Geophysical Research Abstracts
Vol. 18, EGU2016-12089, 2016
EGU General Assembly 2016

Multi-objective calibration of a spatially semi-distributed rainfall runoff model and its snow water equivalent module.

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The snow cover is an important environmental and water management factor in mid latitudes. From the water management point of view the impact of the water accumulated in the snow cover is significant mainly during the spring season when it's melting causes a significant flooding threat when melting is accompanied by precipitation (rain on snow floods). Modelling of spatial and temporal distribution of the snow water equivalent is therefore an important component of rainfall-runoff models. The main objective of this work was to study the possibility to include information on the spatial distribution of the snow cover into runoff modelling and evaluate the quality of the simulation of both of the snow water equivalent and catchment runoff. A conceptual semi-distributed rainfall-runoff model was used in order to model the snow water equivalent in a daily time step. In order to calibrate and validate the model a multi-calibration techniques were used taking into account both runoff from the catchment and the observed values of the snow water equivalents and snow heights in elevation and vegetation zones. The multi-objective calibration linearly combines two optimization functions and aggregates them into one. While the first optimization function compares observed and simulated flows, the second one is based on an indirect comparison of a snow water equivalent simulated by a rainfall-runoff model and the snow cover heights measured in rainfall gauges within the catchment. The aim of the paper is to optimize the ratio of the weights in the optimization. The methodology was tested on the Upper Hron River catchment, which could be considered as a mountainous catchment.