

Referee 2

We acknowledge the careful review of referee 2 and the suggestions he/she provides for improving our manuscript. Below we point out the answers to all his queries and the changes introduced in the amended document.

A review on the manuscript "Analysis of the effects of urban micro-scale vulnerabilities on tsunami evacuation using and Agent-Based model. Case study in the city of Iquique, Chile" written by Rodrigo Cienfuegos, Gonzalo Álvarez, Jorge León, Alejandro Urrutia, and Sebastián Castro

The manuscript presents an analysis of the challenges surrounding tsunami evacuations, with a focus on Iquique, Chile. Using an Agent-Based Modeling (ABM) and tsunami inundation simulations, the study quantifies the evacuation processes resulting from urban micro-vulnerabilities and other factors. This research has a significant contribution, emphasizing the necessity of addressing such vulnerabilities in disaster management. The manuscript can be accepted for publication after a minor revision.

Here are some of the suggestions for improvement. My main concern is on the introduction part.

There is a typo in the title. "and" ->"an"

We have corrected this typo, thank you.

The introduction lacks a clear and explicit statement of the article's main thesis or research question. It would greatly benefit from a more precise outline of the study's objectives, the specific questions it aims to address, and a clear description of how it contributes to existing research in comparison to previous studies.

While historical context is important, the introduction dedicates a substantial portion of its content to discussing past tsunamis and their consequences. This historical background information could be streamlined to allow for a more focused and concise introduction that directly introduces the study's subject matter.

We have re-written the introduction following the lines suggested by the referee. We hope it is now much focused and concise.

In Section 4.2, titled "Validation of the Rayleigh evacuation curve," the term "validation" might not be entirely accurate. Rather, it appears to be a comparison to previous evacuation drills. The discrepancy in the average starting times between the ABM simulations and the actual drills (3 minutes vs. 10 to 17 minutes) raises questions about the model's validation. Additionally, the duration required to achieve close to 100% evacuation seems to be faster in the case of the drills, suggesting that the ABM model may

not be accurately validated for this aspect. A more precise description of the model's performance and limitations in comparison to real-world data would be beneficial.

Thank you for this comment. Referee 1 also raised questions regarding this issue. We have changed the title of the section to better reflect that it is not a validation but an assessment of the model performance. We have also attempted to explain in the amended manuscript the observed differences between the model and the drill. There are at least two factors that we could identify:

The first one is the low recording of evacuees by CIGIDEN during the drill, in comparison to the overall number of participants: according to Solís and Guzmán (2017), while roughly 76,000 people participated in the Iquique drill, only 12,658 (16.7%) were registered in the examined assembly points (eleven). Moreover, as participation in the exercise was not mandatory, it is likely that the recorded participants' departure locations were unevenly distributed across the city, with a more significant participation rate in areas close to the sea (therefore with longer evacuation times), and by specific institutions (primary and secondary schools) that commonly take part in drills and that in Iquique tend to be located in these coastal areas, unlike people that live, work or study close to the assembly points in higher grounds.

The second factor that could have contributed to delayed arrivals at the assembly areas might be related to the fact that in Chile evacuation drills require the population to wait for 2-3 minutes to begin the evacuation after the warning is released, to resemble the time length of a large, tsunamigenic earthquake, that would not allow people to move while it is still occurring. Unlike this delay, the Rayleigh distribution allows a few agents to begin to move as soon as the modelled earthquake begins.

While we acknowledge that the former Figure 7 (Fig. 8 in the amended manuscript) shows time differences across the beginning times of the arrival of evacuees at the assembly areas, we also point out that the modelled times are capable of reflecting with significant accuracy the required times for total evacuation, as measured during the drill (roughly 35 minutes), and to show similar evacuation rates to those collected during the exercise, for the evacuation period after 17 minutes of evacuation. Having said that, it is also important to underline that in this article we do not attempt to deliver accurate modelling of the 2013 evacuation but rather to examine the potential impact of micro-vulnerabilities on evacuation times, within the context of our evacuation model.

In Section 5, L257 states "In Figure 10 we show the differences in the number of evacuees for the ABM simulations with and without urban micro-scale vulnerabilities." However, Figure 10 does not show the results "with and without urban micro-scale vulnerabilities".

Thank you for pointing out this. The title of the Figure was not clear. Indeed, the vertical axis show the temporal difference between the number of evacuee when the simulation is

run without and with urban micro-vulnerabilities. We have clarified this in the title and in the text.

L17 "Tsunami research has come a long way after this event" -> unclear what this implies

Since the introduction was re-organized, this phrase has been deleted.

L54 "possible only" -> "only possible"

The introduction has been re-written.

L71 "The largest reported earthquakes in recent centuries in the area" -> "The most notable seismic events recorded in the region in recent centuries include"

This paragraph has been re-worked.

L236 "16 %" -> Is it 9.7 % ?

You are right, we have corrected this value in the amended version of the manuscript.

Figure 3&4 Recommend to plot the location of DARTs in Figure 3.

We have updated the Figure 3 to include the locations of the Dart buoys.

Figure 6. Change the color scheme. It is difficult to distinguish the arrival time between 15 min and 20 min.

Also following the comments of referee 1, we have improved the former figure, 6 and added a new one (Figure 5 in the amended manuscript) to show the initial sea surface deformation scenarios and wave height time series).