Geophysical Research Abstracts
Vol. 18, EGU2016-17109-3, 2016
EGU General Assembly 2016

Pursuing realistic hydrologic model under SUPERFLEX framework in a semi-humid catchment in China

Lingna Wei (1,2), Hubert H.G. Savenije (2), Hongkai Gao (3), and Xi Chen (4)

(1) College of Hydrometeorology, Nanjing University of Information Science & Technology, Nanjing, China, (2) Water Resources Section, Faculty of Civil Engineering and Geosciences, Delft University of Technology, Delft, Netherlands, (3) Julie Ann Wrigley Global Institute of Sustainability, Arizona State University, Tempe, AZ 85287, USA, (4) State Key Laboratory of Hydrology Water Resources and Hydraulic Engineering, Hohai University, Nanjing, China

Model realism is pursued perpetually by hydrologists for flood and drought prediction, integrated water resources management and decision support of water security. “Physical-based” distributed hydrologic models are speedily developed but they also encounter unneglectable challenges, for instance, computational time with low efficiency and parameters uncertainty. This study step-wisely tested four conceptual hydrologic models under the framework of SUPERFLEX in a small semi-humid catchment in southern Huai River basin of China. The original lumped FLEXL has hypothesized model structure of four reservoirs to represent canopy interception, unsaturated zone, subsurface flow of fast and slow components and base flow storage. Considering the uneven rainfall in space, the second model (FLEXD) is developed with same parameter set for different rain gauge controlling units. To reveal the effect of topography, terrain descriptor of height above the nearest drainage (HAND) combined with slope is applied to classify the experimental catchment into two landscapes. Then the third one (FLEXTOPO) builds different model blocks in consideration of the dominant hydrologic process corresponding to the topographical condition. The fourth one named FLEXTOPOD integrating the parallel framework of FLEXTOPO in four controlled units is designed to interpret spatial variability of rainfall patterns and topographic features. Through pairwise comparison, our results suggest that: (1) semi-distributed models (FLEXD and FLEXTOPOD) taking precipitation spatial heterogeneity into account has improved model performance with parsimonious parameter set, and (2) hydrologic model architecture with flexibility to reflect perceived dominant hydrologic processes can include the local terrain circumstances for each landscape. Hence, the modeling actions are coincided with the catchment behaviour and close to the “reality”. The presented methodology is regarding hydrologic model as a tool to test our hypothesis and deepen our understanding of hydrologic processes, which will be helpful to improve modeling realism.