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Snow accumulation and snowmelt in the forest and in open areas in small mountain catchments, Czech Republic

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The aim of the presentation is to introduce selected results of the research carried out in small experimental mountain catchments in the Czech Republic (Krušné Mts.). The presented research is dealing mainly with the 1) measuring the snowpack and assessing the role of different physical-geographical factors on snow accumulation and melting, such as the vegetation, altitude, slope, exposure, 2) calibration of the snow accumulation and snowmelt models in the local and regional scale and 3) using hydrological models for impact simulations focusing mainly on the runoff change thanks to land cover change (areal change of forests and open areas in study catchments).
Regularly measured data of snow water equivalent (SWE) in experimental catchments (automatic and field measurements since 2009) were assessed using both simple statistical analysis and regression and cluster analysis in order to describe the differences in snow accumulation and melting in forests and in open areas. The dependence on the vegetation, altitude, slope and the exposure was tested. Based on the analysis, the vegetation was selected as the key factor influencing the snowpack distribution in selected catchments. The degree day approach (temperature-index model) supplemented with the simple snow interception model was used to simulate the continuous development of SWE during analysed seasons both for forested and open sites. The model was calibrated based on the measured SWE from specific field campaigns carried out from 3 to 6 times per year. Melt factors were derived based on measured data for coniferous forests, clearings and open areas.
The main findings of the research in experimental catchments showed the differences of the snow depth and SWE in the forest and open areas and quantified the snowmelt rate in different land cover environments (thanks to interception and different amount of solar radiation). The presented results confirm the known problems with applying temperature-index snowmelt models, mainly for modelling the situation when the air temperature fluctuates near zero. Also time step applied (1 day) could not capture the diurnal fluctuation of the air temperature and consequently snowmelt runoff.