Reviewer #2

R2.C1: *The paper presents a new model for estimating flood damage to houshold contents. In contrast to damage to residential buildings, damaged household items are neglected in many (scientific) flood damage models or are estimated using simple approaches such as a lumped share of the estimated building damage. In practical loss estimation applications such as cost-benefit-analysis, where a loss estimation for all sectors and damage types is needed, further approaches exist, e.g. specific stage-damage functions for contents. These approaches are often not well documented or published. With INSYDE-contents the authors propose a detailed flood damage assessment of household contents based on 11 typical household items, their mean replacement values and the estimated number of damaged items, which depends on characteristics of the flood event and the affected buildings. The paper also adds insights on the model's performance and validation using two real world data sets. So, I think the paper and the model presented provide a valuable contribution to the scientific literature on flood loss modelling. Still, the paper could be further improved with regard to the following aspects.*

Reply: We thank the Reviewer for the positive evaluation of our work and for recognizing the contribution of the INSYDE-content model to the advancement of flood loss modelling. We appreciate the constructive comments and suggestions, which we address point by point in the following responses and will incorporate in the revised version of the manuscript.

R2.C2: *Introduction (line 44 - 59): While it is acknowledged that the authors present the relevant literature, not many insights about the existing approaches are provided. Please be clearer about the weaknesses and strengths of the models mentioned. And discuss later in the paper, what your model contributes in comparison to the existing approaches.*

Reply: In the original manuscript, we intended to provide a concise but critical overview of existing flood damage models for building contents. In particular, we noted the limited transferability of empirical models (the ones mentioned in L44-59) due to the strong regional dependence of content types and distributions (L74-76). We also discussed the only existing Italian empirical model (Carisi et al., 2018), noting that it estimates content damage indirectly via a regression on building damage. As stated in the manuscript, this approach overlooks key factors such as the spatial distribution of contents within buildings, thereby limiting its ability to capture content-specific vulnerability. Similarly, we mentioned the synthetic model by Nofal et al. (2020), emphasizing how its simplified assumptions (such as contents placement within a hypothetical single-family wooden building) hinder real-world applicability due to the absence of content and building variability representation.
Moreover, we devoted a dedicated subsection to comparing the outputs of INSYDE-content with those of Carisi et al. (2018) to empirically illustrate the differences in model behavior.
We hope that the clarifications provided above demonstrate that the current manuscript already addresses these aspects in both the Introduction and the comparative analysis. Therefore, we respectfully consider the present discussion to be adequate in its current form.

R2.C3: *Methodology: Since the model development is an important part of the whole paper, I think it should be presented in more detail. It doesn't become clear in my view, why these 11 items (lines 100-102) were selected.*

Reply: As mentioned in the original manuscript, the selection of the 11 household content items was based on a survey of real cases, conducted through the analysis of real estate listings with photographic evidence. These items represent the essential and most frequently occurring contents typically found in residential dwellings, and were selected to ensure relevance, generalizability and applicability of the model to a wide range of household types. We will clarify this point in the revised manuscript.

R2.C4: *Later, the sampling procedure that led to 60 buildings and the sample itself could be better described.*

Reply: The sample of 60 buildings was derived by applying strict selection criteria to a broader dataset of approximately 500 real estate listings examined. The selection was based on the completeness and consistency of the available information, including key geometrical attributes, architectural layouts, interior characteristics and sufficient photographic documentation to enable full model parameterization. Only listings that met all these requirements were retained, in order to ensure the reliability of the input data used in the model setup. As this point is already covered in L111-118 of the original manuscript, we consider the existing description of the sample selection to be sufficiently comprehensive and therefore believe that no further details are available to provide.

R2.C5: *Furthermore, Table 3 and the analyses behind it, should be better explained.*

Reply: To improve clarity, the revised manuscript will include a more detailed explanation of Table 3. Additionally, following the suggestion in R2.C6, we will incorporate in the main text of the paper an example illustrating how the damage function for a specific household item was derived, which we believe will further aid readers' understanding.

R2.C6: *A lot of material is presented in the Supplement, but I would prefer to see at least one example how the damage function was derived for one item in the main text.*

Reply: We appreciate the Reviewer's suggestion and, accordingly, we will include in the main text of the revised manuscript an example how the damage function for a specific household item was derived, including its fragility curve and the dependence on relevant variables. This inclusion will also support the interpretation of Table 3 (see R2.C5).

R2.C7: *Along the same lines, the methods in section 2.2 could benefit from some more details on the data and the methods used.*

Reply: The methodology and data used in Section 2.2 follow the approach adopted in the INSYDE 2.0 model for buildings (Di Bacco et al., 2024). To improve clarity and address the Reviewer's comment, we will revise the manuscript by enhancing the description of both the sensitivity analysis and validation procedures presented in this section.

R2.C8: *Altogether, I think the paper could benefit from a flow chart or another image showing the different stages of the model development and evaluation as well as the data sets involved.*

Reply: In the revised paper, we will include a flow chart in the Introduction to provide a clear visual summary of the main stages of model development and evaluation.

R2.C9: *Table 1: The equation for SA is given as SA = F(SA; NF). Do you mean FA as independent variable here?*

Reply: We thank the Reviewer for spotting this typo. The correct formulation is indeed SA = f(FA; NF), and we will correct this in the revised manuscript.

R2.C10: *Table 1: Why do you use FA (instead of SA) in the equation for HU?*

Reply: Because FA is the independent variable, while SA is derived from FA through an empirical functional relationship (i.e., HU depends on SA implicitly).

R2.C11: *line 176/177: rephrase ("by the same authors" is a bit confusing here)*

Reply: In the revised manuscript, we will rephrase the sentence to improve clarity.

R2.C12: *Table 3: As already mentioned above, the rationales and analyses behind the equations in Table 3 need more explanation.*

Reply: This will be addressed in the revised version of the manuscript (see reply to comments R2.C5 and C6).

R2.C13*: lines 217: "total actualized losses" - please check term*

Reply: In the revised manuscript we will replace "total actualized losses" with "total losses adjusted to 2023 values".

R2.C14: *Figure 2: This figure and the methods behind it need more explanation in my view. Also, the two data sets should be better described in the paper (briefly, but still in more detail than is currently the case).*

Reply: As also noted in response to comment R2.C7, the methodology underlying the results shown in Figure 2 follows the approach developed for the INSYDE 2.0 model for buildings (Di Bacco et al., 2024). In the revised manuscript, we will improve the explanation of Section 2.2 to provide additional details regarding the data and methods used in the analysis.

R2.C15: *Figure 4: These results should be analyzed and discussed in much more detail. How come that the estimates for (semi-)detached house do not show much variability (in contrast to the estimates for apartments)? The authors should present more in depth analysis of these results, including common metrics for errors or model performance (RMSE, MAE etc.), and they should discuss potential weaknesses of their model. How could the model be further improved to better capture the variability of the observed damage/claims?*

Reply: This concern was also raised by Reviewer 1 (see comment R1.C2). We report here the same response for completeness.
As also discussed in Molinari et al. (2020), claim data at the building scale are often affected by significant uncertainty and potential bias. For this reason, traditional flood damage models, as well as INSYDE-content, are typically more reliable when applied at aggregated spatial scales, rather than at the level of individual buildings.
This intrinsic variability in the observed data makes the interpretation of building-scale validation results particularly challenging. In our original manuscript (L368-374), we emphasized the importance of providing uncertainty ranges in the predicted damage values as a way to enhance the informative content of the model compared to purely deterministic approaches.
Nonetheless, we acknowledge the Reviewer's request for a clearer assessment of model performance. In the revised version of the manuscript, we will include standard error metrics (calculated based on the median of the predicted values per building, compared to the observed losses) to complement the visual inspection of the plots. However, we will also add a caveat to caution against over-interpreting these metrics, since observed values should not be considered absolute ground truth in damage modeling, due to the inherent limitations in claim data quality.
As also noted by the Reviewer, the apparent flatness of the predicted damage values for detached and semi-detached houses is partially explained by the use of log-log axes, which compress the visual perception of variability. Furthermore, from a theoretical perspective, a limited dispersion in predicted losses is to be expected for these building types, given their relatively homogeneous characteristics and the shallow inundation depths recorded during the two flood events. In contrast, greater variability is observed for multi-family residential buildings, which generally exhibit broader heterogeneity in both exposure and vulnerability, leading to capturing a damage prediction variability of the same order of that for observed losses. In the revised version of the manuscript, we will therefore include comments on these aspects regarding the interpretation of the results in Figure 4.

R2.C16: *In general, I think that the results could be better interpreted and discussed. In a merged section "results and discussion" there's always the risk that the discussion is too short. The authors should expand theirs.*

Reply: The decision to merge the results and discussion was made to ensure a more concise and coherent presentation, avoiding unnecessary repetition across sections. We believe that the key findings and their implications have already been discussed in sufficient detail throughout the combined "Results and discussion" section, with no additional elements identified that would meaningfully enrich the discussion and justify a stand-alone section.

R2.C17: *Supplement 1 is very helpful and detailed. It will enable others to apply the model, too, which is much appreciated.*

Reply: Thank you.