

Identification of uncertainty sources in distributed hydrological modelling: Case study of the Grote Nete catchment in Belgium

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Abstract

The quest for good practice in modelling merits thorough and sustained attention since good practice increases the credibility and impact of the information, and insight that modelling seeks to generate. This paper presents the findings of an evaluation whose goal was to understand the uncertainty in applying a distributed hydrological model to the Grote Nete catchment in Flanders, Belgium. Uncertainties were selected for investigation depending on how significantly they affected the model's decision variables. A Fault Tree was used to determine various combinations of inputs, mathematical code, and human error failures that could result in a specified risk. A combination of forward and backward approaches was used in developing the Fault Tree. Eleven events were identified as contributing to the top event. A total of 7 gates were used to describe the Fault Tree. A critical path analysis was carried out for the events and established their rank or order of significance. Three measures of importance were applied, namely the F-Vesely, the Birnbaum, and the B-Proschan importance measures. Model development of distributed models involves considerable uncertainty. Many of these dependencies arise naturally and their correct evaluation is crucial to the accurate analysis of the modelling system reliability.

Keywords: distributed hydrological models, Grote Nete, MIKE SHE, uncertainty