

Editor

Dear authors,

Thank you for the re-submission of your paper “INSYDE-content: a synthetic, multi-variable flood damage model for household contents” to NHESS.

As you know, two reviewers have now reviewed your revised manuscript. As you will see from the comments, in general they are pleased with the improvements made. However, two points remain (one from each reviewer) which should be addressed, namely:

#R1: Comment regarding figure 1: the reviewer and I consider this a minor comment. I would request you to try to implement the changes suggested, after which I will take a decision based on my own interpretation.

#R2: Comment regarding the validation: the reviewer and I consider this a major comment. I request you to address this comment, which I believe is very important to this review process. After this, I will request another review of this specific section by the reviewer.

I look forward to seeing the next version of your manuscript which I will then send out for further review as summarised above.

Please be aware, that this is most likely the last possibility for you to change and improve the manuscript. Thus, I suggest that you carefully go through the manuscript again and improve everything which you still find useful to improve (even if the referees have not pointed it out).

Reply: Dear Editor, we would like to thank you for your careful consideration of our revised manuscript and we are grateful for the constructive feedback provided by both reviewers and for your guidance on the two points that required further attention.

In response to Reviewer 1's comment regarding Figure 1, we have clarified the presentation of the workflow by keeping the overview figure in the main manuscript and adding a new supplementary figure (Figure S2). This figure provides a detailed schematic representation of the datasets used and the methodological steps in which they are involved. We chose to include it in the Supplement to avoid overloading the main paper, while ensuring that readers have access to a more in-depth illustration of the workflow.

Regarding Reviewer 2's major comment on the validation, we refined the discussion in this section, where we introduced a new supplementary figure (Figure S7) showing the relationship between observed content losses and inundation depth at the building level for the two case studies. This figure clearly illustrates the large, non-physical variability in the claim data, highlighting the limits of using such data as a reference for validation. We also clarified our rationale for reporting only one error metric (considering also that Figure 4 also provides information of the scatter between estimated and observed values), in order to avoid giving the misleading impression that observed claims provide an unquestionable reference. The revised text now further emphasizes that validation results must be interpreted cautiously, as they partly reflect the inherent uncertainty of the claim data rather than the model itself. Together, these revisions provide a clearer and more balanced picture of both the strengths of the model and the limitations of available observational data.

We hope that these revisions satisfactorily address the reviewers' concerns and your request.

Reviewer #1

R1.C1: *Dear authors, thank you very much for the revised manuscript. The paper has improved. Although not all of my comments were entirely addressed I am satisfied with the changes made except for one thing: The new Figure 1 looks nice, but is too general and doesn't show what I was hoping for. In the method section you are describing many different steps of the data analysis and you combine and use several datasets. I was asking for a figure that depicts that workflow. Thank you for considering my comments.*

Reply: We thank the reviewer for the clarification regarding the expected content of Figure 1. In the revised version of the manuscript, we decided to retain the original Figure 1 to provide a general overview of the study framework, while complementing it with a new figure (Figure S2) in the revised Supplement 1. This additional figure offers a more detailed representation of the datasets involved and the methodological steps in which they are used. We chose to include this material in the Supplement rather than the main text to avoid overloading the manuscript, and also because of its proximity to the subsequent supplementary figures that illustrate the pairplots of the two synthetic datasets (Po and extended dataset, Figures S3 and S4) and the validation datasets (Figures S5 and S6, added in this revision stage (see also our response to R2.C1)).

Reviewer #2

R2.C1: The manuscript has greatly improved. My main concern, the validation section, is still a problem I think. I'm particularly troubled by figure 4, as it raises more questions than it answers, it seems like there is little variation in the predictions and looking at the figure it seems that the model can really not handle the natural variation seen in the loss observations. The authors seem to agree that the log-log nature of the figure may distort it but in that case I think maybe a different figure is needed as the current figure kind of tells me the model isn't adding much value. So we would need a different figure where the log-log doesn't distort the relationship or we would need a more detailed analysis of whether the model is adding value beyond a simple constant for content loss (ie an option could also be to remove the figure and replace it by something else that answers that question). The MAE is a start but on its own doesn't provide much information on how much the complex model adds to prediction quality as we have no reference model. Other metrics like correlation or R2 might be more relevant for that question. So as a reader I would like to know whether this model is useful and currently the validation section isn't answering that for individual buildings.

That being said, it is a well known problem that flood loss models have trouble at individual building level so I'm not totally surprised by the problem and I don't think its necessarily a problem for publication if addressed properly. I just think currently the validation section raises more questions than it answers.

Reply: We thank the reviewer for the constructive comment, which helped us to further clarify the validation section. Indeed, validation of flood damage models at the individual-building level often raises complex issues. As also discussed in the revised manuscript, claim data should not be considered an unequivocal ground truth, as they often display inconsistencies that cannot be explained by physical processes. To explain this, we complemented our previous analysis with a new supplementary figure (Figure S7), showing the relationship between observed content losses and inundation depth at the building level for the two considered flood events. This figure clearly illustrates the large, non-physical variability in the claim data, with differences of up to an order of magnitude even for buildings of the same type and size affected by nearly identical flood conditions. Such discrepancies are likely driven by subjective household behavior or reporting practices, rather than by flood impacts

themselves, and therefore cannot be reproduced by physically informed models, such as INSYDE-content.

For this reason, while we acknowledge the reviewer's suggestion regarding the use of additional error metrics, we deliberately decided to report only the MAE, and purely as an illustrative indicator (R^2 values are very low and this is clearly visible from Figure 4). Reporting a broader set of error metrics could give the misleading impression that the claim data represent an unquestionable benchmark, which is not the case, as discussed earlier. Moreover, given the substantial non-physical variability in the claim data, high values of accuracy indicators would essentially reflect how well the model reproduces the "noise" in the observation, rather than its ability to capture physically meaningful damage mechanisms.

Instead, we chose to emphasize that validation results must be interpreted with caution, since they reflect not only the model's performance but also the substantial uncertainties and inconsistencies in the reference data. We believe that the revised validation section, together with the new supplementary material, now provides a clearer picture of both the strengths of the model and the limitations of available observations, thereby addressing the reviewer's concern.

Regarding Figure 4, we believe that the log-log representation remains the most appropriate choice, especially considering the large variability in content loss estimates for apartment buildings. This visualization conveys the expected spread of losses within the plausible physical range, in line with the stage-damage functions exemplified in Figure 1, which display a certain variation in output values for similar input conditions, as in the validation cases.