Comment on nhess-2022-216

Josep Batlló (Referee)

Referee comment on "Looking for undocumented earthquake effects: an application to Italian localities" by Andrea Antonucci et al., Nat. Hazards Earth Syst. Sci. Discuss., https://doi.org/10.5194/nhess-2022-216-RC2, 2023

Review of "Looking for undocumented earthquake effects: an application to Italian localities"

The paper "Looking for undocumented earthquake effects: an application to Italian

localities" submitted for publication in NHESS by Antonucci, Rovida, D'Amico and Albarello, applies a methodology for identification of sites where possible earthquake effects (damage) occurred and went unidentified/unnoticed in the available macroseismic reports.

I think this is a good contribution, showing new ways to overcome the existing gaps of the macroseismic records.

The methodology is a quantitative and repeatable one, based in a Bayesian probabilistic approach. Once the proper inputs given, the output is the probability of a given degree of intensity to be equaled or exceeded at the investigated site in occasion of an earthquake with known location and magnitude. This paper is a natural extension of the investigations presented in Antonucci et al. (2021).

The probabilistic quantitative approach to the occurrence of an intensity degree at the studied sites is, to my understanding, the most valuable contribution of this paper. The quantitative approach allows to determine possible undocumented macroseismic effects and, much more important, the reliability of the calculated intensities. The methodology may be, as well, used to quantitatively compare the observed macroseismic effects at a site with those expected from our knowledge of the regional macroseismic attenuation.

In an overview, and to my understanding, the submitted article is properly written. Presentation and discussion of the different topics covered are well organized. The examples have been properly selected and are presented with enough detail level. Figures are appropriated and clear. Finally, the bibliography covers well the presented issues and is quite comprehensive.

The presented results are relevant for the improvement of local macroseismic histories and of the macroseismic field of earthquakes. Moreover, the presented methodologies can be used in many other places worldwide and the submitted paper can be used as guide for similar studies elsewhere. Thus, I think the submitted paper fits properly on the scope of NHESS.

I'll not go into many specific details on the submitted written text. It is good to me. But I'll point some questions and a few items I think they may be improved.

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Lines 24/26.- About different macroseismic scales. You cite MCS, MSK, and EMS-98 (those used in Italy); but you do not cite Mercalli Modified (MM). Instead, Bakun and Wentworth (1997), cited as application, used it. I think for this reason it is worth to cite MM.
Thank you. It was an oversight. We will correct it in the revised manuscript.

Lines 70/71.- The latter contained.../ the latter provided. Should be "latter" and "former"?
Yes, it was a mistake. We will modify in the text.

Line 108.- (Rovida et al., 2022 "B").
We will modify.

Line 127.- ...of the two contiguous degrees "as explained/as pointed in Antonucci et al., (2021)".
We will add this sentence in the manuscript.

Line 133.- "Selection of the sample sites". Some criteria for the choice of sites are clear (highest number of intensity data, geographical distribution, distance among sites). But it is not clear if you use some algorithm/automatic system, or the final choice is done in a manual basis (expert criteria).
The selection of the sites was made according to expert judgement. In the manuscript

we will add that this selection is exclusively based on expert judgement without the use of automatic procedures.

Lines 137/139.- the choice of "20 km" is explained in Antonucci et al., (2021). You may refer it.
Yes. However, as required by the other referee, we will add a new sentence to explain that the distance of 20km was selected through an analysis on more than 15000 Italian sites contained in DBMI15 investigating the geographic distribution of these localities and calculating the number of localities within a set of possible distance thresholds for every site.

Line 149.- Are you using the "non-conventional descriptive codes" for your further evaluations? Or you are not using them? It is not clear to me (I assume you are not using them, as in Antonucci et al., 2021), even I can infer that if you focus in data with I ≥ 5 you are not using them.
In this study we decided to use the non-conventional descriptive codes. Focusing on the number of undocumented earthquake effects at the selected sites, we considered the descriptive intensity as observed data. In fact, it would not be formally correct to exclude these data considering them as undocumented effects.

Line 175 / Figure 2.- It is not clear to me if, in the case nearby IDP's are available you compute (and plot) twice the probability (with nearby IDP's and just with IPE).
We compute and plot the estimated probability with the Bayesian approach when there is one or more intensity data documented at the localities within 20km for a given event (IPE+IDPs in the figure). When no intensity data are documented within 20km from the considered site we compute the probability using the IPE alone (IPE in the figure). This point will be better explained in the revised manuscript.

Lines 187 and 191.- Earthquake magnitude is given up to the "cents". I know this comes from CPTI15; but I do not like this "false precision".
We adopted the magnitude values as reported by CPTI15.

Lines 194/195. The case of Modena for the 2012 earthquake is really interesting. Did you check/confirm if this event produced effects of intensity degree 6 in Modena? It can be easy to check if you have contact with insurance companies.
The occurrence of damage in Modena is not easy to be confirmed because Modena was not included in the macroseismic survey related to this event and in Italy the earthquake insurance is not mandatory and as a consequence insurance companies do not collect such information. Detail investigation at local institutions would be required.

Line 279.- To evaluate the feasibility of the...
We will modify this sentence.

Lines 287/288.- ...almost the totality... ->76% (it is better to say "a large amount").
Yes. We will modify in the text.

Lines 295/300.- to me this is an important comment, to be written in shining letters!
Thank you very much.

Line 304.- ...site might cannot be... Do you mean: may not be ?
Yes. It was a mistake. We will correct.