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Comment on amt-2021-210

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Referee comment on "Evaluating uncertainty in sensor networks for urban air pollution insights" by Daniel R. Peters et al., Atmos. Meas. Tech. Discuss., https://doi.org/10.5194/amt-2021-210-RC1, 2021

Congratulations for this huge and impressive work. The paper presents a very interesting use of low-cost sensors and sensor network within the scope of air quality monitoring with some innovative points. However, I was somehow disappointed going through the paper and seeing no data concerning the network calibration method while it as been described in the Methods paragraph and some of the conclusion are based on these particular results. Moreover, the title focus on the uncertainty evaluation while the paper use only RMSE and nRMSE, which, even if they gave relevant information about the quality of the data, I would not consider as an uncertainty but rather an error. From my point of view, through the whole document the word "uncertainty" is used in place of RMSE, nRMSE or error measurement. The author could maybe simply explain their choice of using the RMSE as an uncertainty evaluation tool.

Specific comment:

- Line 25: "average uncertainty (root-mean-square error)" why are you not directly speaking about RMSE, or error instead of uncertainty?
- Line 149: "excluding statistical outliers", how was this exclusion performed?
- Line 224: "redaction" do you mean reduction?
- Line 285-288: "An evaluation of the performance of the independent network calibration method is included in Popoola et al. (in preparation). In brief, the estimated uncertainty of sensor measurements scaled with network method is broadly similar to the uncertainty of reference collocation-calibrated sensors (~30% median nRMSE)." Having not yet access to the performance evaluation results of the network method, it is rather difficult to conclude anything at this point. I hope the discussion will note insist on the network method.
- Line 288-289: "The results in Figs. 2 and 3 suggest that regardless of the method used for calibration, measurement uncertainty of sensors calibrated during a discrete period will be largely driven by the variability in the sensor performance over time." I don't see any comparison of calibration methods in the results of Fig. 2 and 3 which focused on colocation with reference methods.
- Line 291: " S9 (see Sect. 3.2.1)" I don't see Fig. S8 cited before Fig. S9
- Figure 4: Is it possible to increase the number of ticks on the time axes instead of 1

tick every 6 months? It would greatly ease the understanding and help to follow the explanation given in the following paragraphs.

- Line 307: "monthly mean NO_2 concentrations", is there any reason why you compare monthly values instead of weekly or daily for example, even for this long term (2 years) trend? It is known that increase the time average length tends to smooth the sensors variation, decreasing the measurement error.
- Line 424-425: "Additionally, the BL network could provide such information in near-real-time, making it a viable tool for rapid dissemination of air quality alerts." I would be more cautious about this conclusion as, if the scope is to give information about air quality alerts, a difference of roughly -15µg.m3 on a range of roughly 50 to 100 µg.m3 represent an error of -30 to -15% on the measurement value, which seems too large to be trusted for public information. Added the fact that the values are systematically underestimated.
- Line 455-458: "A cost-effective calibration approach such as the remote network calibration method can also be valuable for tracking and improving sensor performance over time by providing periodic calibrations and assessments of network performance, although a single point calibration was used here." It is difficult to acknowledge this conclusion based only on trust at this stage, as the results of the network calibration performance evaluation as not been really discussed in this paper, only by 1 sentence in paragraph 3.1.2.