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Parameter tolerance to forcing data, case study of Coupled Routing and Excess STorage (CREST) hydrological model in Head region of Yellow River of China

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Most of the hydrological models need be calibrated based on the gauged runoff at the catchment outlet. Calibration is a process that optimizing parameters to get the best reproduction of nature runoff for certain forcing data. This means different forcing data could result in similar simulation after calibration, it is called parameter tolerance to forcing data in this paper. This study chooses head region of Yellow River of China as an example, uses the CREST (Coupled Routing and Excess STorage distributed model) for hydrological simulation and ARS (Adaptive Random Search algorithm) for deriving parameters automatically, evaluates the response of forcing data fluctuation after calibration; compares three different forcing data sets: station gauge, TRMM-based Multi-satellite Precipitation Analysis (TMPA) calibration rainfall data (3B42V6) and Real-Time rainfall data (3B42RT), and their simulations after calibrated separately. Results indicate that most of the forcing data fluctuation can be eliminated by parameter optimization until model collapse for extreme input. Considering parameter tolerance to forcing data, TRMMV6 is better than station gauge for its strong point in spatial description, and difference between TRMMV6 and TRMMRT in driving CREST is tiny. These results could vary in other basins or models, further comparison between basins and models is recommended.
Keywords: Hydrological modeling; Parameter; forcing data; CREST; Automated calibration