



## Simulation of hydrological response to the future climate in mountainous basins in Slovakia

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The potential impact of climate changes on river runoff and water balance in mountainous basins in Slovakia was evaluated using a conceptual spatially-lumped water balance model and a regional climate model (RCM). Selected mountainous basins are significantly affected by local climate conditions and the need for high resolution climate studies is particularly important here. Within the framework of the Sixth Framework Programme CECILIA (Central and Eastern Europe Climate Change Impact and Vulnerability Assessment) the ALADIN-Climate regional model with a very high resolution was developed and applied to test the sensitivity of the basins to climate changes. Climate characteristics as precipitation totals, air temperature and relative air humidity were simulated by the ALADIN-Climate model in daily time step with the grid spacing of 10 km. These grid climate outputs were spatially averaged over the selected basins and recalculated to monthly time step.

The hydrological scenarios of the changes in the seasonal runoff distribution were constructed using the following methodology: a) calibration of the conceptual hydrological balance model on data from the reference period and simulation of the reference mean monthly runoff series, b) simulation of the monthly runoff series using the calibrated hydrological balance model and changed input climate data according to the RCM outputs for the future time horizons, c) comparison of the differences between the seasonal runoff distribution in the reference period and future time horizons.

The conceptual water balance model was calibrated in monthly time step with data from 1971-2000 period and validated with data from 1961-1970 period. Based on outputs of the ALADINE-Climate model the possible changes in the mean monthly runoff for the time horizons of 2021-2050 and 2071-2100 were estimated. Simulated results of the long-term mean monthly runoff indicate future changes in the seasonal runoff distribution in the mountainous basins in Slovakia. It could generally be concluded for both of the investigated time horizons, that during the winter and early spring periods, an increase in the long-term mean monthly runoff could be assumed. The period of an increase in runoff could occur from November/December to February/March. This increase could be caused by the increase in air temperature and a shift of the snow melting period from the spring months to the winter period. The period of the decrease in runoff could occur from May to October/November. The increase in winter runoff and the decrease in summer runoff are expected to be more extreme for the later time horizon.