

Nat. Hazards Earth Syst. Sci. Discuss., referee comment RC2
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Comment on nhess-2022-60

Julian Garcia-Mayordomo (Referee)

Referee comment on "An updated area-source seismogenic model (MA4) for seismic hazard of Italy" by Francesco Visini et al., Nat. Hazards Earth Syst. Sci. Discuss., <https://doi.org/10.5194/nhess-2022-60-RC2>, 2022

It is a very nice and clearly written paper illustrating different approaches followed for obtaining key parameters in source-zone modelling for seismic hazard calculations in Italy. The paper is almost ready for publication but it still needs some improvements in my opinion. I suggest the authors to prepare a newer version of the manuscript considering the following issues:

- Seismic rates: five "models" are defined and given the same weight in the logic tree. I believe there is not much difference in them from the practical point of view, but I agree that seismic activity is a very important parameter controlling the final hazard values, so it is justified to consider that wide suit of alternatives. I wonder however if the authors could give an opinion in which one actually they believe more. In my opinion I would go for approach one (i).

- Note that in line 265 you cite "Mt" as magnitude threshold, when elsewhere is cited as M_0 . Not sure if this is a typo or you actually mean it.

- Style of faulting. I would be very interesting to know which criteria is considered to classify the different styles of faulting. I assume this is done based on the rake, but which rake values have you used to classify the ruptures? Aki criteria? Additionally, for the later calculations with OpenQuake I believe you have to state a fault-plane (strike/dip) for each of the different types (reverse, normal and s-s), which values do you use or are these random?

- Hypocentral distribution: This analysis is very nicely performed. The paper states (line 291) that this uncertainty is considered as aleatory. I wonder how this is considered in the calculations. I assume this is done by some built-in procedure in the OpenQuake code itself. Is that right? A Montecarlo? If so, how this affect the 60 realizations? Could you

provide some extra information about this?

- Rupture mechanism: In the same line as above (291) it is said that this issue is also considered aleatory. Please, provide some extra information so the reader can follow properly the way the uncertainty is taken into account and how it is eventually affecting the 60 final realizations. I wonder for example on how you consider the dip and strike of the ruptures in the calculations (line 300), are they horizontal or you are using some fixed values according to the rupture mechanism, for instance 30, 60 and 90 for reverse, normal and strike-slip? or is it a variable considered random?

- GMPEs: To properly follow the results and discussion it is necessary to provide some extra information about the GMPEs used in the calculations, particularly the "distance parameter". I also missed some information about the significance of these GMPEs to be used in Italy, about the distance and magnitude range considered in them, the rupture mechanisms, number of records, ... and very importantly: for what type of ground are you using the GMPEs (I assume rock-type, but this should be stated in the paper to properly interpret the results). I know this paper is not about GMPEs but these are crucial information for understanding the results. I also wonder about the differences between the GMPE of Bindi et al 2014 and Bindi et al 2011. Are they derived from the same database?

- Macroareas (line 380): Macroareas (a set of grouped source areas) are used to calculate b-values. This procedure is followed so the fitted b value results statistically stronger than the one doing the fitting in each of the zones. This a practical procedure, however it may miss significant b variations from zone to zone. It would be good to support the use of this "concept" a bit more.

- I suggest the authors to write at some point in the paper the "return periods" of the key annual probability of exceedance levels targeted (for example: 10% of exceedance in 50 years, also refer as 475-yr return period; and so on). This is not crucial, of course, but it helps the reader, particularly among the engineering community.

- **Discussion and Conclusion: I believe this section could be much improved.** I suggest you to separate Discussion from Conclusion. As it is written now, it seems a bit erratic. It is just a matter of organizing ideas and end properly with a short Conclusion.

- line 356: please provide a bit more information on the "community-based effort". Was a procedure like SSHAC followed? Did it follow a sort of expert judgment method?

- line 363: refrain the use of "true tectonics", use instead "actual" or "known" for example.

- line 364: Documentation is crucial in the process of defining source zones for PSHA. It supports the zone model and provides a ground for further refinements in future updates. The paper lists somehow the different data used in the process of defining the zones; however, it would be very good to provide detail information on each zone about the method/criteria used to define each of the boundaries (and may be add this info as an electronic supplement), as other authors have done elsewhere (eg., Vilanova et al., 2014; García-Mayordomo, 2015)

García-Mayordomo, J. (2015) Creación de un modelo de zonas sismogénicas para el cálculo del mapa de peligrosidad sísmica de España. IGME, Madrid, 125 pp.
<http://info.igme.es/zesis/>

- References: There are few typos, eg., lines 478, 480,

- Figure 6. I believe the y axis should read cumulative annual rate. Additionally, could you use a clearer scale for the x axis so it reads integers and halves (eg, 4.5, 5.0, 5.5,..). The graphs would look better if you also reduce a couple of marks the length of y-axis. In the caption, use approach i instead of "method 1".

- Figure 8. It would be good to also stated the "return period" of each p.o.e. NOTE there is a typo in the titles of the maps as it says 50 years twice, when it should read just "PGA 10% of p.o.e in 50 years". I assume is PGA on rock, but it would be good to say it.

- Figure 11: NOTE the typo on the right hand map (in the title). It should say 2%.

- Figure 13: Typo in the caption, it says "againt".