Abstract:

This thesis analyses the impacts of winter snowpack and subsequent spring and summer liquid precipitation on low flows in the warm season. Meltwater is an important source of groundwater recharge. From groundwater storage streams are donated during summer months. Snow accumulation during cold season is reduced and snowmelt occurs earlier, which is a result of climate change and leads to lower groundwater recharge rates. That is the reason why change in snow cover dynamics affects summer low flows. Main goals of this thesis are to analyse how snow cover affects low flows I warm season and to compare it with impact of spring and summer precipitation.

A conceptual runoff model HBV-light has been used to simulate the snow water equivalent (SWE) and streamflow from three mountain catchments. The integrated multi-variable model calibration procedure was used to calibrate the model. The model was used to simulate the snow and streamflow from 1981 to 2014. Besides the mentioned simulation, two hypothetical scenarios have been performed. These two scenarios accounted for reduced spring and summer liquid precipitation. In the first scenario, precipitation after maximum annual SWE was reduced to 75% of the real measured precipitation. In the second scenario, precipitation was reduced to 50% of the real measured precipitation. This way, the effect of liquid spring and summer precipitation was reduced and thus, it was possible to better separate the effect of snow on low flows from the effect of subsequent spring and summer precipitation.

The results indicated that low flows are more influenced by preceding precipitation than by snow storages. However, this effect clearly changed in time with higher importance of snow on low flows during spring. In summer, the importance of snow decreased. On the contrary, impact of preceding precipitation on low flows is lowest during spring, but preceding precipitation became more important in summer. For modelling scenarios with reduced precipitation, the impact of snow accumulation on low flows clearly increased and persists even until late summer.

Key words:

snow cover, low flows, snow water equivalent, preceding precipitation