Solid Earth Discuss.,
https://doi.org/10.5194/se-2020-194-RC2, 2021

Solid Earth Discussions

Interactive comment on "Seismic signature of the COVID-19 lockdown at the city-scale: A case study with low-cost seismometers in the city of Querétaro, Mexico" *by* Raphael S. M. De Plaen et al.

Anonymous Referee #2

Received and published: 5 January 2021

Review of SE_2020_194: Plaen et al., "Seismic signature... Querétaro, Mexico"

Several papers have now been published describing the reduction of seismic ambient noise due to Covid-19 lockdown measures. So, this is not really an entirely new contribution. However, high frequency ambient seismic noise recorded in cities has many different contributing sources, mainly related to traffic, and it is not always easy to separate their sources and estimate their distance range. In this respect, the Querétaro case study, describing different noise behaviors in different parts of the town, is interesting and deserves publication as it may contribute to further more detailed analyses.

Printer-friendly version

Discussion paper

The paper is generally well written and clear, and the figures are of good quality. Some points, however, would benefit from better descriptions. I recommend publication with minor revisions, especially addressing the main points below.

Main points:

1) Mobility measures. It would be good to describe more clearly the meaning of the "Google mobility index". For example, does a 30% increase in residential mobility mean that there are 30% more people (i.e., 30% more cell phones) in residential areas, compared to the baseline period? Does the Google "mobility index" record only when people change their location ("movement trend" as in lines 113-114)? Or when they use their location app in the cell phones, even if not moving ("the time spent" in each category of place, as in lines 115-116). This is important to interpret the correlations of Fig. 5, for example.

2) In line 143, the sentence "The resulting time series show less impact from weekends, but they are characterized by lower noise levels (Figure 4)" was not too clear for me. You mean that noise on weekends also decreased compared to the baseline, but the decrease was not as large as for weekdays?

3) Lines 151-152 explains the increase in noise levels in the industrial area as possibly due to increase of "delivery of food and supplies". Is this just a hypothesis? Is there a way to help confirm this explanation?

4) section 3.2 Correlation of noise with mobility:

4.1) Lines 235-236. I did not quite understand the explanation for the anti-correlation with mobility in the residential areas. if increased mobility in the residential category indicates more people are staying at home, then less traffic will occur both in the residential areas as well as elsewhere in the city.

4.2) Lines 236-239. I did not understand why the lower correlations in the "New norm" period, compared with the "Early lockdown phase" imply that the mobility pattern is

"more complex" during the relaxation period. For example, a 30% mobility reduction (assuming this is mainly related to traffic reduction) should produce the same RMS noise reduction, independent of the lockdown or new-norm period. I do not understand why traffic (the main source of seismic noise) should relate to the google mobility in different ways in the lockdown and in the new-norm phases.

The problem, I think, is that correlation coefficients may not the best measure as they are much influenced by the scatter. The slope of the straight-lines in Fig. 5 may be a better proxy for the relationship between mobility and seismic noise. For example, the red lines (transit stations) have very similar slope in both phases, during the lockdown (Fig. 5b) and during the whole period (Fig. 5c): about 37% noise reduction/100% mobility reduction.

5) In section 4 (Conclusions) the authors seem to conclude that "traffic appeared to dominate observations" of seismic noise. Strictly speaking, the paper does not "prove" this link between traffic and seismic noise. However, all stations are near roads and highways with heavy traffic ("< 5 km"); in addition, it is well known from the literature that traffic is the main contributor to seismic noise in stations close or within cities. So, it would be better to conclude that the observed correlation between seismic noise and mobility is consistent with the traffic-dominated nature of seismic noise in urban areas.

Minor points:

a) Fig. 1: Please edit the position of label R6BB7 as it hides one of the other stations.

b) Fig. 4: Please indicate the "baseline period" (perhaps along the time axis) as it may help the readers understand the plot more easily.

c) Fig. 5: I suggest to remove the probability level, so as not to clutter the figure, leaving only the r-value. This will also avoid hiding some of the data points. All probabilities are extremely small (because the number of points is very large) - it would be sufficient to mention in the text that all correlation coefficients are highly significant (probabilities

Printer-friendly version

Discussion paper

less than 10E-15).

d) Section 3.1 Sportive events: The analyses of the two football matches is interesting, but it does not add much. It only says that the noise from 22 players running in the field is insignificant compared with that of 30000 supporters jumping in the stadium.

e) Paragraph 230: the correlation coefficients mentioned in this paragraph are different from the ones in Fig. 5. Please check.

Interactive comment on Solid Earth Discuss., https://doi.org/10.5194/se-2020-194, 2020.