Natural Hazards and Earth System Sciences Discussions

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Reply on RC1

Mark V. Bernhofen et al.

Author comment on "Global flood exposure from different sized rivers" by Mark V. Bernhofen et al., Nat. Hazards Earth Syst. Sci. Discuss., https://doi.org/10.5194/nhess-2021-102-AC1, 2021

General comments:

The manuscript provides detailed and useful information about the importance of selecting a "good" and reliable population dataset to assess exposure to floods at global scale. It also present an alternative approach to improve flood susceptibility mapping, by means of a simple geomorphic variable. The paper is well written and enjoyable. Results and comments are significant for future applications. I believe the paper can be published after complying with minor issues.

Author's Response: We would like to thank Serena Ceola for her in-depth review of our manuscript and we appreciate her positive comments about our paper. We feel that her suggestions will significantly improve the manuscript and we address each of her comments below.

Specific comments:

- 9. I would suggest to cite RFSM here

AR: Agreed, we will reference the RFSM in the abstract.

- 32-34: the authors may refer to Ceola et al., 2014, GRL, https://doi.org/10.1002/2014GL061859, (where nighttime lights are used to assess human exposure to floods, including also temporal trends. It may be interesting to compare results (see exposure change from 1975-2015 and Fig. 4).

AR: Thank you for pointing us to this paper. We will compare our findings with the results from the paper in the "Exposure Change from 1975-2015" section.

- 49-64: this part looks like a repetition of waht was written before. I would suggest to remove it or rephrase it.

AR: We agree there is repetition of points already addressed earlier in the introduction. In our revision we will shorten this paragraph by removing the repeated points and rephrase the necessary points to be more concise.

- 100-105: authors should check the paper written by Samela et al., 2015, AWR,

https://doi.org/10.1016/j.advwatres.2017.01.007, where a geomorphic index (GFI) is introduced to define a flood susceptibility map. A thorough comparison should be performed, commented and included in the revised version of the mansucript.

AR: This is indeed an important paper relevant to our work that should be commented on and referenced in our manuscript. Thank you for pointing it out. In our revised manuscript we will include in the methods section a comparison between the two approaches and will comment on this in the discussion where relevant.

Figure 1: I would suggest to show an example with a 10 km2 threshold derived from analyzed data - currently this Figure assumes a different UDA that is confusing.

AR: This is a very good point. We will update the figure to use a 10 km2 threshold.

- 139-140: authors should better clarify why Hn is needed. Also, clearly separate calibration and validation by adding e.g. a chartflow or better rephrasing the text, listing in detail the areas used for calibration and validation respectively.

AR: Thank you for pointing this out. In the updated manuscript we will include the calibration and validation of the RFSM under separate subheadings and rephrase the text for more clarity. We will also include more detail about the calibration and validation areas.

- 144 and Figure 2: authots should provide here a list of the 19 reference flood maps and substitute Figure 2 with Figure S1.

AR: Good point. We will swap the two figures and list the flood maps used for calibration.

- 161: add a list of 6 GFMs

AR: We will include this in the updated manuscript

- 166: which kind of commonly used measure of fit scores did the authors use? Please list them here

AR: We will include and reference these in the updated manuscript

- 208: HRLS and World Pop data: to which year do they refer?

AR: Very good point. We will include this in the updated manuscript

- 211: add "from GHS-POP" in the title

AR: This is a good point. We will update the title.

- 243: authors should cite the paper written by Scussolini et al., 2016, NHESS, https://doi.org/10.5194/nhess-16-1049-2016 on a global-scale flood protection database

AR: Yes we agree. We will cite it in the updated manuscript

- 245-254: authors may consider to remove this part and simply refer to section 3.3

AR: This is a good point. We will remove this paragraph and refer both to section 3.3 and also to the table we will add based on the comment below.

- 248-254: authors should add a table to show a comparison between GHS-POP, World POP and HRSL and should cite Figures reported in the SI

AR: This is a very good point. We will add the table and cite the Figures in the supplementary.

Figure 3: I would suggest to avoid the use of acronyms in the figure caption. Also, I would suggest to start the caption as follows: "Flood exposure from ..."

AR: We agree. The figure caption will be updated.

- 268-271: as stated above, authors could compare their own results with temporal trends as in Ceola et al, 2014, GRL. Also, how change is computed? Is it simply a difference between 1975 and 2015?

AR: We will include a comparison with the Ceola et al paper and will specify how exposure change is computed in the updated manuscript.

- 286: the title "Variation in exposure" could be misleading - what about "Exposure estimates from different population datasets"?

AR: This is a good point. We will change the title.

- 287: what is the exact number of countries considered here? 168 or 169 (as written in Fig. 5 caption - please check this)

AR: Thank you for pointing this out. It should read 168. We will update this in the manuscript.

- 297-299: I found this sentence unclear.

AR: Agreed. We will rephrase this.

Figure 5: dots are too small to be seen and distinguished. Authors should enlarge dot size in panel (C) and line size in panel (b). How are average exposure and exposure range computed? This information should be added to the main text. Is the exposure range a % difference? Is it normalized with respect to the country population?

AR: This is a good point. We will update the figure to enlarge the dots in panel (c) and the lines in panel (b). Exposure in this figure is normalized with respect to a country's population. We will clarify this and how average exposure and exposure range are calculated in the updated mansucript.

Figure 6: what is the meaning of the white square in each panel? Blue pixles in panel (a): what do they represent? What is the amount of the total population in (b), (c) and (d) in the flooded area? Also, consider to explain colors in the caption.

AR: Thank you for pointing this out. The white square is the bounding box for this analysis. We will clarify this in the caption. We will also clarify what each colour means in each of the figures. We will also include population totals for each of the datasets and comment on this.

Figure 7: it would be helpful to zoom over the squared area and show more in detail the RFSM. Also, even though I appreciate the effort to differentiate population per cell, I would suggest to simply distinguish between wet and dry cells.

AR: Good point. We will add a panel showing a more detailed RFSM flood extent. We will also update the figure to distinguish between only wet/dry cells and not population per cell.

Figure 8: rephrase the caption

AR: Agreed. This caption will be updated.

Technical corrections:

- 161: remove "the" before African

AR: Thank you. This will be updated.

- 217: remove "are" before susceptible

AR: Thank you. This will be updated.

- 262: a number is missing in "200-2020"

AR: Thank you for pointing this out. We will change it to “2000-2020”

- 279: remove an extra dot

AR: Thank you. Dot will be removed

- 317: (Tiecke, 2007) should read Tiecke (2007)

AR: Thank you. The reference will be updated.

- 392-393: remove "the" before population and write "cells" instead of "cell". Maybe write 3 arc sec instead of 30 m (for consistency)?

AR: This is a good point. We will change to “3 arc sec”.

- 445: its?

AR: Thanks for catching this. Will change to “it is”.