

Interactive comment on “Practical field calibration of electrochemical NO₂ sensors for urban air quality applications” by Bas Mijling et al.

Anonymous Referee #3

Received and published: 30 June 2017

General Comments:

1. The work presents the process involved in trying to calibrate a low-cost NO₂ sensor for citizen science work. The sensor was collocated near a regulatory monitor for a period of 6 days, deployed in a community for 2 months, and then collocated again for a period of about 9 days. The work explored a number of calibration equations and determined that the best calibration equation would consider the temperature and relative humidity influences and the co-sensitivity to ozone. However, the sensors were not built to also measure ozone and thus, a calibration scheme omitting this factor was selected.

2. Unfortunately, the calibration procedure discussed is not novel or state of the art. Based on the title, I expected that it would be one or other or dynamic and easy to apply

C1

on the fly in the field. This definitely doesn't fit the bill. I think the manuscript would be better received if it were refocused to include a look at the data from the 2-month citizen science deployment.

3. I agree with the comments already posted by other reviews/researchers and have tried simply to add additional information in this review.

Specific Comments:

1. P4, Line 7 – Why was this criteria chosen? 33% of an hour seems rather low and at best arbitrary.

2. P4, Line 14 – Why was the collocation effort conducted at Vondelpark (urban background) and not Oude Schans (urban)? This might have minimized the differences between the calibration and study periods.

3. P4, Line 25 – Include the average deployment period/time to the citizen campaign discussion.

4. P4, Line 33 – Throughout this manuscript, be more specific about your descriptors like higher and better. Discuss the metric used to make those determinations. For examples, regarding temperature on this line, the absolute highest temperature nor the mean temperature appears to be higher during both calibration periods so what metric are you looking at?

5. P6, Line 18 – These two paragraphs should be re-visited to try to simplify. The model letters are not in order of best fit and that might help.

6. P6, Line 26 – Why is ozone considered as a metric if it wasn't routinely measured during the campaign? It reinforces your argument that it should be measured but it's really no good to you in your current work. To really lend weight to your argument that ozone should also be measured if using this NO₂ sensor, you should explore whether the ozone concentrations from the nearest monitor would be a helpful addition and if a sensor based ozone measurement is good enough to help.

C2

7. P6, Line 30 – Discuss the technical differences between these sensor models.
8. P7, Line 2 – Use a statistical measure rather than a figure of demonstrate improved performance.
9. P7, Line 5 – What does calibrated but uncorrected mean?
10. P7, Line 13 – What factors do you think affect the stabilization time. You mention 'most' sensors stabilized within this time. How many is most? Why not provide a range? What was different about the outliers?
11. P7, Line 26 – Aging of temp and RH sensor is not widely reported as a problem. I realize the sensor was measuring in-box temperature and RH rather than ambient but is there really no available data (nearby temp and RH station) by which to put some bounds on this potential affect. Are you considering testing that hypothesis?
12. P10, Line 17 – I think it might also be worth noting what this method would not be able to detect like transient spikes from nearby sources (because you are eliminating any spike outside of 10% of the mean). Because of this exclusion criteria, why do you think you could use this model to provide realistic estimates of peak values?
13. Figure 1 – I would like to see the Vondelpark station on this map to better appreciate the distance and variation in the urban environment. It would also help to see how large of an area this study area is in comparison with the city of Amsterdam.
14. Figure 2 – Rather than the photo of the sensor boxes charging, I think it would be helpful to see how they sit within this housing to better understand the appropriateness of the temperature and relative humidity measurement, etc.
15. Figure 3 – it appears that one sensor, in particular, appears to be an outlier in most of this figures. Was its removal from the study ever considered? Why/why not?
16. Figure 4 – Please check the text to make reference to Vondelpark and Oude Schans (OS) more consistent and clear. I believe at one post one of the stations is just

C3

referred to as GGD.

17. Figure 6 – Graph is not needed, equation and R2 in the text is sufficient for making this point.
18. Figure 7b – A Figure is not the best way to support the assertion that improved performance is clearly shown. It appears to me to be true only about 50% of the time from this figure.
19. Figure 8a – I would remove this Figure. If you leave it, include temperature.
20. Figure 8b – Just reference the data sheet.
21. Figure 9 – Figure, in this format not needed. If you want a figure, it would more useful to show error between measurements vs. time and for each sensor as it starts.
22. Figure 10 – Using similar scales would help illustrate the drift.
23. Figure 11 – Error bars/estimates for the coefficients before and after would be a helpful comparison in this Figure.
24. Figure 12b – Present R2.
25. Tables – Find a way to visually note the older sensors by ID number.

Interactive comment on Atmos. Meas. Tech. Discuss., doi:10.5194/amt-2017-43, 2017.

C4