

Interactive comment on “Seismic monitoring of urban activity in Barcelona during COVID-19 lockdown” by Jordi Diaz et al.

Koen Van Noten (Referee)

koen.vannoten@seismology.be

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The authors present a very nice local study on the lockdown effects in Barcelona observed on the fixed seismometers and (school) Raspberry shakes. In general this is a clear, well-written study which reads fluently. In this review I suggest only minor changes and propose only cosmetic changes and corrections.

There is one statement though that the authors did not fully discuss. The authors explain that they see a direct relationship between the geological cover and the seismic amplification and that this can be detected without the need of performing a microzonation or tomographic inversions. It is somewhat difficult to compare the microzonation results with your findings. It would help to add the zoning of Cid et al. (2001) on the

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maps in Fig. 8 to see correspondence. Also, why is this correspondence there? Because of interference in the subsoil in this frequency band? This needs some more explanation.

Minor comments:

L22: ambient noise studies: this is a bit vague? What purpose have these ambient noise studies?

L31: change brackets to Lecocq et al. (2020); same for L34: Lindsey et al. (2020) + Check the rest of the paper. Authors are often within the brackets when they are an active part of the sentence. I refer to this comment by writing “brackets” in this review.

L34-35: “However, as far as we know, there are no studies available that explore variations in seismic noise within a large city with a space between sites on the order of 2-3 km.” Be careful here: you mean that really no-one studied ambient noise variations? There are a lot of geophysical papers about measuring noise in a city, but these are mostly used for array processing and subsurface identification, nevertheless they use the noise variations.

L43. Thursday the 13th of March

L45. Sunday 15 March or Sunday 15th of March

In this paper be consistent how you refer to dates. I already noticed 3 different

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notations. So use one consistent notation: e.g.

Sunday 15 March

Sunday 15th of March

Sunday, March 15 (probably the last is the best choice, as you continue using this notation, e.g. March 29, May 4, etc. . .)

L67: Is there an official Raspberry shake paper to refer to instead of using the weblink? + It would not harm to cite few city-context papers where Raspberry Shake was already successfully used (e.g. Anthony et al 2018, SRL; De Plaen et al. 2020 (this special issue volume))

L69: outside the municipality

L71: “most recent terranes near the sea”: give a geological time frame. Holocene? Pleistocene?

L71: Is “materials” a correct term? hard rock?

L89: “brackets”

L95: “brackets”

L96: a sentence is missing to link L95 and L96, something like: “because not all stations show reduction up to 45Hz, we will only focus our research...”

L106: although some of the stations

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L117: “its hours of completion”: weird phrasing. If you refer to the activities, it should be “their hours of completion”; not sure if completion is the correct word to use.

L119: “ a curious observation”: is it “curious” when you explain what it is? Perhaps use “remarkable” or “notable”, ... ?

Table 1: This table should be self-standing. Explain what the pre/lock1, pre/lock2 , pre/new norm columns stand for.

L135: “clearly identified”: try to minimize the use of words as “clearly, obvious” etc, rather explain why it’s clear. E.g. a drop follows an lockdown phase, a mean rise follows a phase, etc...

L139: '90dB = -90 dB ?

L150: clearly is ok in this phrase

L155: nearest neighbor algorithm

L170: here again reference should be made to the technique how these figures were computed. Or this can be mentioned in the caption of Fig. 7

L175: indicate which stations you are talking about by e.g. putting station names in brackets behind “in schools”

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L186: (2017) “brackets”

L239: “brackets”

L252 : for people that never visited Barcelona, indicate where montjuic is located

L253: how are both maps consistent? Please explain. Do the 4 zones correspond to the microzonation map of Cid2001? Perhaps it would be interesting to put the zonation boundaries on the map.

L254: “brackets”

L255: “brackets”

L280: “probably be related to civil works near to the station site.” This is speculation. Needed in this paper? You can just say this increase remains unexplained due to lack of local site/communal information.

L358: I think you can separate the discussion (everything before L358) and the conclusion (starting from L358)

L358: in the discussion, a discussion on the comparison between your findings and microzonation findings is lacking. Is this anywhere else observed? Can this be done in other cities (check e.g. papers in this special issue). If this is new, it should be

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mentioned in the conclusions, and perhaps in the abstract.

L360: “brackets”

L373: I think it’s “near real-time”, not nearly real-time. Please check.

L401-403: add these cited references to the reference list and follow the proper citation rules in these lines: i.e. Wessel et al. (2013), Lecocq et al. 2020.

T. Lecocq, F. Massin, C. Satriano, M. Vanstone, T. Megies, SeismoRMS - A simple Python/Jupyter Notebook package for studying seismic noise changes, Version 1.0, Zenodo (2020); doi:10.5281/zenodo.3820046

L437: wrong author list: either provide full names of all 75 authors or write: Lecocq, T., Hicks, S. P., Van Noten, K., Van Wijk, K., Koelemeijer, P., et al. : Global quieting of high-frequency seismic noise due to COVID-19 pandemic lockdown measures, Science (80)., 369(11 September), 1338–1343, 2020.

Figures:

Concerning the figures, the maps are often of low resolution and fonts and legends are too small. Please check if this is due to the conversion to pdf, or if you indeed provided low resolution maps. If so, increase resolution.

Figure 1:

- The colors of the geology in the background of the Holocene, Pleistocene, Pliocene

and Carboniferous periods are very difficult to distinguish.

- Add coordinates to the figure.
- A little inset with the locality of Barcelona indicate on the scale of Spain would be of interest for the international reader.
- can you use a different symbol for Seismometers and Accelerometers (or Raspberryshake)?
- caption: "The dark and light blue dots show the permanent broad-band and accelerometric stations, respectively (?).

Figure 2: in the caption, please write again the lockdown phase dates that correspond to the 3 dashed lines.

Figure 3:

- indicate when lockdown happened with a vertical bar on this figure
 - add to caption: Weekdays are indicated in green.
 - add to caption: Trends in noise variation prior to lockdown.
 - explain again where the stations are located (e.g. AM.R888C in school, ...)
 - What are the spikes on CA.BAJU ?
 - Refer to Lecocq's seismo RMS technique either in the text (L102) or in the caption, to highlight how you made this figure:
- T. Lecocq, F. Massin, C. Satriano, M. Vanstone, T. Megies, SeismoRMS - A simple Python/Jupyter Notebook package for studying seismic noise changes, Version 1.0, Zenodo (2020); .doi:10.5281/zenodo.3820046

Figure 4: It would be more intuitive if the legend could be ordered according to the observations: so MTJR on top (dark green), then R4B31 (light green), etc. . . this would easier read the diagram.

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Figure 6:

- This figure is of low resolution. Can you increase the resolution.
- Also the coordinates are unreadable
- Topographical contours are included, but height is not shown in the legend
- Add a legend below the color axis (normalized PSD)
- Lockdown phase 1b

Figure 7:

- Again I have the impression this is a low resolution figure, but it may be related to the pdf conversion. Please check.
- as said above, refer to the method how these graphs were computed.

Figure 10:

- please increase font of the legend

Fig. S2:

- what happened on 2020-06-24?

References:

Nowhere in the paper, the seismic networks are cited. Please do as below:

CA: Institut Cartogràfic I Geològic De Catalunya, Institut d'Estudis Catalans (1984). Catalan Seismic Network [Data set]. International Federation of Digital Seismograph Networks. <https://doi.org/10.7914/SN/CA>

YS: Diaz, J., and Schimmel, M. (2019). SANIMS [Data set]. International Federation

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of Digital Seismograph Networks. <https://doi.org/10.7914/SN/YS2019>

AM: (1) Raspberry Shake Community; (2) OSOP, S.A.; (3) Gempa GmbH. (2016). Raspberry Shake. (1) OSOP, S.A.; (2) gempa GmbH. <https://doi.org/10.7914/SN/AM>

Interactive comment on Solid Earth Discuss., <https://doi.org/10.5194/se-2020-190>, 2020.

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