

***Interactive comment on* “The impact of uncertain precipitation data on insurance loss estimates using a Flood Catastrophe Model” by C. C. Sampson et al.**

Anonymous Referee #1

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General comments

The paper examines the effects of using four different precipitation datasets, as well as different lengths of time from those datasets, on insurance loss estimates using a Flood Catastrophe Model. Analyses of the uncertainties involved are provided. To contextualize the magnitude of these uncertainties, the authors also provide a limited assessment of the uncertainty resulting from the choice of the parameter set chosen for the hydrological model used in the analyses (HBV). The paper finds the loss estimates to be highly sensitive to the driving precipitation datasets, and the authors suggest that the range of uncertainty within CAT models may thus be largely than commonly

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believed.

In my opinion, the paper is of a very high quality, and provides a novel scientific examination of a CAT modelling structure that is, as the authors state, usually not subject to investigation in the scientific literature due to the proprietary nature and strict licensing conditions of such models. The manuscript is well written and the setup is logical. The figures are generally clear and of a good quality (although see specific comments below for a few exceptions). The findings should be of interested to the CAT modelling and insurance/re-insurance communities, but also to a broader audience involved in risk assessment and risk modelling.

Therefore, I believe that the manuscript is suitable for publication in HESS subject to several minor amendments. However, I also feel that the potential impact and “completeness” of the paper could be further enhanced if the authors include an assessment of the uncertainty associated with the “vulnerability model”: see specific comment 1.

Specific comments

1. My main comment/suggestion for improvement is regards the lack of any uncertainty analysis in the vulnerability module. Whilst this is not strictly speaking essential, given that the aim of the paper is to examine uncertainties resulting from the input data, the authors did provide a limited analysis of parameter uncertainty in the hydrological model in order to “give context” to the findings. I find this contextualization very useful indeed. Hence, I think that the paper would benefit from a similar contextualization for the vulnerability module, even if this is carried out in a relatively straight-forward manner (e.g. sampling around the depth damage curves). An implicit reason for not doing this may be related to the statement on page 35 that “Previous studies that consider flood risk using a model cascade framework have found the “driving” component at the top of the cascade to be the most significant source of uncertainty (Kay et al., 2008; McMillan and Brasington, 2008)”. However, more recently, several studies have also shown the uncertainty arising from the stage-damage curves may in fact be greater than the

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uncertainties higher up in the modelling chain (e.g. De Moel and Aerts, 2011; Jongman et al., 2012). Given this, I think that this further contextualization would provide more “completeness” to the paper, and perhaps provide even greater impact to a broader community. However, I do not think this is an essential requirement for publication. In any case, though, the aforementioned findings should be mentioned.

2. P.36, line 13: the authors mention that stochastic rainfall models can generally be split into 2 groups: profile-based and pulse-based. Please provide a short description of what these mean (and the difference).

3. Section 1.3: for reasons of reproducibility, the stage-damage functions used should be given (e.g. in a figure or table, or as a supplementary data file).

4. I am left wondering whether a “catchment average” precipitation time-series is appropriate, given the steep gradients that the authors describe in the study area. Are there large orographic effects in the basins? However, given the aims of the paper, it is not a major problem, but could be discussed a little more. 5. Page 42, lines 1-2: for reproducibility, please state the names of the “nearest hourly stations” used.

6. In section 1.2 and section 2.2.2, the authors mention the fact that the hydraulic model used here is far more sophisticated than the one used in most vendor CAT models. This raises the question, would the findings and conclusions (in terms of the uncertainty associated with the different precipitation driving data) be similar if these more simple models had been used. I.e., would the use of a simpler hydraulic model affect the sensitivity of the results to the driving data?

7. Section 3.2: visual examination of Figure 7 seems to show that the results for “10 years” perform “best” in terms of their comparison to the observed events. Of course, many factors are influenced here, but it would be useful to mention this and discuss the possible reasons.

8. In the discussion, the authors state that it would be “...difficult to comment a

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stochastically driven flood model as a robust tool for producing EP curves for use in portfolio analysis”. This left me with the question: what would the authors suggest instead? In fact, this is answered to some extent in the conclusions (last 10 lines or so). I think this latter part would be better included in the discussion.

9. In general, the figures are of a high quality. However, I find it very difficult (or impossible) to tell the difference between the grey-scale lines in Fig. 6. Please provide a colour figure or clear hatched/dotted (or similar) lines.

Technical corrections

1. P.32, line 22-23: I’m not sure that “driving observational datasets” is the most clear term here, since they are not all “observed” in the strictest sense. Maybe just “driving precipitation datasets”?

2. P.35, line 14: “. . .to driving uncertainties other previously studied . . .”. There seems to be a missing/wrong word here.

3. P.39, line 9: “ground up loss”: what is this? The expression sounds odd, though maybe it is commonly used jargon in the industry.

4. P.45, line 4 “. . .event an intensity. . .”. Should there be a “with” between “event” and “an”?

5. P.52, line 1: “. . .record and generate. . .”. Word missing (or “to” instead of “and”)?

6. It would be beneficial to label fig 4 and 6 as 4a and 4b (etc.). This would make the cross-referencing in the text (e.g. p.55, line 5) easier to follow for the reader.

References

De Moel, H. and Aerts, J. C. J. H.: Effect of uncertainty in land use, damage models and inundation depth on flood risk estimates, *Natural Hazards*, 58, 407–425, 2011.

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