

Interactive comment on “Simulating historical flood events at the continental-scale: observational validation of a large-scale hydrodynamic model” by Oliver E. J. Wing et al.

Marc Bierkens (Referee)

m.f.p.bierkens@uu.nl

Received and published: 21 December 2020

Evaluation of NHES-2020-344

This paper evaluates a continental-scale flood hazard framework by comparing the simulations with the underlying hydrodynamic model with high water marks (HWM), reconstructed flood extents and insurance claim-based estimates of affected buildings of 9 actual flooding events in the U.S. If hazard frameworks are to be trusted in reproducing correct hazard layers (inundation depth/extent for a given return period), they should be able to reproduce actual flooding events with sufficient accuracy. So, this study produces a much-needed example of performing such an evaluation. The au-

C1

thors are applauded for their efforts. The results are encouraging: given the errors in HWMs, the results are not that much worse in reproducing flood levels as reach-scale hydrodynamic models. Also, flood extent is reproduced with similar accuracy as reach-scale hydrodynamic models, although it was also shown that flood extent is not very discriminative between model configurations and model parameterizations.

The paper is very well written and nicely concise and should be published without much delay. I only have a small number of comments:

The most important one is the additional error that would occur if the framework would be used to estimate future inundation hazards. In that case, one cannot rely on gauged upstream water levels. Instead, input should come from hydrological models. A discussion on the errors that could be expected in that case is advised in light of the usefulness of large-scale hazard frameworks.

Line 54 “convergence of skill”. Please rephrase, as it is not clear what is meant here.

Equation (1): this is commonly referred to as the “mean absolute error” and is a measure of uncertainty akin to the RMSE, but less sensitive to outliers.

Line 161: this link does not work

Equation (4): should this not be $1 - \text{Eq. (4)}$?

Line 220: the realism of HWM observations is observed by comparing it with physically-realistic water levels along a reach. However, is this not a scale issue? Could local obstructions (even temporary such as debris) not have been responsible for deviating HWMs? In this case, there is not an error in the observations, but rather one has observations that has picked up local details not accounted for in the models.

Line 346: underestimates -> underestimated.

Interactive comment on Nat. Hazards Earth Syst. Sci. Discuss., <https://doi.org/10.5194/nhess-2020-344>, 2020.

C2