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Atmospheric Measurement Techniques Discussions

Interactive comment on "Understanding the ability of low-cost MOx sensors to quantify ambient VOCs" *by* Ashley M. Collier-Oxandale et al.

Anonymous Referee #1

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Review of Collier-Oxendale et al. "Understanding the ability of low-cost MOx sensors to quantify ambient VOCs"

This paper is a welcome addition to the literature on the issue of understanding and utilising low-cost sensors systems for measuring and monitoring trace gas concentrations in the atmosphere. The focus of the paper is on the co-location of the systems with more accepted independent measurement techniques for the molecules of interest, i.e. VOCs and selected inorganics. The authors describe the statistical methods and techniques in detail and show comprehensive details of the analysis of the uncertainties and effective of their methods in this deployment.

More detailed required on the co-located methods.

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Discussion paper

The whole analysis falls or stands of the methods used to compare the sensor data. It is therefore important that the correct details, with references, of the instrumentation used in this study. For example, what type of ptr-ms? ToF/quad? Was the LGR instrument really a cavity ring-down or was it an off-access output spectrometer. This may seem picky, but this is techniques and instrumentation paper and so the details need to be spelled out.

Discussion on applicability of techniques described and warnings regarding using these type of sensors in isolation with training data in new environments.

The study data and methods are well analysed and described. However the sensors are trained using very similar data to the data generated by the methods described and the sensors used. How do we know the accuracy of the sensors in new environments? Techniques used in atmospheric analysis are commonly found to have interferences in "new" environments that result in many years of inferences on "false" data. Low-cost sensors is a new area and it would be good for well-run studies such as this to provide some words of warning for the deployments outside of co-location of well-characterised methods, in a spatial mesh to provide high resolution spatial data to a fixed high quality measurement location or well-understood environments. It is important to note that models only work within the parameters of the training data and so phenomena that are encountered outside of the scope of the training data will probably have unknown uncertainties associated. More in depth discussion of these issues would be of benefit in addition to few lines in the conclusions.

Would authors consider adding a "Best practices and procedures" section to the discussion section as mentioned on page 5 section 1.1? This would be a usable summary of their findings.

Comments, data or discussion of the lifetime of MOx sensors and the sensitivity drift.

Do MOx sensors drift? How much do they drift? Is the drift similar across all detected molecules? The training data bookends the measured data and so any sensitivity

or selectivity drifts occurring will be implicit in the models produced by the training methods. In my experience there is significant drift and individual sensor-to-sensor variability even within batches. The authors should address the issue of sensor drift somehow within the limits of their study but also more generally how sensor drift issues may impact the application of low-cost sensor systems.

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