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Natural Hazards and Earth System Sciences
Discussions

Interactive comment on "Tsunami evacuation plans for future megathrust earthquakes in Padang, Indonesia considering stochastic earthquake scenarios" *by* Ario Muhammad et al.

Anonymous Referee #1

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Comments on the manuscript nhess-2017-75 "Tsunami evacuation plans for future megathrust earthquakes in Padang, Indonesia considering stochastic earthquake scenarios" by Muhammad and co-authors

General Comments The paper by Muhammad et al. addresses the development of tsunami plans in Padang, Indonesia, using stochastic earthquake scenarios and high-resolution inundation numerical modelling. While the MS is of interest as it contributes to the improvement of the mitigation policies in a region highly vulnerable to tsunami, I find that their methodology suffers a major limitation of not addressing the building vulnerability to both earthquake and tsunami effects. Moreover, some points need to

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be carefully improved, clarified and justified. In terms of the MS structure and writing, the paper is of good quality; it is well structured and is easily readable. Only the style and the grammar of some few sentences need to be improved. In terms of scientific content, in order to get the paper acceptable for publication in NHESS journal, the following comments should be carefully considered:

Specific Comments by Sections 1. INTRODUCTION: In the introduction section, there is a lack of a description of the effects of the 26th December 2004 Indian Ocean Tsunami on the study area. Therefore, I suggest that the authors add a short paragraph in which they are invited to outline the reasons why the study area of Padang, Indonesia, escaped the destructive effects of the 26 December 2004 Indian Ocean tsunami. 2. EARTHQUAKE SCENARIO SELECTION: The authors must justify their choice as regards the magnitudes of the earthquake scenarios. Why a minimum Magnitude of 8.5 and not 8.25, for instance? Is a Mw8.25 earthquake causes a tsunami with no significant effect on the study area? Why do the authors not consider a maximum earthquake magnitude in the range of this of the 2004 Indian Ocean event (Mw9.2)? Such a choice would change the predicted tsunami inundation characteristics and therefore the associated evacuation plan. 3. STOCHASTIC TSUNAMI SIMULATION: . It is not clear in the text that the numerical model used in this study is a finite-difference code solving non-linear shallow water equations in the Cartesian coordinate system. Please clarify . Also, I suppose that the numerical tsunami code (Goto et al., 1997) was benchmarked and used to accurately simulate other tsunami events, thereby, the authors should mention some references on this. . Which algorithm was used to track the shoreline movement and calculate the inundation? Is it the moving boundary algorithm (Liu et al., 1995)? Other? 4. METHOD FOR THE DEVELOPMENT OF EVACUATION PLANS: The paper addresses the development of tsunami evacuation plans using high-resolution flood maps and compares the estimated inundation depths with the buildings heights to define the vertical evacuation shelters. In my opinion, a crucial component for the development of effective evacuation plans is missing in this approach. It consists of investigating the vulnerability of the coastal building located

within the inundation zone, in particular, the buildings assessed as shelters. This must include an assessment of the buildings resistance capacity to a successive impact of both the earthquake and the tsunami. The study site is located within the co-seismic deformation area (Fig. 1 and 3) and, therefore, a Mw8.5-9.0 earthquake would cause a strong shaking that can have heavy damage on the coastal buildings and road network well before the arrival of the tsunami wave. This issue must be addressed for an effective planning of tsunami evacuation in Padang, Indonesia. 5. RESULTS: The results of tsunami hazard assessment (inundation maps) are of good quality and reflect, On the other hand, results on evacuation plans must be reassessed taking into account the comment #4. 6. DISCUSSION: The discussion must be reworked on the light of the new results and include the vulnerability of the shelters to a successive impact from the earthquake and then the tsunami.

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