

Solid Earth Discuss., referee comment RC1
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Comment on se-2021-74

Anonymous Referee #1

Referee comment on "The damaging character of shallow 20th century earthquakes in the Hainaut coal area (Belgium)" by Thierry Camelbeeck et al., Solid Earth Discuss., <https://doi.org/10.5194/se-2021-74-RC1>, 2021

Review of "**The damaging character of shallow 20th century earthquakes in the Hainaut coal area (Belgium)**" by Camelbeeck *et al.* (2021), DOI: 10.5194/se-2021-74

Summary: This paper summaries the historical, early instrumental, and modern seismicity of a coal producing region in Belgium in western Europe. It uniformly collects and re-evaluates macroseismic data from various sources using the EMS-98 scale before subjecting these to numerical analysis, particularly, the estimation of intensity magnitudes and the depths. It also develops new intensity attenuation models for the specific region to do that above. I feel this paper is a valuable contribution to seismology and earthquake hazard in Belgium but could also serve as a template for the study of seismicity of other regions subjected to anthropogenic seismicity. I, therefore, recommend this paper for publication and list below a comments and suggestions for the authors of this paper to consider, mainly in the Discussion section (**importantly** left to the authors to consider if necessary and if they wish to incorporate).

Reviewer's Comments & Suggestions

- **Section 4**

I feel the discussion of individual cases in the middle of the paper, i.e., all of section 4 might be better suited for the Supplementary Material as opposed to within the paper. I understand that the authors wish to draw attention to each of these earthquakes. However, it does disrupt the flow of the paper – there are 11 pages in total. A suggested workaround might be to move a substantial number of these events into the Supplementary Material, retaining only a small handful within the text of the paper that stood out for some reason.

▪ Section 7.1

It might be useful to consider the decay of intensity from other induced events outside the Hainault area. Perhaps put this in context with any similar work that might exist from Groningen gathered by the Netherlands version of the DYFI? Koen should have access to these if this is an avenue you decide to pursue ð□□□ Alternatively, I think there is some work done for induced events in the central US and Canada where there is a distinct intensity signal between natural events and induced earthquakes. You might wish to consider papers by Gail Atkinson and Susan Hough who have looked at these more closely, and then put your work from Hainault in context from observation. How does it compare? Or does it not compare?

▪ Section 7.2

The authors should begin this section by noting whether or not the spatial distribution of intensity observations is adequate in number and is spatially unbiased. I draw attention to *Meltzner & Wald* (1999) and *Hough & Martin* (2018) who comment/show how the number of points/observations and their azimuthal distribution can produce biased results. Admittedly, you do not use the modelling approaches that were later used by both those studies, but I feel this is an important point to make. I believe, *Van Noten et al.* (2017) shows how intensities can be biased by subsurface geology and *Hough & Martin* (2021) show how intensities, particularly, historical intensities can be biased by social factors. Can you add a few lines to reassure the reader that your intensity data, and by that measure, the attenuation relations are not biased by geology, social factors, and spatial distribution of observations? How reliable are the early reports of shaking effects in the mining areas? Is there the possibility that local mining companies might have wished to keep reports of shaking and or damage hidden from public view?

▪ Section 7.3

Here the authors draw the conclusion that the shallowest seismicity was triggered by mining in the region and ended with the cessation of mining. However, no where in the article it is discussed when this seismicity began AND what was the local seismicity prior to the start of mining for the period in question. Can these two questions be answered without returning to the archives? If you do this, I feel it would add further weight to your assumption (Lines 592 – 593) that the very shallow seismicity was indeed triggered.

▪ Language

I underscore that I do not wish to fault the authors' use of English – it isn't everyone's first language! But relating to this is an over-arching comment is that the authors occasionally use words that might not convey their (the authors') meaning appropriate. You might wish to have these addressed either at the page proof stage or with the assistance of a native English speaker. This is _not a criticism of you but is meant to improve your manuscript! Please do not be offended by this! ð☐☐☐

- **Supplementary Material**

I am happy to see tabulated lists of intensity assessments for each event. This involves a lot of work, not to mention the hours/days/months in archives battling dust and maybe spiders..... These lists (and future ones) will benefit from the inclusion of summarized effects for each location with a reference (or references). This will seem like a big ask to incorporate at this stage in the project and does not impact the outcome of this article! It is a recommendation only; one I hope that future work of this nature will incorporate.