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Improving hydrograph Routing of a semi- distributed conceptual hydrological model

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Conceptual rainfall-runoff (CRR) models are designed to approximate the general physical mechanisms which govern the hydrologic cycle and found practical by many hydrologists and engineers. Proper parameters for conceptual models are very essential and the degree of accuracy for these models also depends heavily on the proper parameters. Based on this, conceptual models can be divided in two major groups, lumped and distributed models. However, limitations on data and calibration, validation processes, lumped models have more practical nature. In this study NAM (NedborAfstromnings Model) rainfall-runoff model is improved and applied to Cakit Basin in Turkey to simulate hydrological response of the basin to the precipitation and predicting daily runoff.
Subbasins are formed in Cakit Basin and for each subbasin daily precipitation, potential evapotranspiration and temperature data are used as driving forces in simulating snow accumulation and melting, interception, actual evapotranspiration, overland flow, interflow, groundwater recharge and baseflow. Optimal calibration parameters were obtained by using shuffled complex evolution approach with meteorological and discharge data. Special attention is given to model high and low flows throughout three water year period. NAM model then modified to semi-distributed form using Muskingum-Cunge flow routing method to simulate the effect of routing in the basin. River cross sections are approximated by calibrating Muskingum-Cunge method with downstream discharge data. Comparison of Muskingum-Cunge method with hydraulic routing is also performed. Muskingum-Cunge method is found successful over hydraulic modelling routing when information on river topography of the basin is not sufficient.
Rainfall – runoff model was evaluated based on Nash–Sutcliffe Efficiency Index (NSE) and Sum of Square of Error (SSE). The model was found successful in predicting runoff for extended time period in Cakit Basin.