

Author Comments to Referee #1

Interactive comment on “Tidal flood area mapping fronts the climate change scenarios: case study in a tropical estuary of Brazilian semiarid” by Araújo et al.

Dear Referee #1,

We do appreciate your constructive, thoughtful, careful, and helpful comments and suggestions. After careful discussions and analyses, we finished the preparation of responses to you. If there are any new comments or suggestions, please let us know.

In this document, we respond to the comments received point by point.

Best Regards,

Paulo Victor N Araújo and coauthors

Response to General Comment:

Referee #1: The paper is relevant to the scope of the journal. It a case-specific article and author(s) has presented the case of Rio Grande do Norte Brazil which was affected by Tidal flooding.

Authors' reply: Many thanks for these kind words, we are pleased that the reviewer finds the manuscript to be interesting, relevant and well written.

Referee #1: Title: In the title, after the semiarid, add the “Region”.

Authors' reply: We accepted and modified in manuscript.

Referee #1: Abstract: Line 20, approximately 118.26 km²; this value is not matched with the values included in the table. Verify and include the correct value.

Authors' reply: The value is correct. Maybe, due to lack of a table with "tidal flood risk values", Referee # 1 was confused with values present in tidal flood vulnerability table (table 5). In order to avoid future mistakes, we added in new version of manuscript a specific table with the tidal flood risk values (table 6).

Referee #1: Introduction: The literature lacks recent advances in tidal flood mapping case studies. The application of modeling techniques for tidal flood mapping and remedial measures cases worldwide needs to include to strength the introduction part.

Authors' reply: We agree with Referee # 1. We enriched the introduction with mentioned points in new version of manuscript.

Referee #1: Study area: What is the significance of Line 64-71 in tidal flood analysis?

Authors' reply: We understand that it would be pertinent to raise a brief summary of basin under study, in order to contribute to other studies. But we remove these lines and leave this description for another manuscript.

Referee #1: Line 88-90, presents about the mosaic study area, however, the area is not presented or marked in any figures.

Authors' reply: In fact, we do not present the features in any figure, but we believe it is extremely important to keep the lines in manuscript, as a way of describing and contributing to study area.

Referee #1: Line 102-103, presented that the study area is also affected by river flooding, and however in the present case described only tidal flooding. Under this condition presented result for tidal flooding deficit the inundation case by river flooding. It would be considered for precise flood risk mapping besides tidal flooding or it would justify not considered river flood in the present case.

Authors' reply: Although "tidal flooding" is the focus of the work, we believe it is also important to mention that the region has suffered some "river flooding" in the past. It is also important to emphasize that the main river is barred in several stretches and that, in studied section, river flooding only occurs in the special rain conditions. The river flooding in region were caused by the accumulation of water from extreme rainfall events in the hydrographic basin. However, after 2010's, tidal flood events have frequently occurred. This factor, together with the lack of literature on the case, corroborates it immensely for publication of this case study.

To improve the understanding of manuscript, we add in lines 104 and 106 the following sentence: "(type of flooding focus on this paper)" ... "and finally, the lack of literature on the case (tidal flood)".

Referee #1: Materials and methods: Description and preparation of land use land cover map for vulnerability mapping are missing.

Authors' reply: Agreed with Referee # 1. We added a new topic in line 207: "3.5 Land use and cover map".

Referee #1: Line 120, data from point 19, however, the figure 19 is not presented in figure 1, in addition, Legend is missing in Figure 1.

Authors' reply: Point 19 of the GOS database is shown in figure 1 with the name "GOS point". The figure 1 is self-explanatory, each vector is already associated with its meaning with source color in same color as vector. Additional information is presented in text caption.

Referee #1: Line 179, LiDAR DEM covers an entire area, however, the area covered in km² and in form of a map is missing in presented research.

Authors' reply: Agreed with Referee # 1. We added in line 76: "The study area covers the entire Piancó-Piranhas-Açú estuary, represented by a rectangle in the measurements 62 x 35.5 km, corresponding to an area of approximately 2,200 km²."

Referee #1: Table 1, Hazard attribute values, in score 1 to 5, however score for 2 is missing. Justify why it is not considered.

Authors' reply: Because we only use 4 climate change scenarios in the literature (including the present), we adopt only 4 flood hazard classes. The most aggravating and least likely scenario (RCP8.5) received the highest score (score 5), as it is the one with the greatest danger.

Referee #1: Table 2, Vulnerability values, in score 1 to 5, however, the score for 0 is missing. Justify why it is not considered or line 216 Score from 1 instead it will start from Score 0.

Authors' reply: We agree with Referee # 1 and changed line 244 to mention the class "0" (in the vulnerable class).

Referee #1: Results and Discussion: What is the significance of the use of High-resolution DEM (LiDAR) data in this work?

Authors' reply: We added in line 249... The flood risk mapping from high-resolution DEM provides the knowledge to optimize investments and provide flood risk management in high accuracy (Schröter et al., 2018). The standardized altimetric reference at centimeter intervals become essential, especially when there is an interest in the analysis of land use and cover, or when economic activities occur in these environments, in order to estimate risks with accuracy (Aguiar et al., 2019).

Referee #1: Why the flood depth map is not presented in this study?

Authors' reply: The map in figure 6 is closely related to "flood depth map", since each hazard class is related to the flood tide quota for that class. In addition, in figure 8, we present an excerpt of the modeling of a tidal flood event occurred in 2015, followed by a photographic field record for model validation.

Referee #1: Flood waves are dynamic quantities, however, the entire concept presented in static condition. If dynamic tidal wave model or unsteady tidal flood modeling will be performed considering the river flooding and rain flooding will generate the different flood inundation or risk scenario.

Authors' reply: Yes. Really, if the tidal flood modeling will be performed considering this sum (river flood + tidal flood) will generate the different flood inundation or risk scenario. However, it is important to emphasize that our goal is to realize only risk of "tidal flooding". Once, that is event that has been causing major problems. In addition, it is important to mention that the study area is inserted in a sheltered coastal region dominated by tides and not by waves. (as presented by Vital et al., 2016). Therefore, we take the opportunity to add the following sentence in line 90: "The study area is inserted in sheltered coastal region, dominate by tide-modified to tide-dominated beaches (Vital et al, 2016)".

Referee #1: Line 269, Table 5.5, However it does not match with the table numbers.

Authors' reply: We accept and correct the call in the text. The correct is "Table 5".

Referee #1: References: Line 309, reference 1 should cite in the English language.

Authors' reply: We quote the title of the work according to originality of publication. As it was published in Brazilian Portuguese, we keep the original title. Natural procedure, as in other articles published by the journal *Natural Hazards and Earth System Sciences*.

Referee #1: Page 17, Photographs A to C, shows the tidal flooding in different years i.e. 2011, 2015, what is the relation with the scenario generated. How it will be utilized for validation, although the scenario is generated based on the 20-year return period.

Authors' reply: The Figure 2, present on page 19, is associated with paragraph on page 4 (study area), where we relate the figure to recent tidal flood events in study area. We believe that it is extremely important to contextualize the reader to problem at focus (tidal flood in north coastal of Rio Grande do Norte state).

Referee #1: These are the major deficiencies observed in this work and need to improve. I rated this paper as a major revision; Happy to review a revised version with significant improvement.

Authors' reply: We would like to thank you for your constructive comments and for taking the time to critically review our manuscript.

Additional relevant changes: We take the opportunity to update the citation on climatic aspects of study area in the paragraph that starts at line 80.