consideration of site characteristics is in progress.
The presented approach has been tested for several years by the Austrian Avalanche and Torrent Control Service and civil engineers as well. In the meantime it has become one of the most frequently used precipitation / runoff procedures in Austria. The latest proof of its reliability has been the successful recalculation of the influence of forests on the enormous flood in August 2005 in the Paznaun Valley (Tyrol, Western Austria).