Responses to Anonymous Reviewer 1.

Thank you for your helpful review. Please find our answers to each of your comments below

1. *>> "The paper properly describes the topic declared by the authors. The different parts of the proposed method are presented in a detailed way, with a rich literature reference. The topic of the paper affords a challenge in the field of multirisk loss assessment, so, the comments presented in the discussion (limits and positive aspects) are agreeable".*

   Thank you for your nice comments and your suggestions.

In addition:

2. *>> "A re-reading of the paper is suggested to correct some typing errors and just some language errors;"*

   Thank you for the nice comment about the structure of the paper. Following your advice, we have accordingly asked an editor (a native English speaker) to carry out a strict language review. The new version has been significantly been improved in that regard.

3. *>> "In the last paragraphs check the use of the numbered list, to extend it to the final sentences;"*

   We have performed such a check in the updated version of the manuscript. We agree with the reviewer that the paragraph after point 4 of the Discussion section better fits as a point 5 because it also discuss the limitations we faced regarding hazard intensities. Thank you for your suggestion.

4. *>> "A check of the conclusion and discussion paragraph is suggested to avoid some repetitions."*

   We have performed such a check in the updated version of the manuscript. We believe that the overall points we have addressed in these sections are now better presented. Thank you.

   Complementarily to the reviewer's suggestions, we have also made slight modifications to the Introduction and Sect. 2.3 that will provide the reader with a smoother reading. Moreover, we have included a simple but informative analysis comparing our results with other scientific literature results at the end of the Discussion section:

   "To give a perspective on the importance of addressing cumulative damage and losses for building stocks, let us recall some of the findings that the available studies of Gómez Zapata et al., (2021) and Markhvida et al., (2017) found. They investigated the likely economic losses of the entire residential building portfolio Lima and Callao solely after seismic ground motion from a M_w 8.8 scenario addressing the variability induced by the same cross-correlation model we have implemented herein. In the first *study, ~1,657,635 residential buildings were considered and both studies considered the SARA building classes and fragility functions, similar to what we have done. Both studies reported mean loss values of around 7 and a maximum of around USD 35 billion (among a stochastic sample of events). It is then interesting to compare such a range of values with the mean loss values reported for a similar M_w (Fig 11-d). Notably, the forecasted losses per event (shaking and tsunami) and inferred from cumulative damage were derived from the much smaller commonly exposed building stock to*

each pair of hazard scenarios (see Fig 8-c), which constitute ~ 21,209 buildings. This means that the building count for the entire residential stock of Lima (Fig 6-a) is around 78 times larger than the commonly exposed to both perils (Fig 6-b). Hence, can note the important role of tsunami-induced losses in the study area. The mean losses expected from the cascading sequence of that M_w 8.8 (i.e. value for the 50th percentile on the green curve in Fig. 11b) is ~ USD 0.75 billion and a maximum of around USD 0.94 billion. Therefore, given the difference between the size of both building portfolios, finding out that the losses for the entire city are expected to be only 9 times larger than the ones forecasted after the action of both earthquake and tsunami, tells us that the crucial importance of carefully addressing the cumulative damage due to tsunami in the study area. Moreover, this tell us that, besides all of the secondary effects of the tsunami, these types of future scenarios in Lima will constitute a huge driving source of direct economic losses for building portfolios, but also uncertainties due to the lack of data to calibrate or validate these types of risk assessment after the action of cascading hazards".

References

Gómez Zapata, J. C., Brinckmann, N., Harig, S., Zafrir, R., Pittore, M., Cotton, F., and Babeyko, A.: Variable-resolution building exposure modelling for earthquake and tsunami scenario-based risk assessment. An application case in Lima, Peru, Natural Hazards and Earth System Sciences, 21, 3599–3628, https://doi.org/10.5194/nhess-21-3599-2021, 2021.

Markhvida, M., Ceferino, L., and Baker, J. W.: Effect of ground motion correlation on regional seismic lossestimation: application to Lima, Peru using across-correlated principal component analysis model, Safety, Reliability, Risk, Resilience and Sustainability of Structures and Infrastructure. 12th Int. Conf. on Structural Safety and Reliability, Vienna, Austria, 2017.