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Atmospheric Measurement Techniques Discussions

Interactive comment on "The Outdoor Dust Information Node (ODIN) – development and performance assessment of a low cost ambient dust sensor" *by* G. Olivares and S. Edwards

Anonymous Referee #1

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General Comments: This work shows promising results for a low-cost low-power particle sensor. The sensor tested is widely available and therefore further characterization would be in the best interest of many parties. As such, this work would benefit from being presented as a cohesive method. The authors have shown that there is a shortcoming, and a correction for it. However, there are unknown shortcomings that have not been characterized, and those need to be addressed. For example, what if baseline drift or temperature response is non-linear over time, or if sensitivity is a function of temperature?

The paper should also discuss how the sensor response is affected by other factors.

Sampling was conducted for a narrow time window with likely static PM sources, how can the sensor be expected to perform under a wider range of conditions? Will there be cross-sensitivity with PM10 and humidity? How will particle chemistry change the sensitivity? If no data is available for some of these factors, the authors should at least discuss potential implications, and appropriate applications considering these issues.

Specific Comments (Page: line(s)): 7514: 1-2: Is this comment intended for the pollutant category of PM only? Other works have done this for other gases, also using low cost sensors.

7515: 5-10: What is the average and peak power consumption for the sensor?

7517: 1-2: Why was only 1 unit placed near the reference monitors? Future work should include multiple nodes for such comparisons.

7517: 10: It appears that PM10 data was available, was that compared with the Sharp sensor response?

7517: 17-20: Did the baseline drift during the temperature-controlled period? Were the sensors placed back into the temperature-controlled box after the field deployment? Had the baseline shifted throughout that period?

7517: 20: A uniform temperature response was used, but is there any reason to doubt that the sensor sensitivity changes with temperature and PM concentration? In other words, can you discount that there is any interaction between temperature and PM response?

7518: 1: This part is somewhat unclear because you had previously said that the baseline was corrected using the average of the sensor responses in clean air, but here you say you corrected for the baseline drift with a linear regression. It appears this correction was only meant for the co-location deployment, but this should be clarified. Why was it done differently, in any case?

7518: 5: Can you suggest any reason for this temperature nonlinearity? If this is a real

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and repeatable response, perhaps you should explicitly state that data taken below a certain temperature threshold is to be censored.

7518: 18: What was the inter-sensor variability during this period?

7518: 20: Did you check for change in sensitivity with temperature in your previous work? Are you sure this is not occurring? When you say it is a sensor property, can you be more specific? Is it constant over time?

7519: 1: How does this drift translate into concentration units?

7519: 12: Clarification is needed here: are you saying that the entire data set was used for baseline correction? You had previously mentioned that 1/3 of the data was used for calibration for the PM2.5 slope. Selecting different chunks of data for different parts of the quantification makes it slightly confusing. Can the same chunk of data be used for both tasks, perhaps at the start and finish of the deployment?

7519: 17: What was the correlation? How much of the variability is captured? What is the RMSE? Were residual distributions analyzed?

7519: 19: How are you defining 'high concentration events' here, above 25ug/mˆ3? Can you show statistically that ODIN in fact captured all of those events?

7519: 26: The directionality analysis is interesting, and could be highlighted as a method to identify high concentration sources using methods like non-parametric regression. This is one of the potentially valuable applications of this type of sensor and could be noted more prominently.

7520: 1-5: This could also be due to PM10 in theory, correct? PM10 concentrations can increase at high wind speeds due to particle re-suspension. Adding a PM10 analysis to this paper is important.

Relevant citations that are missing: Budde, M., Busse, M., and Beigl, M.: Investigating the use of commodity dust sensors for the embedded measurement of particulate mat-

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ter, Ninth International Conference on Networked Sensing Systems (INSS), Antwerp, Belgium, 2012

Interactive comment on Atmos. Meas. Tech. Discuss., 8, 7511, 2015.