

Interactive comment on “Epistemic uncertainties and natural hazard risk assessment. 1. A review of different natural hazard areas” by Keith J. Beven et al.

Anonymous Referee #2

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The manuscript gives an overview of the type of epistemic uncertainties encountered in various scientific disciplines related to natural hazards. I understand that most of the analysis and discussion takes place in the companion paper (part 2), which necessarily makes this paper more descriptive in nature. Nevertheless, the current version reads very much as an exhaustive, but also very exhausting, laundry list of all the "unknowns" that the authors have collectively been able to identify.

In itself, the paper is well written (indeed I could not find anything related to language or spelling to comment on) but nevertheless I found it very tedious to read. This is not only because of the length (at some point it almost felt like an endless lament of things

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that we don't know yet), but also because no reader can be expected to be an expert in all the processes and methods that are mentioned and discussed, and thus easily gets lost (or loses interest). I suggest two points of action to remediate this:

- (1) provide a clear framework for analysis. This would greatly improve the structure and systematic nature of the review.
- (2) reduce the length dramatically (by perhaps a third or even a half).

With regard to (1), I think that a much more elaborate theoretical framework of thinking about uncertainties would be very helpful. The distinction between epistemic and aleatory uncertainties is useful, but each category is still a very broad umbrella for uncertainties of a very different nature. Surely much more fine-grained classifications and distinctions exist and can be used to structure the review? I do not consider myself an expert on the theory of uncertainty (instead more of a practitioner in one of the covered fields, but therefore probably representative for much of the journal's readers). But while reading the long list of epistemic uncertainties, I could not help but feel that these are still very diverse in nature, with very different issues and bottlenecks. For instance, sometimes it seems to be a well understood process that simply suffers from a severe lack of data (which is clearly endemic in all covered areas). Perhaps sometimes a probabilistic model may exist in theory, but no analytical representation to conceptualize it. Sometimes it may simply be the modeller being sloppy (or insufficiently conservative) on the implications of certain assumptions behind a probability model. Sometimes models are used for mathematical convenience or computational necessity (e.g., the Gaussian model) rather than a true belief that it fits perfectly the nature of the phenomenon...

This is not a suggestion for classification (again I am not an expert) but simply some examples to highlight that lumping error sources under just two large umbrellas may leave the reader unguided (and unsatisfied). It also may not do justice to an undoubtedly large body of literature on the nature of uncertainty. For instance, surely within

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the statistical community there must be a lot of thinking about the consequences of incorrect models? Again lumping everything in "epistemic" vs "aleatory" (which reads very much as "non-statistical" vs. "statistical") would not seem to do this justice.

Again, I suppose that much of the second paper is dedicated to this type of discussion. But now it feels that simply all the raw review material is presented in this paper, before the second paper tries to make sense of it. I don't think that this is ideal, and I do think that a lot can be done to alleviate it by taking a more systematic and structured approach from the start.

Much of this would also solve issue (2), in addition to some more rigorous editing (by the authors, not the editor, that is). For instance, quite some space is dedicated to arguing the societal impact and relevance of the hazards (e.g., P9/L9-19). As interesting as this is in its own right, it is probably not truly relevant for the argument of this paper.

Specific comments:

P1/L22: "It is suggested...": I wonder whether this sentence refers to this paper or perhaps to the companion paper? The manuscript indeed mentions the use of scenario analysis in various disciplines, but there is no explicit discussion or argumentation of this, except for a single sentence in the conclusions, which mentions that it is "possible and desirable to extend the analysis to explicitly include different scenarios of epistemic uncertainty", but this comes out of the blue.

P8/L20: "base [...] based": revise sentence construction?

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