

Solid Earth Discuss., referee comment RC2
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Comment on se-2021-38

Anonymous Referee #2

Referee comment on "The effect of 2020 COVID-19 lockdown measures on seismic noise recorded in Romania" by Bogdan Grecu et al., Solid Earth Discuss.,
<https://doi.org/10.5194/se-2021-38-RC2>, 2021

General Comments:

The manuscript of Bogdan Grecu and co-authors examines the effect of COVID-19 lockdown measures on seismic noise recorded by the Romanian Seismic Network.

I have to note that quite similar observations of seismic noise reductions were recently documented by a considerable number of studies on this topic.

However, in my opinion, a "country scale" analysis, like the current one, and the corresponding observations regarding the changes of seismic noise levels in relation to the Romanian measures against COVID-19, deserve to be published. I congratulate the authors for the significant volume of data analyzed.

I recommend the manuscript for publication in Solid Earth's special issue on "Social Seismology and the effect of COVID19 lockdown measures on seismology", after making the following suggested adjustments.

Main Comment:

My most significant comment concerns the "earthquake detection capability" part of the manuscript. In the abstract, the authors state that in the framework of their current analysis, they show that noise reduction during the lockdown has also improved the earthquake detection capability of the accelerometers located in noisy urban environments.

However, a potential reader of the manuscript must reach the last four lines of the "Discussion Section", before he can get some information about this topic.

Besides that, the discussion/information which is provided about the "pre-lockdown" and "post-lockdown" earthquakes, is quite limited to adequately support a reliable conclusion regarding the "improvement in earthquake detection capability".

What are the exact origin times of the two earthquakes (day of the week and local time of occurrence)? Only the dates are provided.

Assuming that the search I have made is proper, the "pre-lockdown" earthquake occurred on Thursday, 2017-08-03 13:13 (local time), while the "post-lockdown" earthquake on Saturday, 2020-04-18 19:17 (local time). In case that the above-mentioned origin times are correct, I believe that such a comparison is not quite fair and it possibly leads to misleading conclusions.

If the authors agree, I would recommend perhaps to totally exclude the part of "earthquake detection capability" from the manuscript, considering also that the structure of the paper will be slightly affected in such case.

Specific Comments:

Abstract

L09: "*March 2019*" □ "*March 2020*"

L12-13: "*containing 148 stations*" □ I would recommend using the phrase "*consisting of 148 stations*".

L14: To be more precise, the reduced human activity is mostly due to the lockdown measures and not due to COVID-19 in general. I would suggest rephrasing that part accordingly. For example, "*...in Romania due to COVID-19*" □ "*...due to the Romanian measures against COVID-19*".

L15: "corresponds to" □ "correspond to"

L18: "In the lower frequency range (2-8 Hz and 4-14 Hz) the variability of the noise reduction among the stations is lower than in the high frequency range, and the noise level is reduced by up to 35%." I find this sentence a bit confusing, especially in the context of an abstract. Could you please clarify and maybe rephrase it? In addition, no information about the percentage reduction observed at higher frequencies (15-40 Hz) is provided.

1 Introduction

L46: "The study analyzed noise data..." □ I would recommend rephrasing this part. E.g., "In the latter study, seismic noise data were analyzed..."

L47: "are responsible" □ I would recommend writing "were responsible"

L49: "..., the first official case in the country being reported on..." □ "..., with the first official case being reported on..."

L57: "all movement was" □ I would recommend writing "all movements were"

2 Data and method

L75: "within the medium to large urban areas" □ "within medium to large urban areas"

L88: " DRMS' " □ Please remove the " ' ".

L84-86: "We choose the above frequency intervals taking into account different contributions that the anthropogenic noise sources have in a wide frequency range, starting from 0.02 Hz up to 40 Hz (Sheen et al., 2009; Boese et al., 2015; Diaz et al., 2017)."

This sentence could raise some potential questions. For example, why low frequency seismic noise (< 1 Hz) was not included in the analysis? The actual reason due to which the frequency analysis was limited up to 40 Hz, is that the frequency content of the anthropogenic noise is strictly limited up to such frequencies? Does the choice of the specific frequency range depend on the sampling rate of the data? It would be good to include some extra comments about your choice of concentrating on the specific frequency bands (2-8 Hz, 4-14 Hz, 15-25 Hz and 25-40 Hz).

3 Results

3.1 General overview

L99: "*computed the median of the noise DRMS*": The temporal variations of DRMS presented in the totality of the manuscript's figures, is superimposed with the temporal variation of the median DRMS during working hours (6h-16h). Did the computation of the median DRMS values computed for the two 30-days long time intervals follow the same approach? This should be clear in the manuscript.

L98-100: "*we computed the median...*", ... "*We compute the percentage...*": I would suggest not shifting tenses between sentences.

L101-103: "*For each site, we represented a circle colored according to the maximum percentage of the noise reduction in each band and sized as a function of the number of inhabitants in the area*": I would suggest not including so much details about the color coding or the symbol size of the plots in the main text. I would just refer to the overall content of Figure 2 (e.g., percentage change of the median DRMS for each frequency band).

L106: "*10000 inhabitants*" : I would recommend keeping the same number formatting with or without a thousand separator throughout the manuscript.

L113: "*Large values*" □ I would recommend writing "*Large seismic noise drops*"

L144: "*... the noise reduction is obvious...*" □ I would recommend writing "*... the noise reduction is evident...*"

L146: "*The lowest level of the noise...*" □ I would recommend writing "*The lowest noise level...*"

3.2 Station in cities

L148: *"Station in cities"* □ *"Stations in cities"*

3.2.1 Free field-stations

L151: *"Free field-stations"* □ *"Free-field stations"*

L156: *"was uniformly imposed at the national level"* □ *"was uniformly imposed at a national level"*

L158: *"...for the station..."* □ *"...for the stations..."*

L162: *"The station is close to the two main boulevards..."* □ *"The station is close to two main boulevards..."*

L163-164: *"The noise at this site is very high and is generated by all of these sources."*: I would remove this sentence.

L168: *"The 24-hour clock plots in Figure 4b..."*: The specific plots are labeled as 4c in Figure 4. I would also suggest including a general reference to Figure 4 describing its overall content in this paragraph.

L170-171: *"The restriction of night activities during the lockdown is responsible for reduction of the noise level observed during the night hours before lockdown"*: This sentence is not perfectly clear to me.

L176: *"During the weekend..."* □ *"During the weekends..."*

L180: *"... the higher interval between trains."* □ Consider replacing the word "higher". E.g., *"the longer inter-train intervals."*

L183: "..., one close college..." □ "a nearby college"

L187-178: "The shopping centers were reopened to the public in mid-June 2020 and this moment increased the noise observed in July." Please consider rephrasing this sentence.

L188-190: "After the quarantine law, the noise level decreased and increased again to reach its maximum after the lockdown, when the schools were reopened in September 2020": The same for this sentence also. Please consider rephrasing it. Consider maybe splitting this part into two separated sentences.

L191: Is station CTISU considered as a free-field station? It is installed in the IES's building. If yes, this part should be moved to another section.

3.2.2 Stations in schools

L211: "... located in kindergarten in Bucharest..." □ "... located in a kindergarten in Bucharest..."

L213-214: "The noise level reaches the level observed during the 2019 religious (Easter and Christmas), summer and winter holidays.": Easter, Christmas and other holidays are discussed in the text but they are not labeled in Figure 7. Please consider labeling the previously mentioned holidays, as you did in Figure 3, for example.

L220: "Figure 7b highlights...": The specific plots are labeled as 7c in Figure 7.

3.2.3 Stations in buildings used for structural monitoring

L235: "headquarter" □ "headquarters"

L281-290: No station ID(s) is/are mentioned in this paragraph. Please include somewhere in this paragraph the station IDs you are referring to (TURN2, TURN3).

L285-286: Easter, Christmas and other holidays are discussed in the text but they are not labeled in Figure 11. Please consider labeling the previously mentioned holidays, as

you did in Figure 3, for example.

5 Conclusions

L407: This section should be numbered as 5.

L410: "*noise reduction is more important*" □ "*noise reduction is more significant*"

L418: "*The level of noise*" □ "*The seismic noise level*"