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Reply on RC1

Anna Rita Scorzini et al.

Author comment on "INSYDE-BE: adaptation of the INSYDE model to the Walloon region (Belgium)" by Anna Rita Scorzini et al., Nat. Hazards Earth Syst. Sci. Discuss., <https://doi.org/10.5194/nhess-2021-363-AC1>, 2022

We would like to thank the Reviewer for the interest in our work and for carefully reading our manuscript; we greatly appreciate the insightful comments as they may contribute to increase the manuscript robustness and, in general, to improve its quality. In the following, we provide a point by point reply to the general and specific comments raised.

R1-C1: Transferability of damage models is a very important topic and the degree of detail and the effort put into the adaptation is impressive. However, the evaluation of the adaptation of the model is difficult. I do agree with the authors that the validation of flood damage models is usually a challenging task and hampered by missing data. Yet, I do think the evaluation and therefore also the conclusion could benefit from a few additional analyses. For instance, a comparison of the adapted and the original model. The difference between the outcomes of the models could give some indications whether the rather high effort of getting all the data sets on the building characteristics etc. is justified. Another point could be the comparison of the very detailed model INSYDE and a very simple stage damage function to assess the difference between the detailed and a more simple approach.

ANSWER: In the revised version of the manuscript, we will follow the suggestion given by both Reviewers (see also response to R2.C3) by including an additional analysis consisting in a benchmarking test for a historical flood event (Ourthe river flood occurred on December 1993-January 1994) by comparing the outcomes provided by INSYDE-BE to those of other damage models developed in the (or neighbouring) region(s) (i.e., FLEMO-ps, Flemish model and JRC-Belgium).

Moreover, we will include a comparison between the new damage functions of INSYDE-BE and the ones of the original Italian model to better highlight how the differences in the contexts of development (mainly on the vulnerability side) justify the effort for the adaptation.

R1.C2: Equation 3: Is i and j again the sub components of the damage? If yes, why is only i changed and j stays baseline?

ANSWER: No, in Equation 3 i and j do not refer to the sub-components of the damage, while i denotes the variable under testing and j indicates all the other variables that are kept constant during the simulations of the sensitivity analysis. This issue will be clarified

in the revised version of the manuscript, by including the following remark after Equation 3: "where x_j^0 denotes the other variables that are kept constant to their default values during the tests".

R1.C3: Also the equation only gives you one ratio, but Figure 9 and 10 are showing two outcomes for the variables (one negative and one positive). I think I get how you estimate the values for the Figures. But I think eq. 3 does not show what you actually compute. For me it seems that you compute the following [EQ]:

$$(D(x_i^+, x_i^0) - D(x_i^0, x_i^0)) / D(x_i^0, x_i^0) \text{ and } (D(x_i^-, x_i^0) - D(x_i^0, x_i^0)) / D(x_i^0, x_i^0)$$

ANSWER: The Reviewer is right, thank you for pointing it out. There was a typo in the original Equation 3, that will be corrected in the revised version of the manuscript..

R1. C4: Figure 9 and 10: Please use the same x-axis in all plots to ensure a just comparison between the different plots.

ANSWER: Since the preparation of the original manuscript we considered the use of the same x-axis scale for both Figures 9 and 10, but this would have made the plots in Figure 10 difficult to read (especially Scenarios 5 to10). We would then prefer to keep the plots as shown in the original manuscript, but we remain open to a suggestion by the Editor on the final choice.