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T. Mathevet

L. Oudin

V. Andreassian

C. Perrin

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# Uncertainty and evolution of rating curves: a key issue for the reliability of rainfall-runoff models?

**T. Mathevet[a], L. Oudin[b], V. Andreassian[c], C. Perrin[c]**

[a] *EDF-DTG, 21 avenue de l'Europe, BP 41, 38040 Grenoble cedex 09, France*

[b] *Université Pierre-et-Marie Curie, UMR Sisyphe, 4 place Jussieu, 75252 Paris cedex 05, France*

[c] *Cemagref, Hydrosystems and Bioprocesses Research Unit, Antony, France*

*E-mail: thibault.mathevet@edf.fr*

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The inputs of rainfall-runoff (RR) models (precipitation, temperature) and the data used for the calibration of their parameters (typically streamflow data) are known to be uncertain, due to measurement and spatial extrapolation errors. In the literature, the impact of input variables uncertainty [Oudin et al., 2006] and model structure [Perrin et al., 2001] on RR model simulations have been largely studied. However, there are very few studies dealing with the impact of the uncertainty of streamflow data used for calibration on the outputs of RR models. Those impacts can be potentially considerable since streamflows are used to calibrate the RR models. The problems related to the construction and extrapolation of rating curves are especially crucial and should deserve more attention.

In this paper, we propose to study the impact of streamflow uncertainty on RR model simulations and parameters. To explore this issue, we use three methods to generate runoff uncertainty:

1. a method based on the use of historical stream gauging and evolution of gauging site;
2. a method based on the use of a 'wrong' rating curves, which is the case when gauging site are poorly maintained;
3. a method based on the use of different extrapolation laws.

In each case, we then calibrate the RR model using these corrupted flow data and assess the reliability and robustness of the RR model. The impact of runoff uncertainty on model performance and parameters is demonstrated using a sample of catchments for which the evolution of the gauging measurements and rating curve are well-documented.

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