Snow cover modelling as an important tool in the rainfall runoff relationship

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Rainfall runoff modelling is a widely used tool in hydrology. An important process in particular in mountainous regions is the behaviour of snow in the hydrologic cycle as water can be held back in the catchment and runoff occurs later during snow melt season. Therefore, most of the applied rainfall runoff models have a snow routine implemented. However, for calibration often only the accordance of the observed with the modelled hydrograph is used, ignoring the agreement of the modelled and observed snow cover.

In our work we apply weekly MODIS snow cover information and compare these to our modelled data gained from a HBV-based conceptual hydrological catchment scale model for catchments located in Austria, Southern Germany and Eastern Turkey. Snow cover is modelled both on a temporal and spatial scale using the temperature index method. Elevation is divided into zones of 100 m. Snow melt and accumulation is modelled using the temperature index method with a dynamic day degree factor. The concept also enables the consideration of exposition and cold content of the snow column. A linear storage is filled by a certain percentage of runoff generated by snow melt. A runoff coefficient parameter divides snow melt into quick surface runoff and soil infiltration. Calibrating the model is done by fitting both the hydrograph and the snow cover in the catchment. Nash-Sutcliffe-values between 0.32 and 0.81 for the Austrian catchments indicate good model efficiency.

Although MODIS provides only information about the spatial snow cover and not about the amount of snow, using this additional criterion for calibration leads to a better identification of hydrological processes and the chance to be "right for the wrong reasons" can be reduced.