Natural Hazards
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EGU

Discussions

Interactive comment on "Global flood hazard map and exposed GDP comparison: a China case study" *by* Jerom P. M. Aerts et al.

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Received and published: 15 May 2020

The manuscript "Global flood hazard map and exposed GDP comparison: a China case study" is a comparison of flood hazard maps computed from eight different global models. In general the paper is well written and covers an important and interesting topic. However, its main problem is that the paper advances our knowledge very little compared to previous studies in the field, including those cited by the authors. I think it is partially because the abstract, introduction and conclusions do not make the contribution convincing enough. More specifically:

1) The authors analyse differences between models purely descriptively. There are no real conclusions from these extensive descriptions. The models differ greatly even

at basic elements such as input and output resolution and minimum catchment size, which were not homogenized. For smaller return periods, the flood defence assumptions are much more relevant than any difference between models. And that is only the hazard component, without even considering uncertainty in exposure. At least some comparison between different model set-ups would be revealing on the sensitivity of the models. I understand that the authors only had access to output maps, however something could be done with GLOFRIS, as it is the authors' in-house model.

2) I recall from the recent EGU conference that the authors' argument for the study, when asked how does it differ from Trigg et al. (2016), was that it includes "industry" models. Their addition doesn't change much here, because despite a rather close agreement between them, there is no indication given whether they are any closer to actual flood hazard or risk. I think to should be better explained, because the argument in the paper is basically

3) Study area: the authors write "China is selected as our case study area because it poses many challenges to flood modelling: data scarcity; a variety of flood mechanisms spanning many climatic zones; complex topography; strong anthropogenic influence on the flood regimes, for example through river training; and a very high concentration of exposure." Firstly, why data scarcity would be the reason for choosing this case study? This only reduces the chances that a sensible comparison with some detailed local flood studies could be made. The study doesn't even try to establish whether any of the models is close to plausible hazard or risk levels (in contrast to Bernhofen et al. 2018). I would rather expect that a data-rich region (with rather good terrain, climate, flood protection, exposure, and historical floods data) would be better, by comparing how the global models deviate from dedicated, high-resolution studies for that area. On the data side, China seems only to offer a (rough) flood protection dataset. The remaining arguments of the authors are pretty much valid for any large country or subregion of any continent. A better explanation is definitely needed.

Overall, the lack of novel conclusions, the poor choice of the study area and a non-

systematic comparison of the models (more appropriate for a review article) are the weak points of the paper. I am sure that the authors will be able to successfully revise their paper with more convincing rationale for the study framework and by extracting stronger, practical conclusions from the analysis. I would be looking forward to read the revision.

Some smaller things I noted down while reading:

Title: I find the title rather confusing, because it is difficult to say what is compared with what. It definitely doesn't make it clear that the different global flood models are compared in terms of exposed GDP for China. It makes rather an impression that a single global map is analysed and rather multiple GDP datasets are used. I suggest to reformulate to clarify that many flood hazard models are compared with each other.

Abstract: The abstract is too long, and consequently lacks enough impact. The first two sentences should be removed (also because no citations should be made in the abstract unless strictly necessary, and simply repeat the introduction). The remaining parts on the introduction and methods are alright, while the results should be more compressed with more concise sentences.

L63: 'GHM' is not defined.

L104-L114: the paragraph lacks a reference to Table 1. The reference to section 2.5 – it should probably be 3.5. "The flood hazard maps are undefended" – please rewrite this in a way that sounds less... weird. Please define here what are the "undefended" and "defended" maps. The text & tables (Tab. 1 & 2) indicate different resolutions of CIMA model – which one is correct?

Eq. 1; what is the term i?

L291: should be $P = 1/R$ rather than $1/RP$. A single symbol should be used per variable (note that you use P to mean two different things); same for eq. 1 (EAE) and 2 (MAI).

Fig. 2: "Major rivers" should be removed, as they only obscure the flood zones. The

C3

map lacks a grid and scale.

Fig. 4: provincial boundaries are not indicated in the legend. No scale.

Section 4.4-4.5: numbering is repeated.

The comparison between EAE and EM-DAT observed loss (4.4) is largely pointless as the authors (1) do not consider influence of the uncertainty in exposure estimates, which has pronounced effect on losses (2) consider only exposure of GDP, and not assets, which are worth many times more (4.5 times in China in 2015, according to Penn World Table) (3) do not use damage functions which transform exposure into losses. I think this whole subsection can be removed.

L484-5: The first part of the second sentence basically repeats the previous sentence.

L506: "exposure at risk" – exposure by definition involves something being "at risk". "flood exposure" would suffice in this sentence.

Additionally, I would suggest to check the conclusions in terms of writing, because while most of the paper is written well, it strangely drops in quality towards the end. E.g.: "...exposed GDP percentages of China", "County level (policy level) defense knowledge...", "For a complete risk assessment it is of importance to include coastal flooding to complete the flood mapping".

Interactive comment on Nat. Hazards Earth Syst. Sci. Discuss., https://doi.org/10.5194/nhess-2020-1, 2020.