

August 4, 2021

Dear Kim, Kevin, and Lesley,

I'd like to write this letter to summarize the performance of the Atmotube Pro sensor based on the field evaluation results of the South Coast Air Quality Management District (AQMD).

The Atmotube Pro is a low-cost wearable and portable air quality sensor that according to the manufacturer, measures fine particulate matter (PM) and volatile organic compounds (VOCs) and reports them in real-time (<https://atmotube.com/products/atmotube-pro>). The PM measurement relies on a Sensirion SPS30 particulate matter sensor and is based on laser scattering using advanced, high resolution particle size binning. The VOC measurement relies on Sensirion SGPC3 sensor and is based on semiconductor metal oxides.

The South Coast AQMD conducted sensor evaluation for Atmotube Pro PM measurements in January-March, 2020 by comparing the measurements from the sensor and a side-by-side federal equivalent method instrument GRIMM. Based on the SCAQMD report (<http://www.aqmd.gov/aq-spec/sensordetail/atmotube---pro>), the Atmotube Pro sensors showed very strong correlations for PM1.0 ( $R^2$ : 0.92) data and strong correlations for PM2.5 ( $R^2$ : 0.79-0.90) in the field evaluation when compared to the GRIMM measurements.

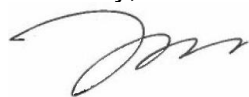
Recently, the South Coast AQMD conducted sensor evaluation for Atmotube Pro VOC measurements from March 31 through April 21, 2021 by comparing the measurements from six different sensors to a widely accepted and tested instrument Thermo 55i. The tests were conducted at one of South Coast AQMD's air monitoring sites in Wilmington, east of a petroleum refinery and west of a major freeway (I-110), where there are substantial VOC emissions from diverse sources, which made it a good site for evaluating VOC instruments. Based on the South Coast AQMD report ([http://www.aqmd.gov/docs/default-source/compliance/all-american-asphalt/atmotube-pro-voc-field-eval\\_final\\_v2.pdf?sfvrsn=4](http://www.aqmd.gov/docs/default-source/compliance/all-american-asphalt/atmotube-pro-voc-field-eval_final_v2.pdf?sfvrsn=4)), the Atmotube Pro sensors showed poor correlation with the Thermo 55i instrument for total VOCs ( $R^2$  ranging from 0.02 to 0.18 when compared to one-minute non-negative Thermo 55i measurements of non-methane hydrocarbons). In addition, the sensors overestimated VOC concentrations.

Based on these field evaluation results, the Atmotube Pro sensors correlated well with the reference instrument for the PM measurements, but not so for total VOC measurements when comparing to the Thermo 55i instrument. Thus, I call for caution in the interpretation of the results produced by the Atmotube Pro sensors for total VOC measurements. I don't recommend using Atmotube Pro VOC results to make any health risk estimates or source characterization.

Low-cost VOC sensor is relatively new in the market. I will be working with South Coast AQMD to better characterize the performance of this type of low-cost sensor technology.

Please let me know if you have any questions.

Sincerely,



Jun Wu, Ph.D.  
Professor of Environmental and Occupational Health  
University of California, Irvine