Geophysical Research Abstracts, Vol. 8, 09412, 2006
SRef-ID: 1607-7962/gra/EGU06-A-09412

Scales in space and time in a mountainous mesoscale catchment using a complex rainfall-runoff model

H. Pöhler (1), V. Dunger (2), J. Matschullat (3)

(1) Technische Universität Bergakademie Freiberg, Interdisciplinary Environmental Research Centre (IÖZ) (Hannaleena.Meier@ioez.tu-freiberg.de) , (2) Dr. Volkmar Dunger, Lehrstuhl für Hydrogeologie, TU Bergakademie Freiberg (dungerv@geo.tu-freiberg.de), (3) Technische Universität Bergakademie Freiberg, Interdisciplinary Environmental Research Centre (IÖZ) (Joerg.Matschullat@ioez.tu-freiberg.de)

The hydrology group within the interdisciplinary BMBF (Federal Ministry of Education and Research)-supported EMTAL-project (Reservoir Catchment Management in Mountainous Regions) studies changes in water balance and runoff resulting from landuse change and climate change. The hydrological model WaSiM-ETH is used for that purpose. It was calibrated and validated in the catchment areas of the rivers Wilde Weißeritz (162 km^2) and Rote Weißeritz (153 km^2) in the Erzgebirge, Germany. Quality and accuracy of rainfall-runoff-modelling depends very much on the spatial scale and the chosen time steps. This accounts especially for catchment areas in highly differentiated areas like Central European highlands. Therefore input data with different spatial resolutions and time steps were used to test the possibility of transferring the model system into similar regions. As most parameters in a model depend on their temporal context, changes in these parameters with differing time steps are expected. In many tests it could be shown that in the given spatial resolution parameters for components of the water balance like the snowmodel, interception, potential and real evapotransporation could be used in all cases. Parameters regarding runoff itself, which means the calculation of direct runoff, interflow and baseflow, had to be changed with changing temporal resolution. In smaller time steps the waterflow in the soil itself seems to be the dominant process, in larger time steps, the storage-like behaviour of soil plays a major role for calculating runoff. This is expressed by the changed parameters. WaSiM-ETH is based on rasters. So different spatial resolution of input data leads to different raster sizes. In this case, raster sizes of 20 m, 50 m, 100 m, 300 m, 500 m and 1000 m were compared. Differences in resolution

of the morphology of the region did not have a significant correlation with changes in the modelled runoff regime. Changes in raster sizes of landuse had only visible consequences in small catchments with areas up to about 50 km^2. Only modelling in a 1000 m raster showed significant changes to modelling in a 20 m raster. Soil had larger consequences on modelled runoff. In the aggregated soil map soiltypes with low conductivities had a larger proportion than in the more precise ones. That lead to a rise of the share of direct runoff with raster size. Total runoff showed remarkably small differences modelled in different raster sizes. The sensitivity of the parameters changes in different raster sizes, but not the absolute number of the parameter which is used after calibration. So if one is only interested in total runoff, the calibrated data set can be used in every tested raster size. Only the 1000 m raster leads to a noticeable, but still relatively small decline in the quality of modelling.