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May 8, 2024

Subject: Submission of the revised manuscript (**Ms. No: NHESS-2023-191)**

Dear Dr. Brunella Bonaccorso,

Thanks for the mail informing "major revision" of our manuscript NHESS-2023-191 based on comments of learned reviewers. The comments of the reviewers have been insightful and helped in revising the manuscript with enhance clarity and robustness. We have simulated a few scenarios and incorporated them in the revised manuscript. Please find the same as attachment.

In light of insightful comments, we have carried out additional tsunami scenarios for the 1881-Car Nicobar, 1941-North Andaman earthquake in addition to the 2004 Sumatra earthquake. Since the latter has affected the region with highest severity, it has been considered for the scenario tsunami risk analysis (Sections 3.2 and 4.1). A brief description of the TUNAMI-N2 model, including calibration parameters and computational grid has also been added to the methodology section 3.2 as per the suggestions. The shoreline uncertainty evaluation and minor points raised by the reviewer regarding figure quality, language corrections, and references have been carefully addressed. The detailed response to the respective reviewers are in the following pages. Needless to mention we are attaching the "clean" and "Track-change" versions of the manuscript.

We hope the revised manuscript is significantly improved and would make important contribution to the field of natural hazards and disaster management and would find audition in the Natural Hazards and Earth System Sciences journal.

We look forward to your kind response.

With sincere regards,

(Anand K. Pandey)

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Our Reply to the COMMENTS of REVIEWERS on Ms. No: NHESS-2023-191

The reply is marked in color.

Title: **Shoreline and Land Use Land Cover Changes along the 2004 tsunami-affected South Andaman Coast: Understanding Changing Hazard Susceptibility.**
https://doi.org/10.5194/nhess-2023-191

Reply to Reviewer #1

This paper addresses an important tsunami risk problem, which is aggravated by the increasing trend in population exposure, tourism etc. The analysis undertaken identifies a number of important tsunami risk issues, but falls short of what is required for a robust population tsunami safety study. To make the conclusions more robust, some additional scenario analyses would be insightful and instructive.

We highly appreciate the learned reviewer for his keen interest in reviewing the manuscript and providing insightful comments and constructive feedback that has helped enhance the quality of the manuscript.

First, all tsunami wave height outcomes are subject to a substantial degree of stochastic variability. Venturing beyond the actual 2004 tsunami wave height measurements, the implications for local upward variations in wave height should be considered by perturbing the tsunami source dynamics. Furthermore, other potentially dangerous earthquake-generated tsunamis merit attention, and an ensemble of some alternative potential tsunami scenarios should be considered, especially those that impact regions of recent economic development. This broadening of the basic tsunami modeling content of the paper would make the results more reliable for informing the practical risk management strategies and other conclusions listed at the end of the paper.

As suggested we have considered 3 Tsunamigenic scenarios namely, a) the 1881-Car Nicobar earthquake, b) the 1941-North Andaman earthquake, and c) the 2004 Sumatra earthquake, and generated the directivity and run-up map (Fig. 3; Table 2). The results and findings are discussed in sections 3.2 and 4.1.

Since the tsunami by the 2004 Sumatra earthquake has affected the region with highest severity, it has been considered for the scenario tsunami risk analysis (Sections 4.2).

We agree that analysis for each event is important but would be beyond the scope of present manuscript.

I hope the learned reviewer will find the revised manuscript appropriate.

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Reply to Reviewer #2

At the outset we highly appreciate the learned reviewer for his providing insightful and constructive comments that has helped enhance the quality of analysis in the manuscript.

The author adopted the TUNAMI-N2 model to evaluate the area submerged by the tsunami flow. The authors should describe: i) the model, ii) the calibration parameters and how they are selected; and iii) the characteristics of the computational grid. The model is applied to a real event, therefore a validation with some field data could be useful.

We agree to the important suggestion for the completeness of the manuscript and have incorporated a short text addressing the above points into the methodology section 3.2

Regarding the shoreline changes, uncertainty must be evaluated. Due to the low slope of the beach in some transects, uncertainty must be correlated with the water level (tide and barotropic surge).

We have adopted a confidence interval of 90% and assigned a shoreline uncertainty value of 10 meters as per the recommendations of the United States Geological Survey (USGS) under the National Assessment of Shoreline Change project (Himmelstoss et al., 2021; Den and Oele, 2018 and Joesidawati, 2016). The short discussion about uncertainty is incorporated in sections 3.3

NSM and EPR are not “statistical” parameters, since they are related to the difference between two observations.

Mean values of these parameters have been computed and we mentioned them as statistical parameters primarily based on Himmelstoss et al., 2021, where it is referred to as Statistical Parameters.

Minor points:

1. L. 48-50 – check the sentence.

   Sentence corrected in the revised manuscript.

2. Figure 3 a and b – please add labels in the axes and the color bars.

   We have redrafted Fig.3 incorporating suggestions.

3. L, 226 – Delete “rates”. EPR is already a rate.

   “rate” is now deleted

4. Figure 5 – the axis labels are too small.

   We have redrafted Fig. 6 incorporating suggestions.

5. pages 14-15 – Check the reference to figures SM1 – SM4,

   SM1 – SM7 is now changed to S1, S2…S7

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6.L. 285-288. Are you sure about the change in water depth? The ground colors in the 2005 and 2022 images also shows a noticeable difference.

The dark blue color in the Landsat images from 2004 and 2005 suggests clear water without detrital sediment load, while the light blue color in the 2022 image indicates a significant fresh sediment load with bright reflectance, and we assume that it will affect the reduction in water column depth.

I hope the learned reviewer will find the revised manuscript appropriate.

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