The authors present an interesting work on flood hazard assessment and mapping. The paper is well-written and easy to follow. However, some issues need to be addressed before the paper can be accepted for publication as follows:

Response: Thank you for your positive feedback and the constructive comments on our manuscript. Please see our detailed response to the comments below:

The abstract should briefly state the purpose of the research, the principal results, and major conclusions. The abstract should be more descriptive rather than informative. More than half of this abstract is allocated to the research gaps which in my opinion is not appropriate (L24-36). Please revise the abstract section with more focus on your methods, and significant results/conclusions.

Response: Thanks for the suggestion on editing the abstract. We removed several lines from the first part of the abstract and added more texts to better describe the method and results of the proposed approach. Please see the revised abstract below:

"In the last decade, DEM-based classifiers based on Height Above Nearest Drainage (HAND) have been widely used for rapid flood hazard assessment demonstrating satisfactory performance for inland floods. The main limitation is the high sensitivity of HAND to the topography which degrades the accuracy of these methods in flat coastal regions. In addition, these methods are mostly used for a given return period and generate static hazard maps for past flood events. To cope with these two limitations, here we modify HAND, propose a composite hydrogeomorphic index and develop hydrogeomorphic threshold operative curves for rapid real-time flood hazard assessment in coastal areas. We select the Savannah river delta as a testbed, calibrate the proposed hydrogeomorphic index on Hurricane Matthew and validate the performance of the developed operative curves for Hurricane Irma. The hydrogeomorphic index is proposed as the multiplication of two normalized geomorphic features, HAND and distance to the nearest drainage. The calibration procedure test different combinations of the weights of these two features and determine the most appropriate index for flood hazard mapping. Reference maps generated by a well-calibrated hydrodynamic model, Delft3D-FM model, are developed for different water level return periods. For each specific return period, a threshold of the proposed hydrogeomoprhic index that provide the maximum fit with the relevant reference map is determined. The collection of hydrogemorphic thresholds developed for different return periods are used to generate the operative curves. Validation results demonstrate that the total cells misclassified by the proposed hydrogeomophic threshold operative curves (summation of overprediction and underprediction) are less than 20% of the total area. The satisfactory accuracy of the validation results indicates the high efficiency of our proposed methodology for fast and reliable estimation of hazard areas for an upcoming coastal flood event which can be beneficial for emergency responders and flood risk managers."

L167. Add one or two sentences to explain about Savanah model in Delft3D-FM.

Response: We have included more details of the Delft3D-FM suite package (Line 186-189). For additional details of the Savannah model, the reviewer is referred to section 3.1.

"Specifically, we used the 2021 Delft3D-FM suite package to model the complex interactions between riverine, estuarine, and intertidal flat hydrodynamics. The suite package can provide detailed information of water level, flow rates, and velocity (Delft3D Flexible Mesh Suite - Deltares, 2021)”

Using a univariate flood frequency analysis in an estuary region should be justified with a detailed analysis that shows there is no correlation between high river flow and sea water level. Otherwise, a bivariate flood frequency analysis should be considered.

Response: In the first steps of this study, we had set up the calibrated Delt3D-FM model for different combinations of upstream flow and downstream water levels. However, we did not find a significant correlation (p-value < 0.05) between river discharge at Clyo station (USGS - 02198500) and coastal water levels at Fort Pulaski station (NOAA - 8670870). The latter was also reported in Ghanbari et al., 2021 and Muñoz et al., 2020. Furthermore, our results demonstrated that high river flow does not affect the inundation area in wetland areas. This indicates that flood inundation is highly dominated by coastal forcing as tides propagate into the Savannah river and lead to flow reversal at upstream gauge stations (see Figure 1 below). The high proximity of wetlands to the Atlantic Ocean shows that the transitional zone, i.e., the area affected by both coastal and inland drivers, is located upstream Port Wentworth station (USGS - 02198920) where the Savannah river trifurcates into the Back River, Middle River, and Front River. Considering the dominant role of sea water level in coastal flooding as well as the negligible effect of river discharge on wetland inundation from the previous analyses, we can justify the proposed univariate flood frequency analysis. For the reviewer’s convenience we also generate a figure of maximum floodwater depth in Savannah under high river flow regimes (10 and 1000-year return period) and mean sea level (Figure 2). The flood maps indicate similar inundation patterns over coastal wetlands and clear differences in upstream zones. . Please refer to Section 3.2 (Lines 277-288) in the revised manuscript for additional justification of the univariate approach.

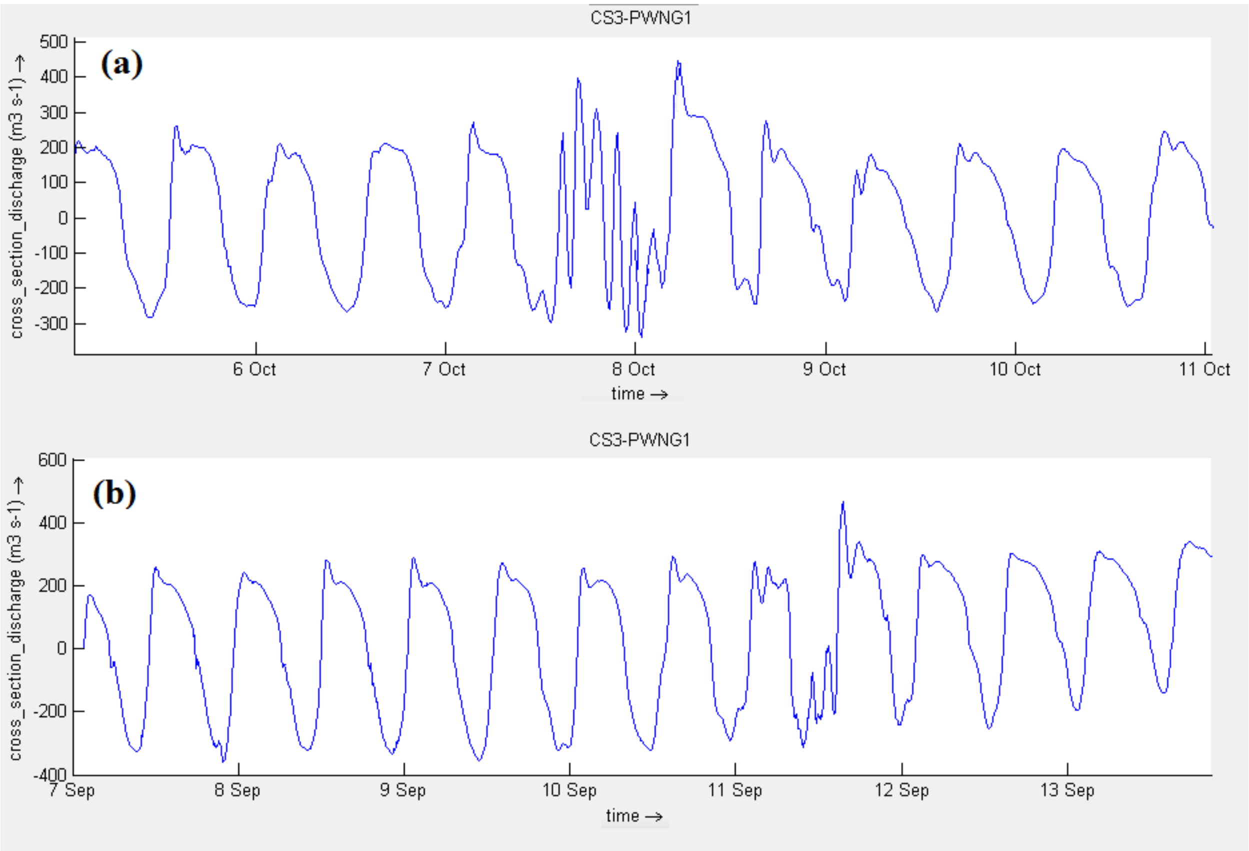

Figure 1. Flow reversal (negative river flow) due to tidal propagation at Port Wentworth station (USGS – 02198920). Simulations of averaged cross section discharge correspond to (a) Hurricane Matthew (Oct/2016) and (b) Hurricane Irma (Sep/2017).

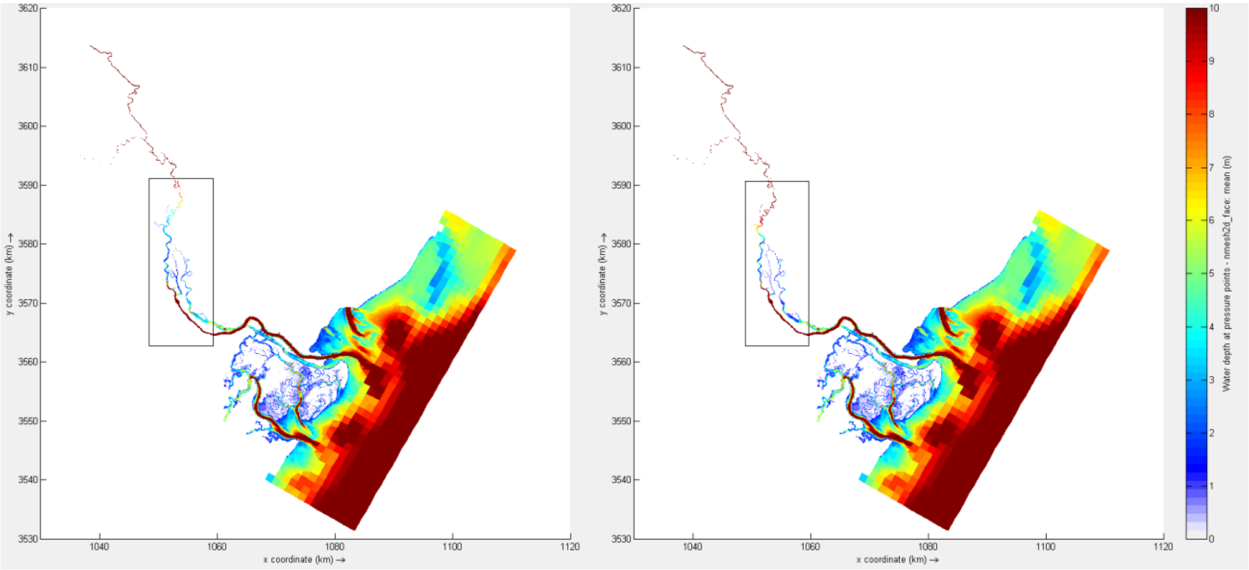

Figure 2. Maximum floodwater depth in Savannah River delta. Simulations of mean sea level and river flow for a return period of (a) 10-year (1413 m^3/s) and (b) 1000-year (2273 m^3/s). Black boxes outline differences of floodwater depth in the transitional zone. The

water depth maps created for the lower parts of the transitional zone (wetland) suggest the negligible effect of river discharge on coastal wetland inundation.

How did you test different combinations of W1 and W2 (Weight parameters)? Please clarify.

Response: Knowing the condition of W1+W2=1, we uniformly pick 100 random w1 from the range of 0-1 which results in 100 set of w1 and w2 (1-w2) for our calibration. Please refer to lines 321-322 in the revised manuscript.

It is not clear how the parameter of TH is derived. Please clarify.

Response: The TH parameter is the result of solving a simple optimization problem by minimizing the total error. We added more information to better explain how to optimize the parameter TH in the revised manuscript. Please refer to lines 356-358.

"To calibrate the binary classifier we minimize the error while searching for the optimum TH value. This means, we use a hundred TH values uniformly picked from the range of $I_{HD}^{min}$and I_{HD}^{max}. For each TH, we use Eq. 2 to generate a binary hazard map and then compare this map with the reference map by calculating the error from Eqs. 3-5."

The manuscript would be significantly improved by providing more discussion about the broader contribution of the study. (e.g., How coastal planners and managers could benefit from the proposed methodology? How the proposed methodology can be utilized in other coastal regions?)

Response: We provided more discussion on the broader impacts of this study and implementation of if in other coastal regions. Please refer to lines 548-553 and 578-607 in the revised manuscript.

"To implement this approach, first, a hydrodynamic model should be set up for the new study area and generate reference inundation maps for different return periods. Access to observed water level data (gauges or HWMs) and flood extent maps from past floods is required to properly calibrate the hydrodynamic model. Then the I_{HD} index calculated from a DEM is utilized together with the reference maps to provide the hydrogeomorphic threshold operative curves for future floods."

"Operationally, the Sea, Lake, and Overland Surges from Hurricanes (SLOSH) model (Jelesnianski et al., 1984) is the storm surge model currently used by NWS to perform storm surge forecasting and create probabilistic flood inundation maps for real-time tropical storms (Sea, Lake, and Overland Surges from Hurricanes (SLOSH, 2022). The feature of SLOSH that makes it the preferred model of the NWS for storm surge forecasting and mapping is the model's computational efficiency that allows the model to be run as an ensemble (Forbes et al., 2014). However, SLOSH is just one of several modeling options for storm surge modeling and mapping, each possessing strengths and weaknesses associated with their simulations. The inclusion of additional models that can create flood maps of storm surge for a given event should provide an enhanced understanding of the uncertainty of inundation at a given location (Teng et al., 2015). However, the higher computational burden of alternative models, such as Delft3D-FM, tend to preclude their use in real-time operations and certainly, their use in generating an ensemble necessary for probabilistic flood maps. The methodology we propose in this manuscript may offer the NWS and other agencies a means to utilize alternatives to SLOSH for flood inundation mapping and probabilistic flood inundation mapping on U.S. coastlines. Models such as Delft3D-FM can generate reference maps to train the binary classifer and build the probabilistic operating curves. The probabilistic operative curves would account for the major source of uncertainties and provide a computationally efficient and reliable decision-making tool for coastal planners and floodplain managers. The operative hydrogeomorphic threshold classifiers proposed for real-time coastal flood hazard mapping can be used as an alternative tool for the rapid estimation of hazardous areas during real-time flood events. In an operational mode, water level or meteorological forecasts can be used to estimate the return period of an upcoming coastal flood event and the methodology here can utilize this as an input to perform LCFM flood inundation mapping both deterministically and probabilistically."

The limitations of the study and the possible enhancements of the proposed methodology should be discussed clearly

Response: We have already included three areas of research for future studies. To expand this, we added more text explaining the study limitations and potential areas for future research. Please refer to lines 511-519 in the revised manuscript.

"The proposed hydrogeomorphic index (I_{HD}) is the primary data for flood hazard mapping in this study. Thus, the quality of two main inputs of this index, namely the DEM and stream network used to calculate features H and D play a vital role in the overall accuracy of the proposed approach. To obtain maximum accuracy, here we used the best available DEM with the finest spatial resolution of 3 m that includes the bathymetry data. However, considering the limited access to such high-quality DEMs in many areas of the world, it is recommended to evaluate the sensitivity of the proposed approach to lower quality DEMs (e.g. 30 m and 90 m DEMs without bathymetry information) in future studies. Another piece of research can investigate the sensitivity of the proposed approach to the density of the drainage network used for calculating the I_{HD} index."

In general here are the areas of research we recommended for future studies:

1. Sensitivity of the hydrogeomorphic index to DEM quality and stream network density (Lines 511-519)
2. Applying the proposed hydrogeomorphic operative curves to inland floods and to other deltas across the US. (Lines 536-540)
3. Improve the flood frequency analysis, considering its uncertainties, incorporating other sources of uncertainties in the modeling to generate probabilistic operative curves (Lines 550-558)
4. A benchmark study that compares the performance of three LCFM methods (Lines 607-610)