

[Response to RC1 on nhess-2021-251](#)

Review of the paper “Tropical cyclone storm surge probabilities for the east coast of the United States: a cyclone-based perspective” by Towey et al, 2021.

Here the Authors analyze how much of surges characteristics in selected locations along the East US coast may explain by TCs producing them or crossing the areas nearby. The work is quite very interesting and absolutely worthwhile to be published. However sometimes the text and above all, the methodology are not very clear and the use of terms such as “noisy” is somehow misleading. Thus I think that text can be published after some major revisions.

Line 20-22: please reformulate

We have rephrased this to: “*This analysis offers a unique perspective by first examining the relationship between the characteristics of TCs and their resulting storm surge and then determining the exceedance probabilities of storm surge associated with TCs based on certain TC characteristics.*”

Lines 25-29 : I would merge these two sentences together

We have merged these sentences together as follows: “*The conditions that generate storm surge, which drive the largest flooding events, are likely to become worse in the future, which can be attributed to rising sea levels (e.g., Tebaldi et al., 2012; Sweet and Park, 2014; Moftakhari et al., 2015), geomorphic changes in the coastal regions (e.g., Familkhalili et al., 2020), and increasing storm intensities with anthropogenic climate change (e.g., Sobel et al., 2016).*”

Line 35 : I would avoid to use the term “scenario” because as far as I understand you are talking about “atmospheric configuration”

Correct. We have changed “scenarios” to “atmospheric circulation patterns.”

Line 45-47 : Could you please explain what you mean with “noisy”?

By “noisy,” we are referring to variability in the data points from the statistical fit. We will replace all mentions of “noisy” in the manuscript with specific descriptions.

Line 49: Again...what do you mean with “noisy”? how is this relationship? Linear? Please explain better

See prior answer. This figure (6) in reference to Irish et al. (2008) does not show the type of relationship. We will reflect this change in our statement.

Line 62 : As the sentence is formulated, it looks like that storm surges affect TC characteristics. Is it like that? Please explain.

This sentence has been reworded to: *“Since this TC information is timestamped, storm surge data can then be related to various TC characteristics over the course of its lifecycle.”*

Line 86-87: Could you please explain why it is not important in the statistics neglecting the wave setup? Do you have a reference for that?

It was not our intention to suggest that it is not important to neglect the wave setup. However, for the sake of our calculations of storm surge, we do not consider the effects of the wave setup. Wave setup is very important, but also very complicated. We have rephrased this sentence to: *“While the wave setup is an important component in the water level (e.g., Phan et al., 2013, Marsooli and Lin, 2018), we neglect this component in our calculation of storm surge due to its overall complexities and its variations based on location and storm intensity.”*

2.2 Methods section

A1) maybe I miss the point in the text but do you explain somewhere in text the choice of the radius for the search of TC in the circle centered on the location of the surge? In Figure 2 you talked about 250 km, why do not you choice 400 or 500 km?

We will update Figure 2 to include all TCs within 500 km. We have added this sentence to the manuscript: *“All TCs that pass within 500 km of a tide gauge are retained for this analysis. We initially consider a search radius of 500 km due to the typical spatial sizes of TCs, but also examine smaller search radii of 250 km and 100 km.”*

A2) I do not understand well the method. You consider all the TCs crossing a radius in a certain distance from the location and you associated the closest one to the event in the day of each maximum daily storm surge, do you? If so it is not very clear from text. If you have two closed systems crossing the area (probably something rare or impossible) how do you find that one responsible for the event?

We have rephrased the relevant paragraph in this section to the following: *“To determine the maximum storm surge associated with a TC at a given location, only the time steps for when a TC was within 500 km of a tide gauge are considered when the storm surge could be realistically attributable to a TC. First, the maximum daily storm surge that occurred on*

the day of each time step is assigned to each time step. The highest storm surge of all of these time steps within 500 km is the storm surge value attributed to a TC. We note that the storm surge we find in this manner is not necessarily the storm surge that occurs at the time when the TC was closest to the tide gauge. In the case that there are multiple TCs within 500 km of a tide gauge, the closest one is the one more likely to be attributable to the storm surge and thus the TC that is retained for the analysis.”

A2) Why do you choose a linear fit as best fit and not for example an exponential fit as done in the references in the introduction?

This is a fair point. We will apply both linear and exponential fits to our data, noting which provide the better fit for each location and variable.

Line 154 : I think that the use of term noise is misleading. I would just state that the propagation speed is less important than other variables

Agreed, we have changed this to: “This does not mean that propagation speed does not have some physical impact on the surge generated by a TC, but rather that its sole influence on surge is more complex compared to the other variables that influence surge.”

Line 161-164 : not very clear this sentence, please rephrase

We have rephrased this to: “The likelihood that a TC meets certain criteria (i.e., a TC comes within 500 km of a location) and produces storm surge exceeding the threshold associated with a 1 yr return period is examined through a probabilistic analysis.”

Section 3.1

I would avoid to say “strong enough predictor” or “better predictor”. What I see is that the variables that you consider are not able to explain completely the variability observed for the storm surges . Please reformulate

We have changed mentions of “strong enough predictor” or “better predictor” to state that the variable does not fully explain the variability in storm surge.

Line 215-17 : not very clear... do you mean TC stronger that the climatology of the systems crossing the area?

Yes, we will clarify the wording in this statement to reflect this.

Line 303-305: Not very clear..as far as I see, you correlate storm surges and TCs characteristics not the opposite. Again the adjective noisy here is not correct in the sense

that relationship between surge feature and TC, I think, is not linear not noisy. Please rephrase

You are correct. We will rephrase this statement.