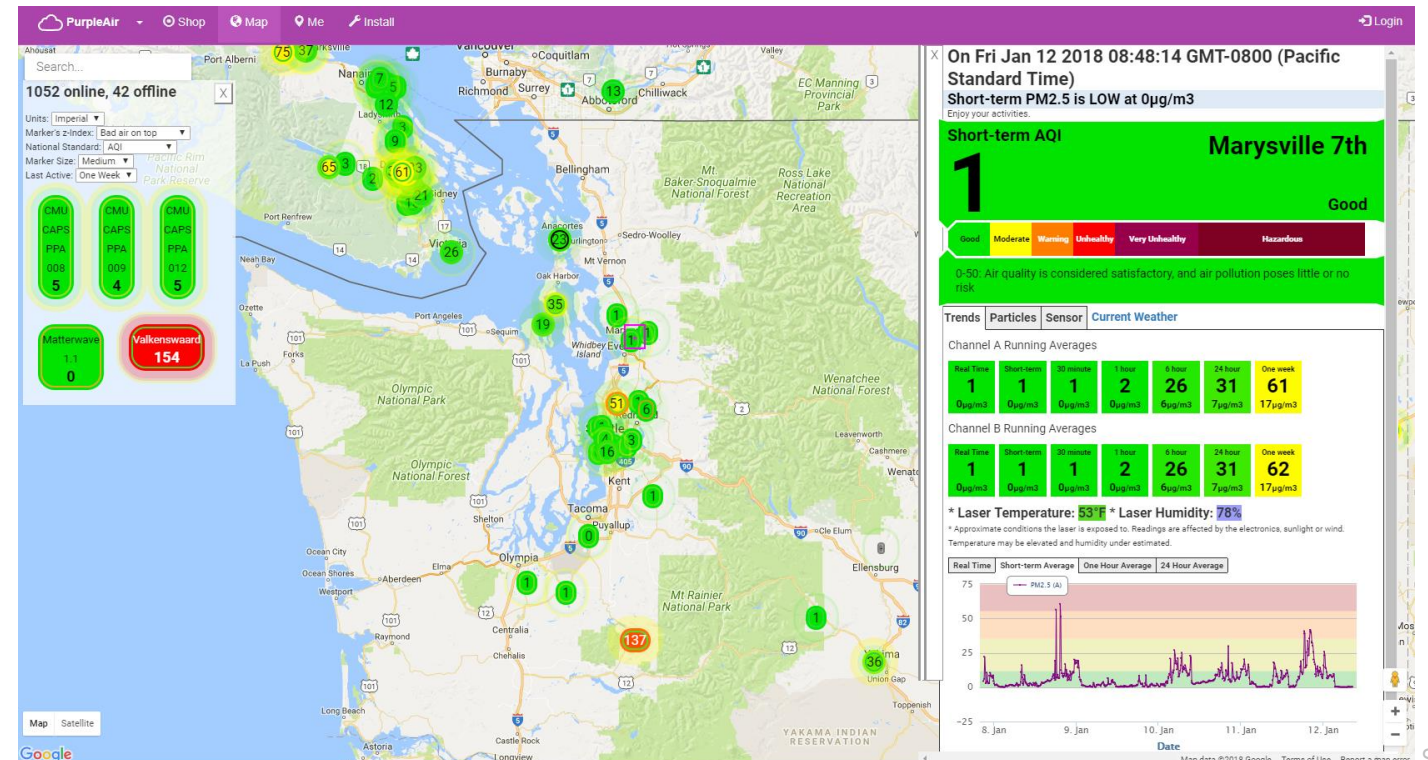


Overview

- 3 Sites (Marysville, Duwamish, Tacoma South L)
- Data from 12/6/17 to 4/4/18



Comparison to Nephelometer and FEM TEOM

- TEOM ~ Purple Air + RH + Temp
- Hour / day time scale (average of 3 site-specific equations)

- CF=1

	PA to TEOM	PA to Neph	Neph to TEOM
Correlation	0.81 / 0.93	0.89 / 0.98	0.89 / 0.95
Slope	0.52 / 0.53	0.47 / 0.49	1.08* / 1.06
Intercept	0.38 / -0.86	2.76 / 0.76	-0.59* / -0.44

- Purple air reads ~2 times higher
- Purple air correlation with TEOM is close to the correlation between the neph and TEOM

*Neph has already been calibrated to Partisol

EPA Air Sensor Toolbox: Suggested Performance Goals for Air Sensors

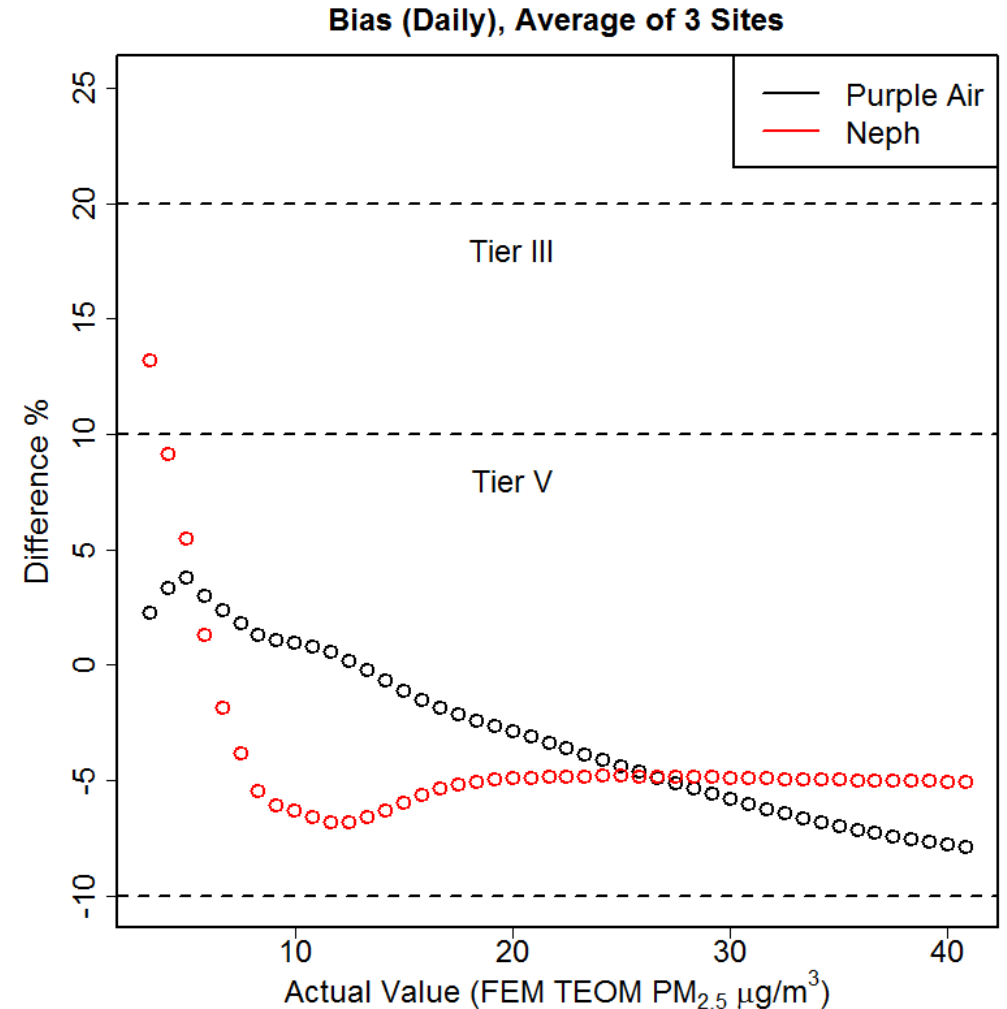
Tier	Name	Precision/Bias %	Data Completeness %
I	Educational	50	50
II	Hotspot identification	30	75
IV	Personal monitoring	30	80
III	Supplemental monitoring*	20	75
V	Regulatory monitoring	10	75

* “Supplemental monitoring might have value in potentially providing additional air quality data to **complement existing monitors**. To be useful in providing such complementary data, it must be of sufficient quality to ensure that the additional information is helping to “**fill in**” **monitoring gaps** rather than making the situation less understood.”

Link: <https://www.epa.gov/air-sensor-toolbox/how-use-air-sensors-air-sensor-guidebook>

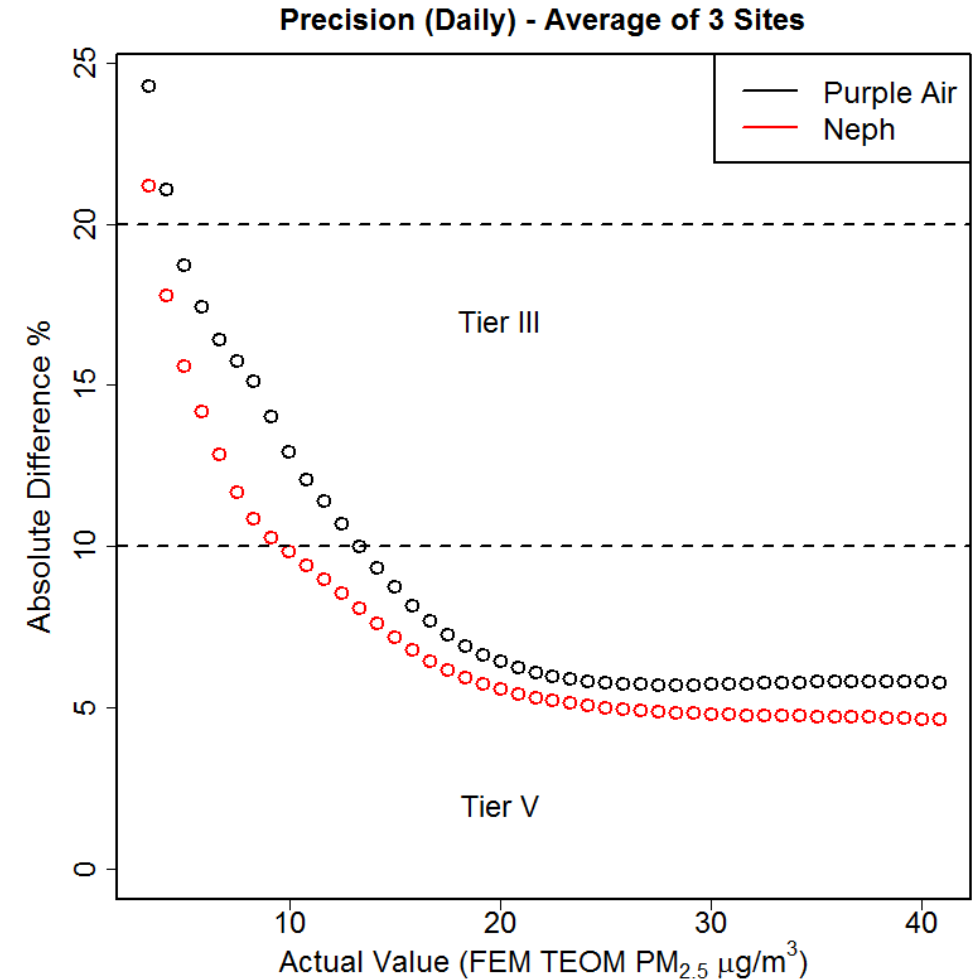
Bias

- $100 * (\text{Purple Air} - \text{TEOM}) / \text{TEOM}$
- X-axis starts at 3 ug/m^3
- Calibrated Purple Air and neph read lower than TEOM above $\sim 10 \text{ ug/m}^3$
- Meets Tier V criteria from $\sim 4 \text{ ug/m}^3$ to max measured



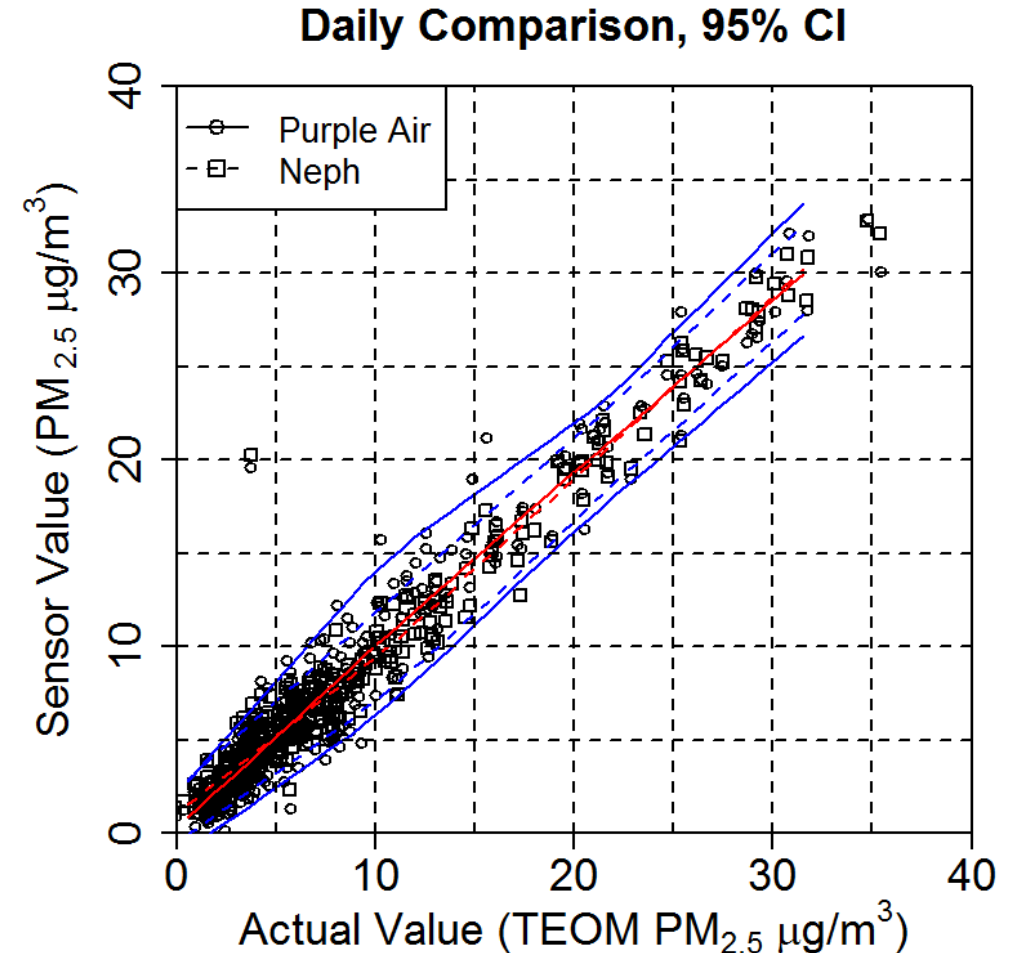
Precision

- $100 * \text{abs}(\text{Purple Air} - \text{TEOM})/\text{TEOM}$
- X-axis starts at 3 ug/m^3
- Meets Tier III criteria from $\sim 4 \text{ ug/m}^3$ to max measured and Tier V from about $10\text{-}13 \text{ ug/m}^3$ to max measured



Daily Comparison with 95% Confidence Intervals

- Solid lines are Purple Air, dashed lines are the neph. Circles are PA, squares are neph
- The red lines are the mean, the blue lines are the 95% CIs
- If the TEOM says the $PM_{2.5}$ concentration is $10 \mu\text{g}/\text{m}^3$, 95% of the time the Purple Air or Neph will report 7 to 14 $\mu\text{g}/\text{m}^3$
- If the Purple Air or the neph say the $PM_{2.5}$ concentration is $25 \mu\text{g}/\text{m}^3$, 95% of the time the TEOM will report 23 to 30 $\mu\text{g}/\text{m}^3$



Summary

- **Purple Air is very highly correlated to neph and highly correlated to TEOM**
- **Purple Air performs similarly to neph in terms of bias and precision**
- **May be useful in supplemental monitoring as well as education, exploratory analyses, and micro-scale monitoring**
- **Caveats**
 - **2x higher before calibration**
 - **Upper limits? (These data only cover up to 85 ug/m³ hourly and 40 ug/m³ daily)**
 - **Reliability over time in the field and ability to perform maintenance**
 - **Limited amount of data**
 - ▲ **Seasonality**
 - ▲ **Differences by site, region**