Uncertainty estimation for the Xin’anjiang model parameters

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Abstract Due to the uncertainties in hydrological forecasting mainly derived from hydroclimatic input data, hydrological model structure and model parameters, the investigations on the uncertainty of model parameters are crucial to improve the precision of flood forecasting. The Xin’anjiang (XAJ) model developed by Renjun Zhao is considered an effective conceptual watershed hydrological model, and it has been extensively employed for hydrological modelling problems. In this study, the generalised likelihood uncertainty estimation (GLUE) methodology for XAJ model identification allowing for equifinality was proposed to identify the uncertainty of model parameter sets. Additionally, the GLUE analysis was utilized to determine the Yanduhe catchment, one tributary of the Yangtze River watershed, and the uncertainty of XAJ model parameters. Based on the view of two storm events, we observed SM in the XAJ model is very sensitive. For example, its likelihood values displayed the peak value area and its little change will have a large influence on the simulated results; while \(K, B, EX\) are not sensitive. Further, we found the observed discharge hydrograph can not be located wholly within the upper and the lower limits of the simulated discharge hydrograph, and some discharge values may fall outside of the 90\% uncertainty bounds. This indicates that the XAJ model can not be used to simulate the discharge hydrograph well because of the uncertainty of the model.

Key words uncertainty estimation; GLUE methodology; XAJ model; Yanduhe catchment