Effects of data time-step on hydrological model parameters and prediction performance

MengXuan Jie (1), Hua Chen (1), ChongYu Xu (1,2), and Qiang Zeng (1)

(1) State Key Laboratory of Water Resources and Hydropower Engineering Science, Wuhan University, Wuhan, China (jiemengxuan@whu.edu.cn), (2) Department of Geosciences, University of Oslo, Oslo, Norway (c.y.xu@geo.uio.no)

The time resolutions of calibration data play a key role in determining the hydrological model' parameters, predicting performance and application. In this study, the impact of data time-step on the performance and parameters was examined by using the 1-, 2-, 3-, 4-, 6-, 8-, 12- and 24-hourly data sets as the inputs to the Xinanjiang hydrological model. Firstly, parameters sensitivity analysis was conducted in the parameter identification stage to determine the sensitive and time dependent parameters. Then, the Bayesian method was used to achieve the posterior distribution of the hydrological parameters with different time-steps, and the uncertainty of the model performance in each time resolution was discussed and compared. Finally, the qualitative and quantitative relations between parameters and data time-steps were evaluated. The results show that (1) the sensitivity level of the 8 sensitive parameters changes over time-step. (2) The values of model efficiency measures between observed and simulated discharges also change with the time –step in such a way that they first increase and then decrease as the data time-step increases from 1 to 24 hours. And (3) the posterior distributions of the sensitive parameters are highly related to the time-step. What's more, the quantitative relationships between parameter values and data time-steps were obtained and verified to be reasonable, which in some extent provides reference for hydrologic forecasting in different time resolutions.