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Can performance metrics accounting for the flood extent shape improve inundation model calibration?

Thaine H. Assumpção¹, Ioana Popescu¹, Andreja Jonoski¹, and Dimitri P. Solomatine^{1,2}

¹IHE Delft Institute for Water Education, Delft, The Netherlands (t.hermanassumpcao@un-ihe.org)

²Delft University of Technology, Delft, The Netherlands

The calibration and validation of inundation models have since long been influenced by data availability. When only stage hydrographs and high water level marks were available, metrics such as the Root Mean Square Error (RMSE) were selected for goodness-of-fit assessment. When remotely sensed flood extent data started to be obtained, binary performance measures started being used. Although data availability and modelling resolution have advanced in the past decades, the methods behind performance evaluation remain similar. Shape-based metrics used in topology and pattern recognition could enhance not only the raw model performance but our ability to diagnose achieved results. Therefore, in this study, we discuss how much improvement in calibration can be obtained by employing shape matching metrics. The research is conducted in two experiments: a 2D hydrodynamic benchmarking model and the Po River case study. Different metrics traditionally used in inundation modelling and metrics tailored towards shape matching were employed. Calibration of the Manning coefficient was performed using one metric at a time. Experiments showed that metrics incorporating scale components (e.g. differences in areas and/or distances) provide better calibration. This corroborates the wide use of traditional metrics and indicates the potential of using shape-based metrics, which can augment our ability to diagnose models and improve modelling results.