Comment on nhess-2021-188 with annotated pdf (supplement)

Anonymous Referee #2

Referee comment on "System vulnerability to flood events and risk assessment of railway systems based on national and river basin scales in China" by Weihua Zhu et al., Nat. Hazards Earth Syst. Sci. Discuss., https://doi.org/10.5194/nhess-2021-188-RC2, 2021

The manuscript by Zhu et al presents an interesting simulation framework to analyze the vulnerability of the Chinese railway system to floods. The proposed methodology uses an event-based approach and proposes a series of performance indicators that starting from the analysis of the state-of-the-art national railway network allow them to quantify system disruptions caused by floods and identify risk hotspots. Vulnerability curves and flood risk maps at both national and provincial spatial scale are the main outcomes from the proposed framework, and these are two fundamental products to enhance the robustness of the transport systems, optimize the effectiveness of maintenance operations, drive planning and management of floodprone areas, also in view of a likely future scenario with increasingly frequent extreme flood events due to climate change.

The general topic fits the purposes of the Journal and the methodology here experienced in the Chinese context can be easily transferred to other sites. The adopted approach is rather rigorous and the methodology is well described, even if some improvements are needed and some aspects must be clarified. Overall, this paper is logically organized. The core theme of the manuscript has merit, even if the elements of novelty are not adequately stressed in my opinion. English language and style are rather fine, even if the paper could benefit from a further careful review to correct some errors, typos and avoid redundancy of information in some passages.

I believe that this paper could potentially deserve publication after major revisions. The quality of presentation in the present form is still not acceptable for publication and I have some suggestions, general comments, and specific remarks, which I have annotated in the attached .pdf file, that I believe should be addressed prior to publication.

My major concerns can be synthesized in the following points (explained in detail in the annotated manuscript):

- Abstract: the discussion on the results is too large and detailed for an abstract while a brief description on the adopted methodology is totally missing;
- Introduction: the introduction should provide also some further details on both the adopted methodology and metrics. An anticipation of the analyses that will be carried out is essential to encourage potential readers to go through the paper. Novelty of the proposed approach should be better stressed.
- In Data and Method section and sect 2.1.1, the global flood hazard model should be better described (also providing some examples in the SM). All the adopted metrics should be defined much more carefully, with a more precise and effective use of terms. For instance, only the trains where passenger travel can be cancelled or detoured, while passengers cannot be cancelled or detoured; so the metrics named 'passenger cancelled' or 'passenger detoured' in my opinion should be renamed (and better defined at their first appearance in the text).
- The description of the fitting procedure (Sect.2.1.2) must be improved. Figure 2a is rather unclear to me, and the caption does not help the readers. Moreover, its size is too small and the inset legend cannot be read (similar problems are present also in Figures 5, 6 and 7). I would suggest to place the four graph in figure 2 in a 2 x 2 grid, enlarging each graph. Caption must be more clear for figure 2a and more concise for figs 2b, 2c and 2d.
- 2.4 could be renamed "performance loss metrics" and restructured with a separate subsection for each metric. Subsection 2.4.2 could become sect. 2.5. All the assumptions made for the metrics definition must be better clarified.
- Results section presents a quite good description of the results while comments on the potential implications of the various results are almost totally missing or present only in the discussion section; this aspect could be improved. The discussion on the results of the sensitivity and uncertainty analysis in Setc.3.4 should be considerably improved; for instance, pie charts in Fig.8 should be explained and commented.
- Some practical examples of the utility of the proposed approach should be reported in the conclusion to highlight the importance of the work.
- Please double-check your References. I have found out some inconsistencies. For example, in your manuscript you refer to Liu 2018a and 2018b, but in the References I have found Liu 2009, Liu 2018 and Lyu 2018.

I hope that my suggestions could serve to ameliorate the paper.

Please also note the supplement to this comment:
https://nhess.copernicus.org/preprints/nhess-2021-188/nhess-2021-188-RC2-supplement.pdf