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Atmospheric Measurement Techniques Discussions

Interactive comment on "A low-cost $PM_{2.5}$ monitor for wildland fire smoke" *by* Scott Kelleher et al.

Anonymous Referee #2

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This paper by Kelleher describes the design of a low-cost and field portable PM2.5 monitor that would be of interest to many readers, especially related to remote sampling without access to mains power. The authors give a thorough description of the design, components of their monitor that would enable one to replicate their monitor as well discussion on the consideration that went into the design. The authors demonstrated the use of the monitor in the field, describe the use to spatial mapping the distribution of smoke from a prescribed burn in Colorado, and demonstrate that the monitor was able to successfully capture daily PM2.5 mass concentrations that compared well to reference instruments. The only downside to the paper is that I would have liked to have seen more discussion on the on-line optical sensor (Sharp) to monitor PM and the reasons why it failed. This will help the reader understand the limitations of the Sharp sensor and so avoid similar problems. In this reviewer opinion, the manuscript falls within the scope of AMT and should be considered for publication after consideration

of the minor points below. Specific comments 1. Page 4, line 95: Perhaps the authors could outline why they chose the Sharp optical sensor over the myriad of other low-cost particle sensors available commercially. 2. Section 2.4: what sampling height did you place the monitors? 3. Page 9, line 216: Perhaps you could compare the total battery life that was achieved during the measurements compared to the simulations? 4. Page 11, line 240: While I agree that you should correct for collection efficiency of the filter, it would help if the authors were a bit more explicit in how the correction was applied 5. Page 11, line 245: why would the high mass loading reduce battery power, was it because the pumps had to work harder than expected? 6. Figure 7: For each site on the maps you give an 'average' PM2.5 daily mass concentration. How is this an average concentration when each map is one day of measurements and there is presumably one OAS at each site? 7. Figure 7 and S3: what happed to data from the 11th, 13th, 14th and 16th Sept? Why is data from these days not included in the Supplement? 8. As mentioned previously, I think more discussion on the why the Sharp optical sensor failed would be useful. The authors mentioned baseline correction was attempted but give no details, what variables were tried but failed? Or to put it another way, how did you come to conclusion that the baseline was not correctable? As the strong linear trend with temperature suggested that it could be correctable. By giving details of what did not work is just as valuable for the reader, so that they can avoid similar issues with this sensor. Furthermore, have other people reported the same problems (e.g. Wang et al. 2015)? 9. Figure 9: What about the results from the second location were the OAs was co-located with reference instruments, did it perform just as well? 10. Page 16, line 333: there have been a few recent papers that have found reliable low-cost and small optical particle counters (e.g. Crilley et al.2017 & Sousan et al. 2016). I think the authors could reference these and other papers here with discussion on whether these other sensors may be useful and practical.

References Crilley, L. R., Shaw, M., Pound, R., Kramer, L. J., Price, R., Young, S. Lewis, A.C. and Pope, F. D. 2017. Evaluation of a low-cost optical particle counter (Alphaseense OPC-N2) for ambient air monitoring. Atmospheric Measurement Tech-

niques Discussion. In review. Sousan, S., Koehler, K., Hallett, L. and Peters, T.M., 2016. Evaluation of the Alphasense optical particle counter (OPC-N2) and the Grimm portable aerosol spectrometer (PAS-1.108). Aerosol Science and Technology, 50(12), pp.1352-1365.

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