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The Multi-Objective Calibrations of a Distributed Hydrologic Model with the Degree of Distributions

Jungho Kim (1), Taegyun Kim (), and Bo-Rim Lee ()

(1) Colorado State, Fort Collins, United States (jungho.kim@colostate.edu), (2) Gyeongnam National University of Science and Technoiogy, Landscape Architecture, Jinju, gyeongnam-do, Korea, Republic Of (tgkim@gntech.ac.kr), (3) Gyeongnam National University of Science and Technoiogy, Landscape Architecture, Jinju, gyeongnam-do, Korea, Republic Of (hoyoungqr@naver.com)

In the distributed hydrologic models, one of the most important things to set up the models would be how models are complicated. The more complex a distributed model is, the more data sets the model needs to reproduce its processes. In particular, the degree of distributions becomes complicated, the number of parameters to be calibrated is drastically increased in the procedures of model calibration.
In this study, we investigate the multi-objective calibrations of a distributed hydrologic model with the different degree of distributions. The Hydrology Laboratory Research Distributed Model (HL-RDHM) is employed to simulate snow and streamflow over the Animas River Basin in Colorado, USA. For model calibrations, the Multi-Objective Shuffled Complex Evolution Metropolis (MOSCEM) algorithm is used, and three different scenarios are conducted depended on model complexities: semi-lumped, semi-distributed, and fully-distributed. Simulated snow and streamflow are produced on 4 km Hydrologic Rainfall Analysis Projection (HRAP) grids and the outlet point at end of basin, respectively. Simulations are compared to observed snow information from three Snow Telemetry (SNOTEL) stations within the study basin and USGS streamflow gauge located in end of the basin. A 5-year period (Water Years 2001-2005) data set is available for model calibration and validation. To confirm the achievement of model calibration, a priori parameter set is provided as a benchmark by U.S. National Weather Service (NWS).
This research shows whether the multi-objective calibrations are useful with distributed hydrologic models. Moreover, the proper degree of distribution for the Animas River Basin is established with the multi-objective calibrations of HL-RDHM model.

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