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Spatio-temporal discretization of catchment models for water balance modelling

H. Kling, H.P. Nachtnebel

Institute of Water Management, Hydrology and Hydraulic Engineering, BOKU, Vienna, Austria (harald.kling@boku.ac.at)

This study presents a comparison of water balance modelling in a mountainous catchment with two different modelling approaches regarding spatial and temporal discretization. The study focuses on the catchment of the river Gail (1400km^2) in southern Austria. Elevation ranges from 600 to 2700m. Snow-accumulation and snow-melt have an important impact on the seasonal water balance. The spatial and temporal distribution of water balance components was modelled with a water balance model with (1) a semi-distributed discretization and daily data and (2) with a spatially distributed discretization (1x1 km grid) and monthly data. Both models use precipitation and temperature as input data. For the monthly model an internal disaggregation was necessary in order to consider variability of precipitation and temperature within a month. For the daily model simulated runoff was calibrated against observed runoff at several gauges within the catchment as part of a case study focusing specifically on the Gail catchment. Parameters of the monthly model were calibrated with a regional calibration procedure with runoff data of gauges spread across Austria as part of modelling the spatially distributed water balance of Austria. Both models performed well and the simulated water balance of the two models is quite similar for the Gail catchment. The daily model was used for determining water balance components and for an analysis of runoff components (surface-runoff, inter-flow, and base-flow). The monthly model was used to derive maps of basic water balance components (precipitation, runoff-depth, actual evapotranspiration). Since both models produce similar results it can be concluded that for spatially distributed modelling of basic water balance components it is sufficient to use monthly data.