

Influence of catchment spatial subdivision on the accuracy of the snow accumulation and snowmelt model

Abstract

This thesis is focused on influence of catchment spatial subdivision on the accuracy of rainfall-runoff model simulations. A hydrological model HEC-HMS developed by U.S. Army Corps of Engineers was applied in the thesis. Study area includes two experimental catchments; Bystřice River basin and Zlatý Brook basin. Both catchments are located in the Krušné Mountains. The research in catchments has been carried out by the Department of Physical Geography and Geoecology since 2008. The influence of four different horizontal and vertical catchments delineation on runoff simulations was analyzed. The simulations were performed in two two-year periods 11/2008–10/2010 and 11/2010–10/2012. The attention was mainly aimed to snowmelt component of the model, for which temperature index method was chosen. The results of simulations were compared with water stages data measured in catchments outlets and with data from winter field measurements (snow depth and snow water equivalent). The results from both catchments showed that higher accuracy of simulation of the snow water equivalent was reached by dividing the catchments into more elevation zones. However, each of the catchments behaved in different way. The accuracy of simulated runoff from catchments evaluated by selected objective criteria didn't reach satisfactory results. However, in the Bystřice River catchment the simulation was improved when the catchment was divided into 3 subcatchments. The accuracy of simulation was higher when the catchment was spatially undivided in case of Zlatý Brook catchment. The positive effect of higher number of elevations bands was confirmed, especially in Bystřice River catchment. The results were compared with the knowledge obtained from scientific literature.

Keywords: rainfall-runoff model, snow accumulation, snowmelt, spatial distribution of the parameters