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Natural Hazards and Earth System Sciences
Discussions

Interactive comment on "Tsunami hazard assessment in the southern Colombian Pacific Basin and a proposal to regenerate a previous barrier island as protection" *by* L. J. Otero et al.

Anonymous Referee #2

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Comments on nhess-2013-119 Tsunami hazard assessment in the southern Colombian pacific basin and a proposal to regenerate a previous barrier island as protection L. J. Otero et al.

The manuscript presents tsunami hazard assessment for Tumaco, Colombia. Earthquake-generated tsunami scenarios are constructed basing the regional seismtectonics and on past earthquakes and tsunamis. The authors propose the restoration of a (modified) previous sand barrier destroyed by the tsunami which hit Tumaco in 1979. This barrier island however likely protected the innermost coasts from the tsunami. Results then focus on the differences of simulated impact and flooding with

and without the barrier and lead to suggest the regeneration of the barrier for protection against future tsunamis.

Though the main concept of the paper is really relevant for NHESS, I think there is a major flaw regarding the scenario design and selection procedure. The two parallel source rows with the same thrust mechanism imparted, shown in figure 5, and both capable of a M8 event are clearly unphysical. If they represent uncertainty in the subduction interface location, this is not clearly stated. However, as the authors properly document, the zone is well studied and uncertainty of this size is clearly an overestimation. The Zone I-IV source positions could be instead those of extensional intra-slab outer-rise potential earthquakes. Actually, according to figure 4, the 1979 Mw 7.9 (or 8.1 in Table 1) earthquake occurred just on the innermost segment which can well be the location for a subduction inter-plate event.

A better design of the earthquakes used to test the effectiveness of the barrier would then clearly improve the paper. I then suggest a major revision including the simulation of new tsunami scenarios. Moreover, I suggest to explore the effect of changing other source parameters, such as the position along dip too, that is the effect of at least moving around the rupture on the subduction interface. For such a near-field event, it could be worth exploring at least the effect of uncertainties in the strike direction and dip angle, or that of a variable slip distribution. Last, but not least, the Wells and Coppersmith empirical scaling laws are likely suitable for crustal earthquakes. For subduction zones it would be probably better to consider Strasser et al., SRL, 2010, or Blaser et al., BSSA, 2010.

Another major comment regards the maximum magnitude of 8.6 here considered. The failure of seismic and tsunami hazard assessments based only on relatively short catalogues has been dramatically but clearly shown by the 2011 Tohoku event, which was one of unanticipated size, exactly for this same reason. A class 9 earthquake seems to be possible virtually at any subduction zone. I think it is dangerous and misleading to set 8.6 as a maximum credible magnitude.

I have also some further comments of minor importance, and there are several typos I found.

Since this is not a probabilistic hazard assessment, it might be worth adding at least an estimate of a rough recurrence time for large tsunami events. This would be useful for a cost/benefit analysis that would be performed if the idea of regenerating the barrier will be considered by decision makers.

If just two scenarios are used, what is the point of discussing and showing (Fig. 5) several source zones?

Please, add a figure with initial sea level elevation used for the different scenarios.

p. 1175 l. 10. Probably two hours is just sufficient for the first arrival. l. 20. change Gutsher in Gutscher (also elsewhere in the manuscript)

section 2.1. Please add some toponyms (e.g. Bocana Milagros or Mira River) to Figure 1-2.

section 2.2 and elsewhere in the manuscript and in the tables: I would use strike-dip-rake, which are the more commonly used in seismology. Moreover, I couldn't find epicenters coordinates anywhere in the paper, please add for the sake of reproducibility (e.g. in Table 2).

section 3.1 should be considerably shortened. COMCOT code is well documented in the references.

p. 1184, l. 9. Change Guziakov in Gusiakov.

Results/Discussion. The barrier was removed by the 1979 tsunami. This is not accounted for in the simulations, or it is parameterized by bottom friction. It could be of some importance. Please, discuss.

Figure 2. Please improve, it is difficult to read.

Figure 4. Add a scale for circle size and labels for the most important events.

Figure 5. Add coordinates.

Figure 7 (or section 4.1). Please better define energy flux and how you did estimate it.

Interactive comment on Nat. Hazards Earth Syst. Sci. Discuss., 1, 1173, 2013.