Solid Earth Discussions

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Reply on RC3

Laura Peruzza et al.

Author comment on "A revised image of the instrumental seismicity in the Lodi area (Po Plain, Italy)" by Laura Peruzza et al., Solid Earth Discuss., https://doi.org/10.5194/se-2021-35-AC4, 2021

Thanks to R#3 for the useful comments.

We reduced the length of the paper by deleting from the main text the description of data providers and past initiatives of earthquake catalogues in Italy; these details, that we believe are however useful for who wants to perform similar revision works on instrumental seismicity, are now handled in a separate Appendix. We did also some other minor changes tracked in the text, to simplify some verbose sentences.

Concerning the comparison between old and new locations, unfortunately we cannot represent it in terms of statistical graphs, or maps, as 1) the majority of initial earthquake locations derive from catalogues that do not list their errors in location (this is the case of CSI catalogue by INGV for example, and the early ISC Bulletins), and 2) hypocentral solutions may have different standards in location procedures and error definition (this is the case, for example of the datasets of UNIGE that changed algorithms in time), thus the representation of errors can be misleading. Note that for these reasons, the error bars/different symbols used in Figs 8-9 are not applied in Fig. 5, as mentioned at lines 250-251 of the first manuscript; a statistical comparison pre-post is therefore impossible. Conversely, the representation of standard errors of the relocated dataset, with the known limits on standard errors of Hypo71, it is now provided in a new figure, that we suggest to handle separately, in Appendix 2.

About the differences in location, and especially the generalized increase in depth, this is strongly influenced by the velocity model adopted, as Table 2 shows in a very simplified way by the "mean depth". The representation of the shift on a map or a section is not trivial, as the "connections" between pre-post locations of events make the image extremely blurred, and as previously said, no errors can be accounted for in the starting dataset. In addition, some events moved out of the represented frame, and are therefore no more visible in the plots. For answering to the R#3 request, we computed the distances of pre-post location, and plotted in histograms too, briefly commented in Appendix 2 as well. We hope it fit the R#3 request.

About the other more specific comments:

- there is no particular reason for the 3/15 km distance, except that these values have been taken as reference by the Italian guidelines for gas storages;
- the cluster SE in Fig. 8, corresponding to the distance at km 100-110 in section BB' can

be related to the buried thrust mapped slightly north of the cluster. Consider that the section is taken approximately along the fault strike, and therefore it is not representative of possible geometries at depth. Consider also that the set of events is not complete (cut by geographical selection, as it is at the very corner of the target area studied) and it represents small magnitude earthquakes (max magnitude ~3), for which no focal mechanism is provided by standard investigation. We invite the reviewer to contact us if he/she is interested in deepening the investigation in this area, with an ad-hoc reprocessing of existing data.

- The thin grey lines in Fig. 1 are seismic lines, now added in the figure caption.
- 3 modified, and Fig. 4 is now cited in the text.

Some other minor changes have been done in the figures.