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Atmospheric Measurement Techniques Discussions

Interactive comment on "Performance of NO, NO_2 low cost sensors and three calibration approaches within a real world application" *by* Alessandro Bigi et al.

Anonymous Referee #2

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The paper brings together important testing, training and analysis of low cost sensor datasets. I would be happy to recommend acceptance of the paper after consideration of the following comments:

The introduction suggests that improved control of regulatory monitoring networks has resulted in "...occasionally more efficient..." measurements. This is subjective, inflammatory and untrue, at least in the EU, where significant improvements in data quality over the last 30 years are directly attributable to improvements in regulation and QA/QC. Increased spatial density of measurements is not a requirement of the Directive, assessment of maximum exposure is. This needs to be reconsidered.

The behaviour of the sensors to rapid transients in meteorology needs to be considered. It is well known (Alphasense technical guidance, for example) that the EC sensors they supply are extremely sensitive to rapid changes in RH, which can change the processing required to produce concentration datasets. This does not appear to have been specifically considered in the paper. Additionally, while the B43F has been specifically designed with a screen to minimise the effect of ozone interference, there's little data available to confirm that this is effective long term. Were any tests conducted after the campaign to assess the effectiveness of the screen after 8 months in use?

Long term drift of the sensors before application of training is an important question. There's very little data available, or recommendations from manufacturers about sensor shelf life or maximum number of hours a sensor should be used. Some of this seems to be apparent in e.g. Figure 8?

It was not obvious to me what frequency the electrode outputs were interrogated for the creation of 1 minute, 10 minute and hourly data. Could this be reported?

Was there any laboratory testing of the sensors (apart from the manufacturing data provided by the supplier)?

I assume in equations (1), (2) etc, where you define the models to calculate concentrations, that the factors are unique to each sensor? E.g in equation (1), do the variables beta0 to beta5, plus epsilon have different values in both the NO and NO2 equations?

In section 2.1 you talk about the use of a small blower to bring sample air to the sensors. Do you measure the flow of air at all times? The effective diffusion length of the EC sensors will be affected by this flow of air, if it fluctuates, you may well see changes in performance characteristics.

In section 3.1, third paragraph, you start a sentence "Whether this shortage in generalisation occurred over a spatial scale or not...", but it doesn't end as a proper sentence.

The Uncertainty plots for Figure 9 are illuminating. The Directive requirement is to

report measurement uncertainty “in the region of the Limit Value”, so for NO2 this would be at 21ppb (annual LV) and 104.6ppb (hourly LV), using the calculation methodologies described in EN14211:2012 It would be very interesting to overlay the measurement uncertainties for the reference methods used in Switzerland on top of Figure 9 for comparison. I’m sure Christoph will be able to provide this!

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