**Natural Hazards
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Interactive comment on "A proposal for a new parametrization of historical intensity data providing a better handling of uncertainties" *by* M. Mucciarelli

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Discussion**

**A proposal for a new parametrization of historical intensity data providing
a better handling of uncertainties**

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Interactive Discussion

Discussion Paper

General comment and issues

Most of seismic intensity scales have twelve degrees of intensity by which the size of an event is ranked on the basis of observed effects. When an earthquake cannot be associated with one single class, it is often recorded by reporting all the uncertain classes (i.e. VIII-IX or 8-9) or, worse, forgetting the qualitative, ordinal character of the intensity, by a decimal number (i.e. 8.5, and 7.3 or 7.7 in the Icelandic database). In the article the author proposes to express the macroseismic intensity of an earthquake through a probability vector. Actually the idea has already been exposed in the literature some years ago and some references should be added in the bibliography, like:

Rotondi R., Egozcue J.J., Zonno G. (1993). "Bayesian approach to the treatment of uncertainty in seismic data", *The Statistician*, 42, 513-523.

Rotondi R., Meroni F., Zonno G. (1994). "A different intensity recording for reducing the uncertainty in its assessment: an application to the completeness analysis of earthquake", *Natural Hazards*, 10, 47-58.

Those articles also tackle the issue of the consequent changes in stochastic modelling and the estimation problem. In any case this article has the merit to draw the attention on the problem of the uncertainty in data collection with the hope that the proposal is accepted by the community of seismologists.

As regards the Monte Carlo simulation, the procedure has to be explained better; in general, the steps are the following (see Wikipedia):

- define a domain of possible inputs;

- generate inputs randomly from a probability distribution over the domain;

- perform a deterministic computation on the inputs;

- aggregate the results.

In the present case could they be the followings?

- define the classes of a seismic scale as domain of possible inputs;

- generate inputs according to one of these two ways:

  a. fixed a level of intensity (i.e. VII-VIII), modify a site history by associating, for each of the earthquakes of that intensity, the value p (or $1 - p$) with the intensity class VII (or VIII), being p drawn from a uniform distribution on $(0, 1)$;

  b. fixed a level of intensity (i.e. VII-VIII), modify a site history by associating each of those earthquakes with VII (or VIII) intensity class if the random number p, drawn from a uniform distribution on $(0, 1)$, is less (or larger) than 0.5.

- after considering all the intensity levels (from VI to IX), count the number (or the total weight) of the events in the various classes of intensity $\{VI, VII, VIII, IX\}$.

Minor remarks

1. pg 3562 line 22 - "*values such as VI-VIII which are ...*": I suppose that it should be "*values such as VII-VIII which are ...*";

2. pg 3564 - using the relative error (i.e. (6-5)/5=20%) as a measure of the uncertainty implies that the error decreases as intensity increases (i.e. (8-7)/7 = 14%), that is rather strange;

3. pg 3565 line 5 - explain the expression 'modified site catalogue', does it mean 'catalogue resulting from the simulation'?

4. pg 3566 line 7 - the ratio average vs. standard deviation is usually referred to as the coefficient of variation $cv = \sigma/\mu$;

5. Caption of Table 1: intensity instead of intetsity;

6. in Caption of Figure 1 - Empirical Cumulative Distribution Function instead of Frequency; the word 'empirical' already means that it is based on the frequencies; I suggest: Empirical Cumulative Distribution Functions of the MRT in Ferrara (above) and Modena (below), produced by 5000 simulation runs for some intensity classes.

7. Figure 2 - Why does the contribution only come from VIII-IX, considering that there is an earthquake of 7.5 intensity in the database? For the Caption, I suggest: Histograms of the MRT in Ferrara, produced by 5000 runs for some intensity classes.

8. Caption of Figure 6 - specify that the picture represents the values of the coefficient of variation; the link with the concept of over- and under-dispersion is given in the text.

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