Atmos. Meas. Tech. Discuss.,
doi:10.5194/amt-2018-301-AC3, 2019

Atmospheric Measurement Techniques Discussions

Interactive comment on "Derivation of Flow Rate and Calibration Method for High-Volume Air Samplers" *by* Richard Hann and Mark Hermanson

Richard Hann and Mark Hermanson

richard.hann@ntnu.no

Received and published: 29 January 2019

This commenter has provided a link to a document of exercises in one of the courses offered by the Air Pollution Training Institute. The document is undated, but related documents from EPA were prepared in the late 1970s. Within the document are equations for calibration of total suspended solids (TSP) air samplers. These samplers use the same calibration equations as PUF samplers, which are the general topic of our manuscript. As we note in the beginning of our paper, none of the methods or documents we have seen show the derivation of the calibration equations. The same is true with this document, and we will include the reference as further evidence of the need for the derivation.

It is important to point out that TSP samplers are operationally different from PUF samplers. One of the significant differences is that on a PUF sampler, what is being calibrated is the differential pressure gauge (e.g. MagnehelicTM). A TSP sampler does not have a differential pressure gauge but instead uses a device referred to in these exercises as a "recording transducer" (Laboratory 1, Figure 2) which in other words is chart paper, shown in Figure 7, and problem set 1 Figure 3. That is what is being calibrated. Part of the resulting difference is that if the TSP sampler experiences variability in flow, it will appear on the chart paper. However, TSP samplers are equipped with Mass Flow Controllers (MFC) which sense the rate of air flow and will adjust the flow (by adjusting motor speed) to keep it constant. A PUF sampler does not have a chart recorder or a MFC. The PUF operator accounts for the difference in the flow of the sampler by calculating an average differential pressure gauge values at the beginning and end of the sampling event.

In this document here are three experiments, none of which are involved in our paper or, in general, in use of a PUF sampler.

Experiment 1 is the calibration of the orifice device using a Roots meter. We mention this in our manuscript beginning on page 6, line 13. For us, this is typically performed by the manufacturer in a laboratory environment.

Experiment 2 is Reference flow audit device which calibrates the resistance plates. We do not use resistance plates to change flow during calibration. We use the ball valve on the sampler to change the flow.

Experiment 3 is verification of mass flow controller (MFC) range. Our devices are not TSP samplers and do not use an MFC.

Interactive comment on Atmos. Meas. Tech. Discuss., doi:10.5194/amt-2018-301, 2018.