

# Accepted Manuscript

Research papers

Model uncertainty reduction for real-time flood control by means of a flexible data assimilation approach and reduced conceptual models

E. Vermuyten, P. Meert, V. Wolfs, P. Willems

PII: S0022-1694(18)30538-9

DOI: <https://doi.org/10.1016/j.jhydrol.2018.07.033>

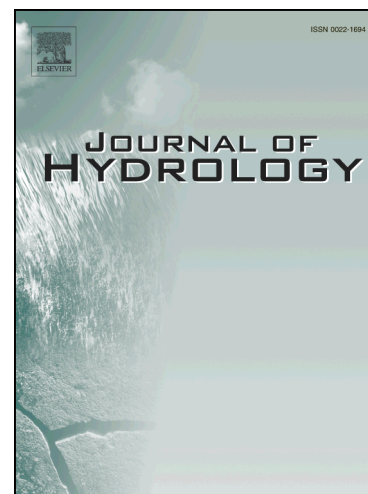
Reference: HYDROL 22965

To appear in: *Journal of Hydrology*

Received Date: 2 January 2018

Revised Date: 22 June 2018

Accepted Date: 14 July 2018



Please cite this article as: Vermuyten, E., Meert, P., Wolfs, V., Willems, P., Model uncertainty reduction for real-time flood control by means of a flexible data assimilation approach and reduced conceptual models, *Journal of Hydrology* (2018), doi: <https://doi.org/10.1016/j.jhydrol.2018.07.033>

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

1 **Model uncertainty reduction for real-time flood control by means of a flexible**  
2 **data assimilation approach and reduced conceptual models**

3 **Authors:** E. Vermuyten<sup>1</sup>, P. Meert<sup>2</sup>, V. Wolfs<sup>3</sup>, P. Willems<sup>4</sup>

4 <sup>1</sup> Doctoral researcher, KU Leuven, Department of Civil Engineering, Hydraulics Section, Kasteelpark Arenberg 40,  
5 BE-3001, Belgium (corresponding author). E-mail: evert.vermuyten@kuleuven.be

6 <sup>2</sup> Postdoctoral researcher, KU Leuven, Department of Civil Engineering, Hydraulics Section, Kasteelpark Arenberg  
7 40, BE-3001, Belgium. E-mail: pieter.meert@kuleuven.be

8 <sup>3</sup> Postdoctoral researcher, KU Leuven, Department of Civil Engineering, Hydraulics Section, Kasteelpark Arenberg  
9 40, BE-3001, Belgium. E-mail: vincent.wolfs@kuleuven.be

10 <sup>4</sup> Professor, KU Leuven, Department of Civil Engineering, Hydraulics Section, Kasteelpark Arenberg 40, BE-3001,  
11 Belgium. E-mail: patrick.willems@kuleuven.be

12 **Abstract**

13 Recently, a combination of model predictive control and a reduced genetic algorithm (RGA-MPC) has  
14 shown to be an efficient control technique for real-time flood control, making use of fast conceptual  
15 river models. This technique was so far only tested under ideal circumstances of perfect model  
16 predictions. Prediction errors originating from hydrodynamic model mismatches, however, result in a  
17 deterioration of the real-time control performance. Therefore, this paper presents two extensions of  
18 the RGA-MPC technique. First, a new type of conceptual model is introduced to further increase the  
19 computational efficiency. This reduced conceptual model is specially tailored for real-time flood control  
20 applications by eliminating all unnecessary intermediate calculations to obtain the flood control  
21 objectives and by introducing a new transport element by means of flow matrices. Furthermore, the  
22 RGA-MPC technique is extended with a flexible data assimilation approach that analyzes the past  
23 observed errors and applies an appropriate error prediction scheme. The proposed approach largely  
24 compensates for the loss in control performance due to the hydrodynamic model uncertainty.

Download English Version:

<https://daneshyari.com/en/article/8894489>

Download Persian Version:

<https://daneshyari.com/article/8894489>

[Daneshyari.com](https://daneshyari.com)