Atmos. Meas. Tech. Discuss.,
doi:10.5194/amt-2020-217-RC2, 2020

Atmospheric Measurement Techniques Discussions

Interactive comment on "Stationary and Portable Multipollutant Monitors for High Spatiotemporal Resolution Air Quality Studies including Online Calibration" *by* Colby Buehler et al.

Anonymous Referee #2

Received and published: 13 October 2020

This manuscript presents the design of a new low-cost sensor system that incorporates an innovative approach to maintaining sensor performance – an automated system for performing zero/span calibrations. This manuscript is particularly relevant as the integration of a zero/span system into a low-cost sensor device has the potential to help address the ongoing challenges of sensor drift and degradation. The authors provide a detailed description of the technology, including the sensors incorporated as well as the hardware and software. Two versions of the device have been created to accommodate stationary and portable monitoring. The authors also share initial results on performance of the device and compare these results to previous studies.

Comments:

1. Multiple studies have observed that calibrating sensors using field co-location data as opposed to a laboratory approach tends to result in higher performing and more robust calibrations (e.g., the study mentioned in lines 56-57). Considering this information, it is recommended that the authors discuss their rationale for using a laboratory calibration approach (lines 200 -201). In addition, do the authors anticipate any limitations regarding the zero/span system given that the span gas will not have the same mixture of background pollutants as the ambient air being sampled?

2. On line 67 the authors mention the issue of sensor drift – given the wide range of sensor types used, it is recommended that the authors expand this discussion to include how drift and cross-sensitivities tend to vary by sensor type.

3. Regarding the modification to the Figaro 2600, according to the results in Figure S6 – even though the trends are linear, it appears that adding the charcoal filter seems to reduce the sensor's sensitivity, are there any other impacts from this modification, such as a slowed response time? Recommend adding more discussion on this topic.

4. Were the portable monitors also tested via a co-location in the field with reference instruments, if not could the authors discuss the rationale?

5. In Section 3.4, the authors discuss the performance of the zero/span system. It is recommended that the authors comment on the impact of the system on sensor performance for each pollutant. During the field co-location tests, did the implementation of the system have any clear impact on the resulting data? It seems this system might be most useful during long-term deployments - though the field tests appear to range between 1 week to 1 month long.

6. In Section 3.5, for Table 3, it is recommended that the authors add columns or a second table that lists the length of the deployment, the location of the deployment, and the calibration approach used (i.e., field or lab). In addition, consider highlighting

or adding comparisons to results for which a laboratory calibration was tested in the field.

7. In Section 3.5, in Table 3, for all pollutants except PM2.5 the raw OEM sensors are listed, whereas the names of commercial devices are listed for PM2.5 – recommend adding the raw OEM sensor used for all devices.

8. Reconsider the use of the term 'monitor' throughout the manuscript (i.e., multipollutant monitor and portable monitor). These devices are typically referred to as a sensor, sensor platform, or sensor system, while generally the term monitor is reserved for research or regulatory grade instruments.

9. There is some red text on line 491.

Interactive comment on Atmos. Meas. Tech. Discuss., doi:10.5194/amt-2020-217, 2020.