

Reply to the comments of Laurent Spinelle on the manuscript "Long-term behavior and stability of calibration models for NO and NO₂ low cost sensors"

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We sincerely thank the reviewer for the positive review and the constructive feedback to improve the manuscript. Please find the detailed replies to all points made by the reviewer. In the following, the reviewer's comments are given in black and the replies in blue and revised text in green.

Very interesting paper and very interesting work, particularly on this rather new subject with such a very long-term experimental data base. The work carried out is presented in a very thorough way, which in a way do not help for a fast reading but help the interested reader to fully understand the work. Congratulations to the author for this work. Only few comments and questions below:

Line 64: "two identical electrochemical" what do you mean by identical? are they coming from the same batch? or is it only that they are the same model?

Reply: It meant that the two NO sensors and two NO₂ sensors are the same sensor model, Alphasense NO-B4 and Alphasense NO₂-B43F, respectively. The term was corrected to "two electrochemical".

Line 64-65: "relative humidity sensor and a temperature sensor" is this a unique sensor? in this case maybe you can write "a combined relative humidity and temperature sensor".

Reply: It was a unique sensor (Sensirion STH21), which measured both temperature and relative humidity. The term was corrected to "a combined relative humidity and temperature sensor."

Line 153: "For evaluation of the sensor calibration performance", I think 1 the is missing at the beginning of the sentence "For the evaluation of the sensor calibration performance"?

Reply: We corrected this in the revised manuscript.

Line 168: "An schematic", only a typo "A schematic".

Reply: We corrected this in the revised manuscript.

Paragraph 3.1.2: did you considered to filter based on the manufacturer's limit of detection or one you could have evaluated with some lab test ? in fact, it is known that at low ambient air concentration (10 - 15 ppb) sensors response is dominated by noise or interference.

Reply: The technical specification provided by Alphasense quantifies the sensor noise of ± 2 standard deviations as 15 ppb for both the NO₂-B43F and NO-B4 sensor, when testing the sensors in 'Alphasense ISB low noise circuit'. However, the criteria might not be applicable to the data collected from the field measurement because the sensor response in the ambient environment may not be comparable with the response during laboratory tests. In the current study, we did not filter any raw data except the sensor malfunction periods occurring during the second co-location period, to show the full range of the sensor measurement in the field condition.

no changes in the revised text.

Line 304-305: "the penetration of raindrops into the sensor units may cause significant disturbance of the sensor signal", do you mean disturbance on the electronic components?

Reply: Yes. It meant that the raindrops may penetrate into the housing of the sensor units during rain events and hinder the signal transfer in the electronic component of the sensor. The sentence was corrected to "the penetration of raindrops into the housing of the sensor units may cause significant disturbance of the sensors or other components of the sensor units."

Line 346: "lower, medium and higher NO₂ levels", you should maybe give your range of concentration as those categories may vary a lot from country to country.

Reply: The sentence intended to point out that the NO₂ sensor performance during their deployment in a small sensor network in the city of Zurich allowed distinguishing sites with lower (AC009 and AC010), medium (AC011), and higher (AC012) NO₂ levels as shown in Figure 7. According to the measured ranges from the sensor units, the ranges are now stated in the sentence as "with lower (0 - 20 ppb), medium (20 - 30 ppb) and higher (40 - 50 ppb) NO₂ levels as shown in Figure 7."

End of the conclusion: Do you consider the contrast you are pointing out between NO and NO₂ can be inked to the difference between the gaseous species involved and there sensitivity to interferent ? e.g. O₃ is a well-known interferent for NO₂ sensors

which can impact drastically the data quality, in particular in the filtered sensor version for which the filter efficacy depend on the O_3 level, whereas this kind of strong interference are less common for NO sensors.

Reply: Thanks, this is a very valid point that has also been addressed by referee #1. As described in our reply to the third comment of referee #1, we now mention the interference to O_3 as a reasonable and likely explanation for the observed ageing of the NO_2 sensors and the absence of a clear degradation over time of the NO sensors. In the revised manuscript we refer now to the very relevant paper by Li et al. 2021 as mentioned by referee #1. See our reply to the third comment of referee #1 for details and the changes made in the revised manuscript.