Natural Hazards and Earth System Sciences Open Access **EGU** Discussions

Comment on nhess-2021-79

Anonymous Referee #3

Referee comment on "Flood–pedestrian simulator for modelling human response dynamics during flood-induced evacuation: Hillsborough stadium case study" by Mohammad Shirvani and Georges Kesserwani, Nat. Hazards Earth Syst. Sci. Discuss., https://doi.org/10.5194/nhess-2021-79-RC3, 2021

It is an important topic and well within the remits of the journal. They have used a single agent-based modelling (ABM) framework running on Graphical Processing Units (GPU). However, in the review's view, further clarification and revision is required before paper is suitable for publication.

- This paper is a follow up from previous papers from the authors and the authors need to clearly state what are the novelties and to demonstrate clearly the effects of these novelties.
- There have been recent experimental and numerical studies which has shown improved HR assessment, e.g. Martinez-Gomariz et al. (2016). Why the authors used Equation quoted in line 133 for flood Hazard Ratio while they used more recent studies to evaluate flood HR?
- Flood Hazard Ratio introduced in this study (line 133) also include a debris factor which has a significant impact on the HR. This is missing from the equation. what is the significance of removing this from the equation?
- In some places the paper is confusing. In particular, section 2 where there are many references to the other sections.
- Justification to use Mode 2 with the simulator to plan evacuation case study involving severe flood is based on the lack of major changes as a result of implementation of Mode 4 (line 394). This seems to be insignificant and based on 1 simple case study. The reviewer expects a more detailed analysis for such decisions.
- The authors provided a good literature review of the topic. However, their methodology and novelty only compare with their previous study, e.g. use of BMI (line 170), age and gender (line 10) are considered as novelty when compared to Shirvani et al. (2020). However, these have been used in flood hazard assessment previously.
- The paper seems too long in reviewer's view. It can be more concise by shortening some of the text which are less relevant to the novelty of this paper. Some of the figures and tables are also reproduced from other publications, e.g. Figure 2 and Table 1 and 2. Removing those and just citing them seems more appropriate. This will reemphasise the point about the overlaps between this and other publications.
- It seems the characteristics are assigned randomly to the agents (line 292). What is

the significance of such random assignment? For instance, how repeatable the simulations will be if they are repeated and what is the significance of this repeatability.

- What is the significance of including conditions from both toppling-only and toppling-and-sliding (paragraph starting line 402)? Furthermore, a case study considered a shopping centre where the floor material expected to be different to the conditions where stability experiments were conducted. Furthermore, the slope and the direction of walking has impact on stability. The authors are expected to consider this somehow.
- Similarity between the predicted flood inundation levels and those of the EA flood maps were used as the validation of the model. It is stated that "the generated inflow hydrograph is able to replicate realistic floodwater depths and extents within the walkable area" (line 531). It is important to ensure that both simulations have the same conditions to be able to draw such a conclusion. For instance, is the EA flood maps produced under similar hydrographs? Furthermore, velocity is as important if not more important than the water levels in case of evacuation. It is important to show the velocities across the domain and provide reader with an assessment of uncertainties associated with such predictions.

Minor comments:

- What was the reason behind the orientation of the model used in this study? Was it not more efficient to have y-axis parallel to A61?
- Line 152: what is n_M?
- Equation 2: where is the source of the equation and calculation of M? It might be better to be cited in the same way as Equation 1.
- It will be useful to also include whether the discharge was added only as mass or there is also momentum (velocity) associated with the flow.

Reference:

Martínez-Gomariz, M. Gómez, B. Russo, Experimental study of the stability of pedestrians exposed to urban pluvial flooding. Nat. Hazards, 82 (2016), pp. 1259-1278, 10.1007/s11069-016-2242-z