

Review of the paper titled “Integrating macroseismic intensity distributions by a probabilistic approach: an application in Italy” by Andrea Antonucci , Andrea Rovida , Vera D’Amico and Dario Albarello.

General comments

The paper introduces an improved probabilistic procedure for the estimation of intensities at a site taking into account the availability of intensities at neighboring localities. A large amount of intensity data in Italy is used. The methodology is applied to a historical earthquake with promising results, considering the uncertainties for an earthquake of the 16th century.

The authors have deep knowledge of the procedure, developed in their previous papers, and of the nature of data used.

It is therefore recommended that the paper is published with minor revisions.

Specific comments:

- Do the authors consider all IDPs used in the study have the same quality?
- **The Italian Macroseismic Database – DBMI15 does not provide any quality assessment for the single IDPs. Anyway, some exclusion criteria have been adopted (section 3.2): in particular, we discarded data relative to non-numerical macroseismic observations and unidentified localities/large areas. Moreover, volcanic earthquakes have not been considered in the analysis.**
- I would not add a comma after e.g. or after i.e.
- **We followed the most recent articles published in NHESS, where there are commas after e.g. and i.e., but we leave the decision to the editorial office.**
- Comment on Figures 8 and 10d: Observed Intensities seem to cover a more limited area than the synthetic with probability >90%. Would this imply for a larger earthquake magnitude? Please comment.
- **The earthquake magnitude computed considering the synthetic intensities for the case study in Figure 10d could be different from the one calculated from observed ones. However, synthetic intensities cannot be used for estimating earthquake magnitude because they are computed starting from an IPE (and then combined with intensity data at nearby localities), which uses the magnitude of the selected earthquake as independent variable.**
- L62: spatially close to the site of interest: assuming similar local soil conditions at these localities?
- **We do not make specific assumptions on local soil conditions.**
- L137-138: Comment: at 20 km distance, the possibility described in lines 128-129 is very low.
- **The search radius was selected by balancing the needs for maximizing the number of intensity data within the radius (related to the average density of settlements in Italy) and minimizing the possible geological heterogeneities present in the same area. As represented in Figure 1, the best balance among these conditions appeared to be 20 km. This point will be better explained in the revised manuscript.**
- L149: How is intensity 1-2 defined?
- **In DBMI15 there are very few IDPs with intensity equal to 1-2 derived from macroseismic bulletins resulting from macroseismic questionnaires. No explanation is given in the original data. In our dataset these values are very few (i.e. 17 in this case) and they do not affect the results.**
- L213: Which time period cover the seismic histories of the 28 localities?
- L213: More info is necessary on the decision for selection of the 28 localities.

- The considered seismic histories cover the same time-period of DBMI15, i.e. 1000-2017, but their length varies for each locality. In the revised version of the manuscript, we will add a new table with the details of the seismic histories of the 28 selected localities, such as the number of IDPs, the time coverage, the maximum intensity and we will also show their location in Figure 1.

Technical corrections:

L16: replace “data” with “values”

L26: add a comma after coordinates

L27: replace “sources” with “source”

L46: Postpischl 1980 not in reference list

L125: “at a pair” or “at pairs”

L162: replace “in the following” with “as below”

L414-416: Postpischl et al 1985 not in text

L429-431: Rovida et al 2021 not in text

We thank the reviewer for all the technical corrections, which we will take into account in the revised manuscript.