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Natural Hazards and Earth System Sciences
Discussions

Interactive comment on "Damage functions for climate-related hazards: unification and uncertainty analysis" *by* B. F. Prahl et al.

Anonymous Referee #3

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The submitted manuscript by Prahl et al. aims at a universal formalism for using damage function to study natural hazards and their impacts. They approach damage functions from a micro-scale (single item) and a macro-scale (granular portfolio of homogeneous and independent items) approach in their attempt to develop a unification, or better crossover, that could support a comprehensive damage assessment at an intermediate level of complexity. A large portion of the manuscript discusses uncertainties and reviews limitations arising from uncertainties at both a microscale and macroscale level.

I am puzzled by this confusing manuscript and this referee does not claim that he understood the line of argumentation or how the 37 pages of manuscript elucidate the study's aims. Instead he ended up jumping back and forth between the draft's main

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part, figures, appendix, and supplements in the hope to find a convincing discussion of what he thought was promised in the abstract. This referee is also somewhat familiar with other excellent work authored by the same scientists. He is therefore particularly wondering what happened to the logical order and depth of argumentation in this draft? In its present condition, it is difficult for this referee to judge what "new concepts, ideas, methods, or data" are covered. The authors certainly succeed in "considering relevant related work" and they include "appropriate references". Their "clarity of concepts and discussion", however, needs to be significantly improved. The figures have a very high quality and the choice of colours is excellent, but they should be placed at the appropriate positions in the text and be better discussed. I understand that this is likely not the authors' fault, but instead due to the "draft style" forced upon them by the publisher. Nevertheless, given the confusing arrangement of main body and appendix it adds to the difficulties this referee has with identifying and understanding the main message conveyed.

Suggestions for a revision: 1. General Structure I find the manuscript does not need an appendix. The authors should instead aim for weaving its present content into the main part. It seems odd that the appendix A and B are currently much stronger and easier to read than the actual argumentation in the manuscript's body. That being said appendix C is worth expanding. In particular an actual discussion or conclusion seems to be missing. I think C could be merged with the discussion of uncertainties in section 3 of the main part while adding a better discussion of results. The "Lisbon case study", for example, reads more like a recipe on how the authors approached the problem than an actual study with some conclusion. Where is the result? What did the authors learn? How did their approach improve our understanding or support a certain hypothesis that other researchers had before?

2. Rewrite Abstract and Deliver on Your Sales Pitch It seems odd that both title and abstract point towards a "unification" and "universal approach" that has common grounds in storm damage, coastal-flood, and heat mortality, while the later focus seems to be

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mostly on flooding. Can the message of universality be clarified or extended? Or is unification meant to be the cross over between micro- and macro scale?

3. What is the intention of the paper? Is it a review? Is there a novel contribution to the field? Why did the authors spend their valuable time preparing this manuscript? What was their motivation? The authors list many valid thoughts and items that are "unknown", "not well understood", or "remain elusive" and they name several aspects that, for instance, "go beyond our envisaged intermediate level"– envisioned?– but they seem not to attempt to fill this present gap in our understanding. For this referee– who is tasked by the editor with judging the manuscript's novelty– it is difficult to decide what part of the manuscript is a review and what is a new contribution by the authors. Can this be made clearer? For instance, on page 9 / page 10 we hear a lot about what the authors do "for the work at hand", but on page 10, i.e. 1/4th into the paper, I have indeed still problems to identify what this "work at hand" actually comprises.

Page 6: "From first principles, [..] Without loss of generality [...] This assumption will be relaxed [...]" This paragraph might facilitate a feeling of over-simplification in the reader's mind. Considering the derivations of the appendix, however, this is far from the authors' intention.

Page 7: Equations All properties are explained in the text with the exception of the function g(x-\lambda). g, however, is only defined later in the appendix. Merging main body and appendix would resolve this issue.

Page 9: Could examples of "conceptual, mathematical, and computational uncertainty" be added here?

Page 10: "Precise understanding of the data uncertainty not only is key for the application of the damage function but is also a necessary prerequisite both for calibration and validation." I fully agree with the authors and therefore it is important to actually define data uncertainty. The following paragraph on data uncertainties is, however, confusing. Could an example be used to illustrate each step in the "causal chain" and, more

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importantly, "local variation or random fluctuation within the considered portfolio" or "external modelling". I read this paragraph multiple times and while it is grammatically correct, I still have difficulties to grasp what it actually says.

Page 12: Is this actually Monte Carlo simulation? It sounds more like bootstrapping or leave-N-out cross validation. What is the stochastic component other that randomly drawing from the data? Maybe a stochastic building-portfolio distribution model was fitted and then used for a Monte Carlo simulation?

Conclusions: "A unified damage function was developed on common grounds in the assessment of flood and storm hazards." This is the second time that I read this– the first being in the abstract– but I seem to have missed where you actually developed this unified damage function? Where is it?

Referee's summary: I think the manuscript has strong potential, but it requires a significant rewrite that should not be done lightly. I enjoy an easy to read content, but the style of reporting in this manuscript feels a little too informal and imprecise for this referee's taste. This might be subjective as I cannot really pinpoint specific sentences, but only describe an overall impression that arises from reading through the paper. Maybe the authors could try to use more precise and focussed formulations for their resubmission? Maybe reordering the manuscript to a more logical and causal line of argument is all that is really needed to avoid this "feeling of confusion".

If the authors carefully rewrote the complete article using better formulations and adding more substance to the discussion that puts their contribution into context, it would become acceptable for publication. In its current condition, however, this referee has true difficulties to speak of only "minor" revisions.

Interactive comment on Nat. Hazards Earth Syst. Sci. Discuss., 3, 6845, 2015.