

Nat. Hazards Earth Syst. Sci. Discuss., referee comment RC4  
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## Comment on nhess-2022-136

Anonymous Referee #4

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Referee comment on "Spatial Distribution of Vulnerability to Extreme Flood: in provincial scale of China" by Wei Li et al., Nat. Hazards Earth Syst. Sci. Discuss.,  
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The authors present the paper "Spatial Distribution of Vulnerability to Extreme Flood: in provincial scale of China". They apply Cloud-improved Entropy Method to calculate used indexes weight, and the Fuzzy Variable Theory to calculate the total vulnerability. A small-scale map of China vulnerability was produced.

Below some considerations and suggestion.

- Vulnerability is an essential component of risk analysis and, as such, it has to be deeply investigated. In the manuscript the terms "risk" and "vulnerability", are often used as synonymous and in other cases they are used together (see e.g. row 20: "...spatial distribution of the EF risk vulnerability...", row 99: (... "risk indicator of EF vulnerability..."), row 237: (... "factors of flood risk vulnerability"), and many others. I suggest to review the terminology.
- In the flow diagram of Fig. 1 reference is made to "Stability analysis". What does it refer to? To the stability of adopted model? This analysis process should be described in the manuscript.
- The matrix (2) is formally incorrect (see last row and last column).
- "H", listed for each province/city in table 5, is described from the authors (equation 7, row 148) as "level eigenvalue of the evaluation sample". From these values, the vulnerability map (fig. 5) is derived. If "H" is the vulnerability, why call it "level eigenvalue"? if not, how do the authors get the map from value of H? The map derivation process should be better explained in the text.
- The vulnerability is divided into four levels: "mild", "moderate", "severe" and "extremely severe", passing from numerical analysis to a purely qualitative data. In the text should be indicated the criterion of numerical thresholds choosing and, the thresholds value indicated.
- Conclusions are sparse and, in many respects, obvious. They should be integrated.
- Both to complete and improve the paper, and to support the reliability of the procedure adopted, a validation of the vulnerability map produced, could be useful.

In attached file other minor notifications are reported.

Please also note the supplement to this comment:

<https://nhess.copernicus.org/preprints/nhess-2022-136/nhess-2022-136-RC4-supplement.pdf>