Response to Peer Review Comments

Referee #3:

1. The results do not fully meet the stated objectives. The stated objective is: *assess the applicability and transferability of overseas flood damage models to Australian (geographical conditions): The authors use two other models (except their own) for damage estimation and compare the results. One of these other models is not an overseas model. They do not describe the U.S. flood damage model and its approach in enough detail. Points that may hamper the applicability and transferability and that may explain the differences in performance are neither analyzed nor discussed.*

- We are very grateful for this comment. The reviewer is correct. The objective of study has been modified for the next issue.

2. The wording, and especially technical terms are not always used with care. Generally, the paper lacks precision in describing data and models and using technical terms, e.g. validation and calibration sometimes seem to be mixed up.

- We appreciate your comment. This issue has been resolved in the next version.

3. The literature, while sufficient in amount, does not always support the statements, e.g. p.3824, l. 25: the cited papers don't support the view that flood probability and value of the exposed property have increased exponentially.

- The reviewer is correct. This sentence has been modified in the version.

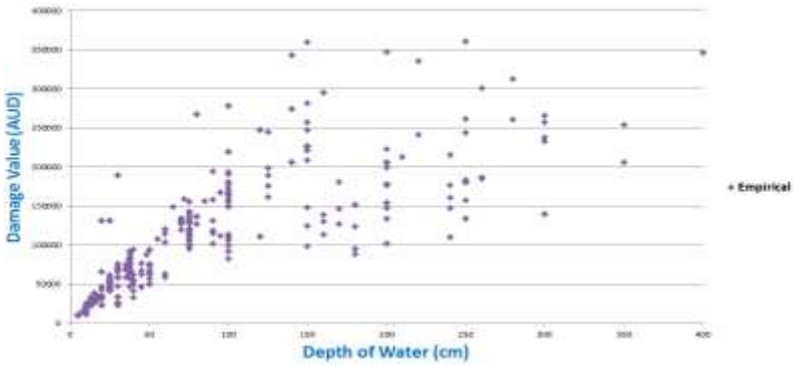
4. For model development, calibration and validation the authors use the same dataset. This is not scientifically sound. Validation should use an independent dataset. If such data are not available, this kind of dataset should be created using methods like split- sample or leave-one-out cross validation.

- The reviewer is correct. A new dataset has been provided by the reconstruction authority of Queensland. Therefore, the newly derived model will be calibrated with the historic data collected from Bundaberg region. Afterwards, the performance of all applied models, for estimation of structural damage in the Australian study area, will be validated by the dataset collected from Maranoa region.

5. The empirical data do not look like real world loss data. I want to put special emphasis on this point. The empirical data are the foundation of this work as the new model is based on this dataset and validation and model comparisons use these data. The data description lacks detail (how many cases are used, number of loss cases in each class) and is very complicated. It is not always clear who (the authors, the survey data provider) has done what in the process of modifying and selecting the data that were finally used. Looking at the unnatural distribution of losses in figures 6, 7, and 8, I was wondering, whether the original dataset from the Queensland authority already give typical damage per water stage/range. This would represent a somewhat empirically derived model itself. More likely,

the process of transferring the qualitative loss categories back into absolute losses and then relative damage/damage ratios obscures the real loss, suffered by the affected buildings. The empirical cases generally do not look like real loss cases (e.g. Figs. 6-8; Tab. 3, 2nd column): Residential damages tend to show huge variance, but the presented data look very "clean": Little to no spread, no outliers, and a clear order (higher water stage – higher loss ratio). In my view, it is indispensable to describe the empirical data in more detail (e.g. provide a table giving number of loss cases, number of loss cases used, cases per building/construction class, and maybe plot all cases in a figure giving water stage and damage). In addition, the data transformation process is not clear enough. So far, the reader cannot really judge the suitability of the dataset for the purposes, it is used for. Additionally, the authors should discuss the quality, aptitude and uncertainties in the loss data and see, whether the applied analyses (e.g. error calculation) are reasonable using these data.

- Many thanks for this comment and the suggestions. The empirical data come from the real world and it has been collected by two times survey done by the government of Queensland. To be more precise, these datasets and the attached guideline describe the extent of damage for each building based on the affected items. Afterwards, on the foundation of relative value of affected items compared to the total value of building, the percentage of damage has been calculated by the author. Also, the level of water for each building has been reported separately in the mentioned spreadsheets. All in all, the reconstruction authority of Queensland has reported the level of water and the affected components of each building in the mentioned datasets and the authors have just exchanged the description of damaged components into percentage of damage (based on the relative value of components). **Consequently, descriptions of damage have been transferred to the relative value of losses directly.** Please consider that this alignment of damage percentages for **each vulnerability classes** is related to the homogenous area of study in terms of building type; structural value; building quality; building size; and building age (reference: "the national exposure system of Australia", cited in the next version). Therefore, please consider that the empirical data has been split based on the buildings characteristics and vulnerability classes and they are expressing the extent of damage relatively (**independent from the area of buildings and replacement values**).
  Although the new additional dataset has destroyed this alignment a little, still the population of scattered data is very rare (less than 3 %) which is related to the very low variation of buildings in our areas of study. Also, this rare population (less than 3%), even after resampling of dataset by means of bootstrapping, did not change the considered trend.In the next version, the dataset has been depicted based on the absolute values by multiplying the percentage of damage by the replacement value of buildings (extracted from " the national exposure system of Australia") . This graph shows the huge variance mentioned by you (**because of the dependency into area and replacement value of buildings**). Please see this graph in the below. Also, in the next version and for resolving the confusion, this part has been reworded again and some more explanations have been added as well.



Some additional minor points:

Tab.2: Why is r=1.5 not tested? It looks visually like a good fit (fig.4), definitely better then r=2.5.

- The reviewer is totally correct. Based on the comments of other reviewers and on the foundation of additional dataset, section 6 has been revised substantially and the "r" value has been already selected equal to "1.5".

Tab.3: Is it feasible to exclude underestimation (results <1) from the error statistics?

- We appreciate your comment. Based on the above explanations, section 6 and the related comparisons have been revised substantially.

Figures 1 and 2: The location maps (figs 1+2) give very little and purely administrative information. At least hydrology and elevation should be part of the study area description, maybe even inundation (if available).

- We appreciate your suggestion and we will add it just in case of availability.

In Tab. 1 and Fig. 3, the subassembly classes do not fully match. How do you separate the relative value of foundation and below first floor?

- We are very grateful for this comment. In the Fig. 3 we have separated the below first floor from the foundation because of the different fragility and behaviour of them against water impacts. Based on the mentioned references, from the relative average value considered for the foundation and below first floor, 3% of that is related to the below first floor and 9% is related to the foundation.