The title (العنوان):

Auto-calibration of HEC-HMS Model for Historic Flood Event under Rating Curve Uncertainty. Case Study: Allala Watershed, Algeria

APA Citation (توثيق APA):

Kastali Abdennour, Zeroual Ayoub, Zeroual Sara, and other (2022). *Auto-calibration of HEC-HMS Model for Historic Flood Event under Rating Curve Uncertainty. Case Study: Allala Watershed, Algeria* . KSCE Journal of Civil Engineering .VOL 26(n°1), p. 482-493. DOI ou URL : https://link.springer.com/article/10.1007/s12205-021-1051-4

Abstract : Flow simulation and forecasting accuracy using rainfall-runoff models is one of the main challenges in hydrological modelling, especially when focused on the flow simulation at a short time scale. These uncertainties are typically dependent on the model design, the technique used for estimating model parameters, the process of considering rainfall variability and errors in the discharge data used for the calibration. Indeed, the uncertainty associated with the discharge derived from the rating curve is ignored in many earlier rainfall-runoff models. In this paper, we provide a quantitative approach to rigorously investigate the effect that the rating curve uncertainty model has on the auto-calibration of Hydrologic Engineering Center-Hydrologic Modeling System (HEC-HMS) model at hourly time scale. The multisegment BaRatin rating curve, based on the Bayesian analysis, was used to construct the most probable (MaxPost) rating curve with the bounds uncertainty for hydrometric station of Allala watershed. This allows establishing a new discharge hydrograph with its uncertainty bounds that are subsequently used in HEC-HMS calibration, to provide model parameters with confidence interval and to evaluate the model prediction accuracy. In HEC-HMS model, soil conservation service-curve number (SCS-CN) was applied to compute the runoff losses, while the SCS unit hydrograph (SCS-UH) method was used to estimate the direct runoff at the basin outlet. The model calibration process was carried out for the flood event of 2002 using four objective functions and validated for three independent events. We found that the calibration of the initial abstraction values (IA) varied between −15.16% and 20% when assessing the uncertainties associated with the rating curve, whereas the calibrated curve number values (CN) varied between −5.18% and 7.8%. The confidence interval for the CN and IA were extended from 65.71 to 74.81 and from 26.95 to 19.08, respectively. Results highlighted that the rating curve uncertainty has significant impact on the HEC-HMS model calibration parameters. Rigorous consideration of this uncertainty can improve considerably the model ability to predict the hourly discharge hydrographs.

KEYWORDS : Rating curve uncertainty ;BaRatin analysis ; HEC-HMS ; Nelder and mead algorithm ; Flood forecasting