October 26, 2017

Paolo Tarolli
Editorial Board
Natural Hazards and Earth System Sciences

Dear Dr. Tarolli:

We are in receipt of your most recent decision letter regarding our manuscript nhess-2017-152 requesting minor revisions. This letter details our responses to the latest comments from Reviewer #3. In all cases, the Referee's comments are in plain type and our responses and commentary are in italics. We appreciate your time and the time of all of the Referees in providing a careful critique of our methods and our results.

We thank you once again for your consideration.
Sincerely,

Cameron W. Wobus, PhD
Senior Scientist
Environment & Health Division

Enc.

Referee #3 General Comments

I have reviewed the revised manuscript and the author's response. Indeed, I had accidentally reviewed the original version of the manuscript and the revised version is certainly improved. As I stated before, I consider the methodological framework presented in this work novel and as such, I wish to see the paper published.

We thank the reviewer for the overall positive review. We wish to see the paper published as well.

Referee #3 Specific Comments

1. I am fine with your methodology for assessing changes in modeled 1% AEP events, as you mention. However, your assessment of changes in frequency is based on a threshold (the one you identified at the 1%AEP from the 2001-2020 period), which means that your results are also threshold-dependent. Considering a longer period could (certainly would) lead to a different threshold that would lead to potential differences in the results. In fact, this relates to your discussion on the sampling uncertainty which you have identified to be in the order of 5-20% that you chose not to propagate in your assessment. However, presenting some evidence on the sensitivity of the results on the threshold (even just for the min/max possible values) would be beneficial for the readers. Again, due to the complexity of the problem you are addressing it is understandable that all the different sources of uncertainty cannot be realistically quantified. However, since you have already estimated a range of uncertainty for the 1% AEP I would strongly encourage you to show how this affects the results.

   We recognize and appreciate the Reviewer's concern, and we have evaluated the effects of this threshold-dependence on the timeseries of flooding, as follows: based on our bootstrapping analysis, we assigned a random error to each 1% AEP flood ranging from +20% to -20%, and re-calculated the timeseries of flooding at each node for each model. We then calculated the average number of floods occurring in the CONUS each year, with and without this error propagation, for each model, and we also calculated the distribution in the number of floods across the full ensemble. We have summarized the results of this exercise in Section 3.1 of the revised manuscript, and we have added two new figures and a summary to Supplemental Information File #2. Because the error on the 1% AEP event can be positive or negative based on our bootstrapping analysis, the overall effect on the timeseries of floods (and therefore damages) nationwide is negligible: while some nodes experience more floods, others experience fewer floods. As we expected, the overall impact is also minor in comparison to the intermodel variability, and justifies our decision to leave this source of uncertainty out of the remainder of the paper.

2. I understand the point of the authors and my point was not to require that the simulated flows matched perfectly the observed. My point connects to the previous point on the impact of uncertainty in the estimation of 1% AEP. Let's assume that FEMA calculated

the 100yr flood based on N observations available from the simulations. Take the N simulated events and calculate the 100yr flood (Q100N). If we take a sub-sample n<N of those observations and recalculate the 100yr flood we will end up with a different estimate Q100n (uncertainty due to sample size). The number of times the future (simulated) flows exceed Q100N and Q100n will be different and thus the associated estimates of future damages would be different. Again, in my opinion, this point could be addressed (at least partially) by providing some indications on the sensitivity of the results to the estimation of the baseline 1% AEP.

See response to comment #1 above: we believe that the new error analysis we conducted, as summarized above, addresses this comment as well.

3. My second comment relates to page 5, L5 where the authors define as "flood" the annual maximum flow value that exceeds the baseline 1% AEP. Why are you considering only the annual max? There can be also other events within the year that exceed the baseline 1% AEP. Accounting for these as well will have a significant impact in the future change of "flood" frequency and associated damages. Please clarify/justify your choice.

   The reviewer is correct that although it is unlikely, more than one event could occur in a given year that would exceed the historical 1% AEP event. However, because our 1% AEP event calculations are based on an annual maximum timeseries, we have focused the remainder of our analysis on the annual maximum flows as well. We have added additional text to Section 2.4 describing this choice, and why we anticipate that this choice makes our future flood damage estimates conservative.