

Miaolin Wang, Jun Xia, and Chongyu Xu

Distributed hydrologic simulation based on the land characteristics in the Jinsha River basin in China

Hydrological simulation in ungauged catchments has been singled out as one of the major challenges in the hydrological sciences. In this study, a Distributed Time Variant Gain Model (DTVGM) was applied to the 30 sub-catchments in the Jinsha River basin, headwater of the Yangtze River for the purposes of testing the applicability of the model in the headwater region of the Yangtze River, examining the possibility of relating the model parameter values to the physical properties of the catchment, and assessing the effect of land use changes on the runoff yield. The area ratios of soil textures and land use types of 30 catchments were extracted by GIS. The results show that (1) the model is capable of reproducing the historical record of runoff for the region with an average value Nash-Sutcliffe coefficient equals to 0.83, (2) the major parameters are successfully regressed to physical properties with multiple regression coefficients vary from 0.71 to 0.84, and (3) runoff is sensitive to the land-use changes. In particular, changing of agricultural land to grassland will increase runoff yield and changing of forest land to grassland will decrease runoff yield. The results of the study are important for the water resources management and flood forecasting in the headwater region of the Yangtze River basin.

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