

A distributed hydrological model for flood forecasting in semi-arid regions

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Abstract A physically-based distributed hydrological model, which considers both the infiltration excess and saturation excess mechanisms, is presented. Infiltration excess runoff is modelled through a modified Green-Ampt model. Saturation excess runoff is calculated through the TOPMODEL concept using the topography index $\ln(\alpha/\tan\beta)$. The generation of a spatially-distributed local water table pattern is calculated for each grid cell. A routing model based on the gamma function $G(n,k)$ of the Nash unit hydrograph and travel time is employed to generate the runoff hydrograph. Some model parameters are estimated from soil types or land cover data, and other parameters are optimized by the SCE-UA algorithm. The proposed model is calibrated and verified using hourly rainfall–runoff data from a semi-arid catchment named Linkou, which is a sub-basin of Yellow River with an area of 2476 km². Results indicate that both the simulated and forecast hydrographs possess good agreement with observations.

Key words hydrological model; Yellow River, China; TOPMODEL; gamma function
