

Nat. Hazards Earth Syst. Sci. Discuss., referee comment RC1
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Comment on nhess-2021-359

Anonymous Referee #1

Referee comment on "Real-time coastal flood hazard assessment using DEM-based hydrogeomorphic classifiers" by Keighobad Jafarzadegan et al., Nat. Hazards Earth Syst. Sci. Discuss., <https://doi.org/10.5194/nhess-2021-359-RC1>, 2022

The paper is interesting and presents a useful methodology for coastal flood modeling. The validation against a hydrodynamic model is OK but a bit questionable; this should be done against historical flood maps. A few assumptions should be also clarified. Limitations, uncertainties and implications need to be further discussed. I have recommended several edits and some comments in the PDF. Here are some additional comments:

- Please provide more information on the study catchment, particularly those that affect your model results. This includes computational area, soil type, channels' size, ground slope, land use etc.
- Section 2: Present the source of drainage network data. Also, how detailed does that represent the drainage network?
- The verification of the approach against flood maps generated by a hydrodynamic model is questionable. How well is the model calibrated? For what historical events (how large/intense), it has been calibrated? Also, why not using satellite imagery like Dartmouth Flood Observatory?
- Please discuss the properties of the high-performance computing system that was used for simulations (Section 3.1.2).
- More details on the LHS application are needed. How was it informed by Hurricane Matthew peak WLs? What parameters were considered as uncertain? What probability distributions were used and how were they characterized?
- Please discuss how the performance of model was graded based on the fit metrics (RMSE, AUC and R^2). You may refer to Moriasi et al. (2015) and Ahmadisharaf et al. (2019) for streamflow predictions via R^2 or others for flood simulations.
- Neither RMSE nor R^2 measure bias. Metrics like PBIAS need to be used along to measure the model performance.
- Please define what 'error' exactly is in the model evaluations under the Results section.
- Please discuss what probability distributions exist in the MATLAB allfitdist tool.
- The underlying assumption of a univariate flood frequency analysis is that a peak WL

with a given return period leads to a flood event with the same return period. However, studies (e.g., Brunner et al. 2016) have shown that a combination of peak flow and other attributes like volume may lead to a different return period. This limitation should be at least acknowledged in the paper.

- Further details are needed on how TH and HDC are derived. As of now, it appears that they are subjectively derived.
- MAE has been reported in the Results section but not in the Methods section. Please either remove it from the Results section or discuss it in the Methods section.
- There should be a plot on calibrating w_1 and w_2 coefficients (for the H and D variables).
- L429-432: Reasons for this poor performance need to be discussed in the Discussion Section.
- The comparison of computational time against the hydrodynamic model is unclear to me. Did you compare your static model against an unsteady Delft3D-FM or the steady-state? The runtime of an unsteady hydrodynamic model should not be very long; therefore, this advantage of your presented model is not as strong as it is presented.
- Broader impacts need to be discussed. The authors should discuss what implications these results have for coastal planners and floodplain managers etc. and what existing programs in the US (e.g., FEMA FIRMs) may benefit from this research.
- Study limitations and potential areas for future research need to be expanded.
- Sources of uncertainty and how they may affect your findings need to be discussed.
- Please discuss how your presented modeling framework can be used in other study areas. What considerations should be taken to do so? Guidelines should be provided in the Discussion section.
- Please spell out all the abbreviations in the headings, figures and tables. These need to stand alone.
- Please italicize all variables/parameters in the text.

I hope the authors find these comments useful in their research. If the authors decide to submit a revision, both sets of my comments, including the above and in the PDF, should be addressed.

Please also note the supplement to this comment:

<https://nhess.copernicus.org/preprints/nhess-2021-359/nhess-2021-359-RC1-supplement.pdf>