

# **Tsunami evacuation modelling as a tool for risk management: application to the coastal area of El Salvador**

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## **Authors' response to Anonymous Referee #1**

First of all we would like to thank this Referee for accepting to review this paper and for the valuable and constructive comments provided. According to the suggestions made by the Referee, we have carried out an extensive revision of the paper and we proceed in this document to answer all the comments, the referee's comments being presented in black bold font followed by the authors' answers in blue font.

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### **Referee #1**

**1. An explanation on how the 23 tsunami scenarios were obtained is needed or a reference to a previous publication (if exists) is needed.**

A reference to a previous publication on the hazard assessment carried out is provided in the revised paper.

**2. The authors do not explain how they obtain the aggregated scenario. Is it done using SCHEMA project methodology?**

The methodology to obtain the aggregated scenario (which is consistent with the SCHEMA methodology) has been included in the revised paper with a reference to SCHEMA.

**3. In figure 4 a map showing flow velocity is needed in order to better understand the drag map. How**

Figure 4 has been modified according to this comment.

**4. To compute the drag map what velocity is used? Maximum velocity? Please explain.**

The drag value at each point of the grid and for each event modeled is obtained by multiplying the speed value by the depth value at each instant, and calculating the maximum value of the product, i.e.  $\max(h * u)$ , which is different than considering the maximum value of the speed at that point (i.e.  $\max u * h$ ). The drag value at each point of the grid for the aggregated case (23 worst credible events) is the maximum drag value obtained among the 23 events.

This explanation has been included in the revised paper.

**5. Figure 6: Please explain the meaning of the black rectangles. The caption shows the road network but it explains nothing about the evacuation routes. Evacuation routes are shown only in figure 7.**

There was a mistake in the figure caption, which should read "road network" instead of "evacuation routes", being consistent with the legend. This has been corrected in the revised paper. The meaning of the black rectangles has been included.

**6. Line 267: Natural Breaks method please insert reference**

A reference and additional explanation has been inserted.

**7. Line 264 – 265 Where it reads: “The indicators for the assessment of safe areas also provides” should be corrected to: “The indicators for the assessment of safe areas also provide”**

This has been corrected in the revised paper.

**8. Line 307 the sentence reads better if the words elapsed and instant are included: Population Reaction Time: time elapsed from the instant that population receives the alert until 307 they start to evacuate.**

This has been modified in the revised paper.

**9. Line 340: Evacuation distances: the aim is to obtain the minimum length (L) from each evacuation point of origin to the destination point. What is meant by minimum length? The minimum distance a person has to walk? The authors should clarify.**

This has been clarified in the revised paper.

**10. Definition of slope: Slope =  $(Z_a - Z_o)/L$ ; being  $Z_a$  the highest point and  $Z_o$  the lowest point. The authors should clarify which points they are referring to by highest and lowest points. Are these points on the evacuation route?**

This has been clarified in the revised paper.

**11. Line 404 where it reads: “The Analysis” should read “The analysis”**

This has been modified in the revised paper.

**12. Figure 2: The caption should be changed to: Tsunami evacuation time lines. The caption is incomplete. Authors should explain the difference between top and bottom draw.**

The caption has been changed and completed according to this comment.

**13. Line 321: a reference to figure 2 should be inserted after: “situation happens (see figure 2)”**

A reference to Fig.2 has been inserted.

**The following references need corrected:**

1) Clerveaux, V., & Katada, T. (2008). Tsunami scenario simulator: a tool for ensuring effective disaster management and coastal evacuation in a multilanguage society. *Science of Tsunami Hazards*, 27(3), 48–71. This reference is not quoted in the text and should be deleted from the references list:

2) Line 60 (Jonkman et al., 2008) refers to (2008a) or (2008b)?

Both references have been corrected in the revised paper.