

Nat. Hazards Earth Syst. Sci. Discuss., referee comment RC1
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Comment on nhess-2021-102

Serena Ceola (Referee)

Referee 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-RC1>, 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.

Specific comments:

I. 9. I would suggest to cite RFSM here

II. 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).

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

II. 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 manuscript.

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.

II. 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.

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

I. 161: add a list of 6 GFMs

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

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

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

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

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

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

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 ..."

II. 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?

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

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

II. 297-299: I found this sentence unclear.

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?

Figure 6: what is the meaning of the white square in each panel? Blue pixels 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.

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.

Figure 8: rephrase the caption

Technical corrections:

I. 161: remove "the" before African

I. 217: remove "are" before susceptible

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

l. 279: remove an extra dot

l. 317: (Tiecke, 2007) should read Tiecke (2007)

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

l. 445: its?