Testing Report - $PM_{2.5}$ Base Testing

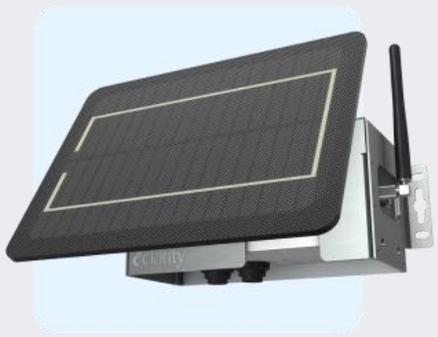
Clarity Node-S

This report reflects the v2.1 Global $PM_{2.5}$ Calibration performance

New York City, NY

New York Department of Environmental Conservation

May 2024 – June 2024



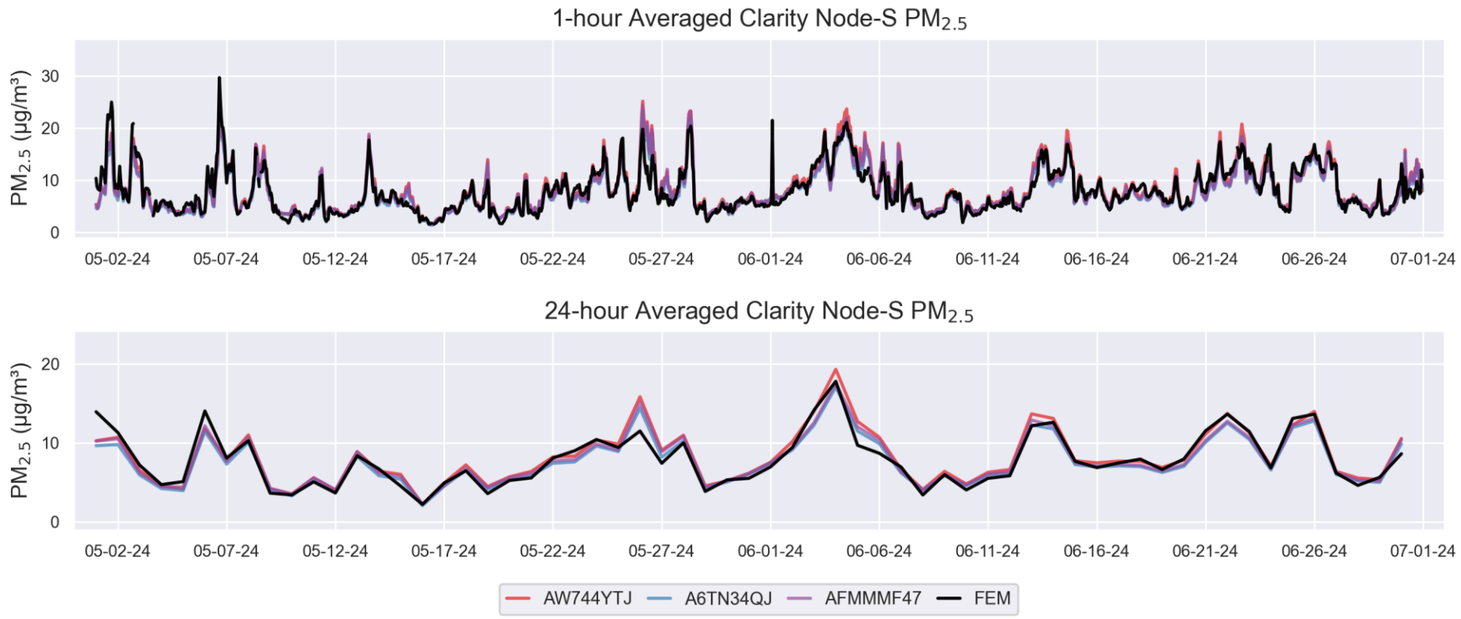
Deployment Details

Testing Organization and Site Information	
Testing organization (Name, Organization type, Contact website)	New York Department of Environmental Conservation
Testing location (City, State, Latitude and Longitude)	Queens New York City, NY 40.74, -73.82
AQS site ID	36-081-0124
Sampling timeframe (MM-DD-YY)	05-01-24 to 06-30-24
Sensor data source	Clarity Cloud
Reference data source	AQS via RAQSAPI

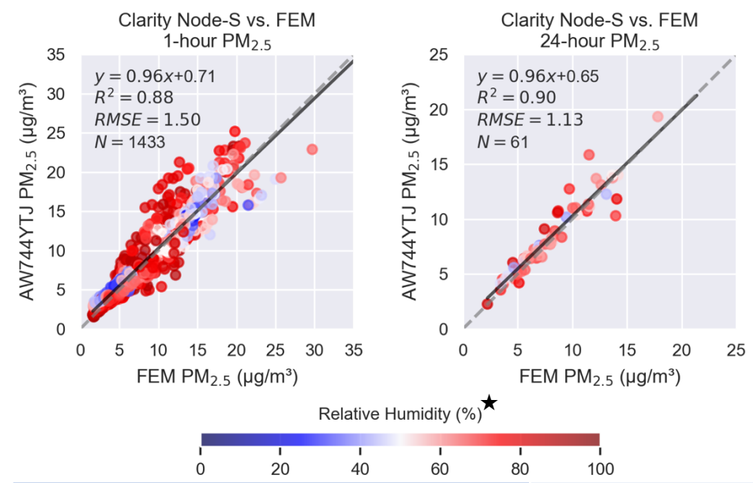
Sensor Information			
Manufacturer, model	Clarity Node-S		
Device firmware version	2.4.1.01		
Sampling time interval	1-hour		
Sensor serial numbers	AW744YTJ	A6TN34QJ	AFMMMF47
Issues encountered during deployment?	☐	No Issues	

FRM/FEM Information	
Manufacturer, model, designation	Teledyne API T640 at 5.0 LPM w/ Network Data Alignment, Broadband spectroscopy, FEM
Sampling time interval	1-hour
Date of calibration	Span dust checks: 2024-05-02 (inconclusive), 2024-05-07 (pass) 2024-06-03 (pass), 2024-07-15 (pass)
Date of flowrate verification check	2024-04-08, 2024-05-02 2024-05-07, 2024-05-16 (audit) 2024-06-03, 2024-07-15
Description, date(s) of maintenance activities	-

Time Series Plots

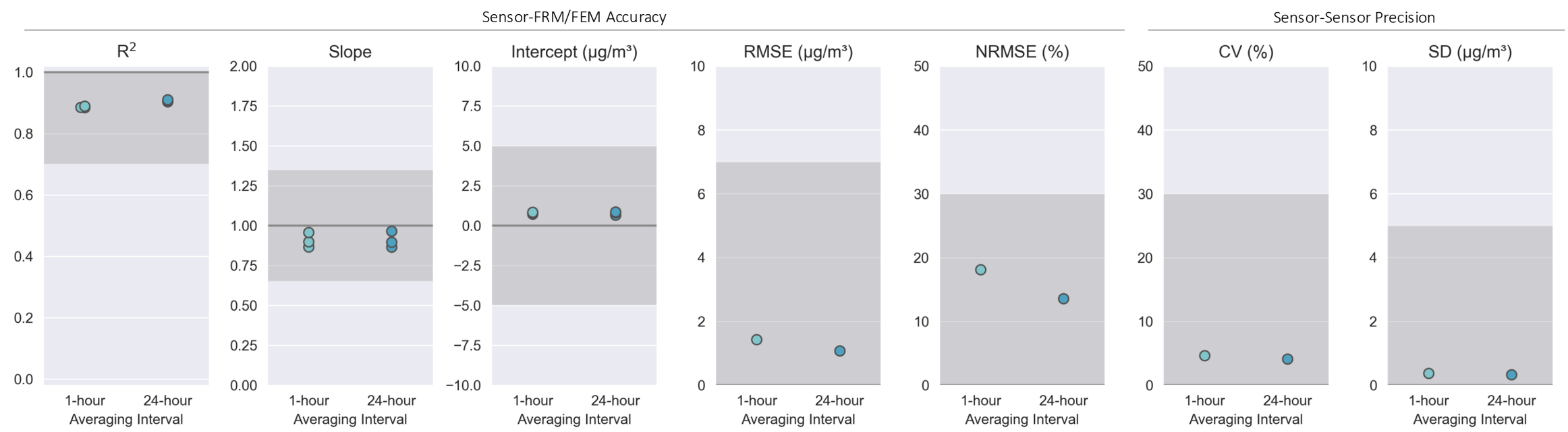


Scatter Plots: Comparison to FRM/FEM

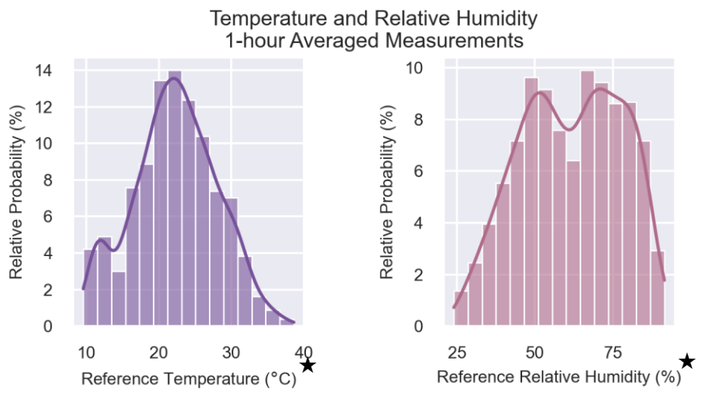


Range of FRM/FEM concentrations over duration of base test (µg/m³)	[1-hr] 1.6-29.7, avg: 7.9, [24-hr] 2.2-17.8, avg: 7.9
Number of 24-hr periods in FRM/FEM monitor measurements with a goal concentration ≥ 25 µg/m³	0

Performance Metrics★

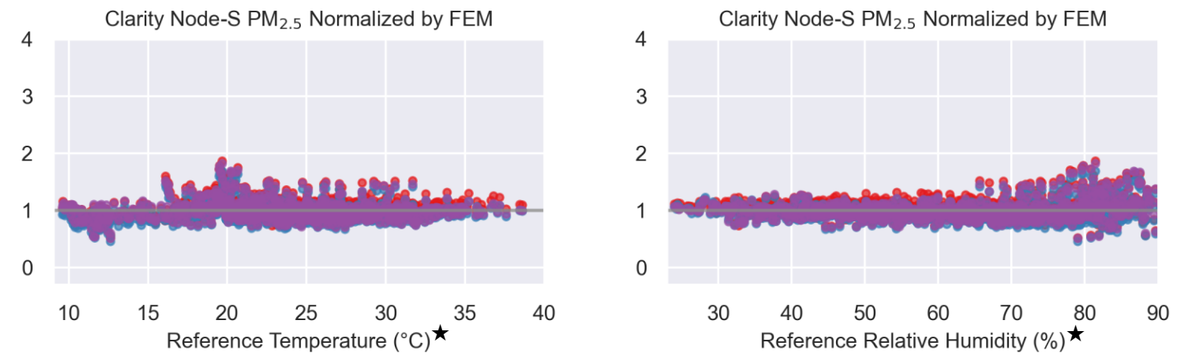


Meteorological Conditions During Deployment



Number of 24-hr periods outside sensor manufacture-listed temperature operational range (no operational range specified)	-
Number of 24-hr periods outside sensor manufacture-listed relative humidity operational range (no operational range specified)	-

Meteorological Influence



Mean number of paired, normalized concentration and temperature values (1-hr averages)	1464
Mean number of paired, normalized concentration and relative humidity values (1-hr averages)	1464

★The reference station does not have meteorological instrumentation, so the reported temperature and relative humidity measurements are from the Clarity Node-S's internal temperature and relative humidity sensor.

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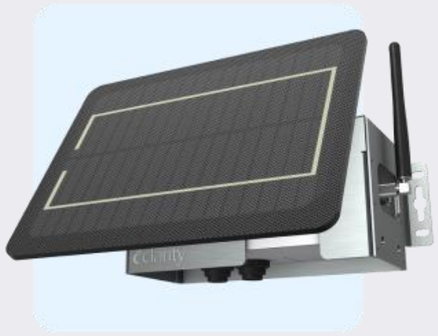

Tabular Statistics

Sensor-FRM/FEM Correlation

	Bias and Linearity						Data Quality			
	R^2		Slope		Intercept (µg/m³)		Uptime (%)		Number of paired sensor and FRM/FEM concentration values	
	1-Hour ●●●	24-Hour ●●●	1-Hour ●●●	24-Hour ●●●	1-Hour ●●●	24-Hour ●●●	1-Hour ●●●	24-Hour ●●●	1-Hour	24-Hour
Metric Target Range	≥ 0.70	≥ 0.70	1.0 ± 0.35	1.0 ± 0.35	-5 ≤ b ≤ 5	-5 ≤ b ≤ 5	75%*	75%*	-	-
Sensor AW744YTJ	0.88	0.90	0.96	0.96	0.71	0.65	100	100	1433	61
Sensor A6TN34QJ	0.89	0.91	0.87	0.86	0.79	0.79	100	100	1431	61
Sensor AFMMMF47	0.89	0.91	0.90	0.90	0.83	0.85	100	100	1433	61
Mean	0.89	0.91	0.91	0.91	0.78	0.76	100	100	1432	61

	Error			
	RMSE (µg/m³)		NRMSE (%)	
	1-Hour ★	24-Hour ★	1-Hour ★	24-Hour ★
Metric Target Range	≤ 7.0	≤ 7.0	≤ 30.0	≤ 30.0
Deployment Value	1.4	1.1	18.1	13.6

Device-specific metrics (computed for each sensor in evaluation)
- ○○○ Metric value for none of devices tested falls within the target range
- ●○○ Metric value for one of devices tested falls within the target range
- ●●○ Metric value for two of devices tested falls within the target range
- ●●● Metric value for three of devices tested falls within the target range

Single-valued metrics (computed via entire evaluation dataset)
- ☆ Indicates that the metric value is not within the target range
- ★ Indicates that the metric value is within the target range

Sensor-Sensor Precision

	Precision (between collocated sensors)				Data Quality	
	CV (%)		SD (µg/m³)		Number of concurrent sensor concentration pairs	
	1-Hour ★	24-Hour ★	1-Hour ★	24-Hour ★	1-Hour	24-Hour
Metric Target Range	≤ 30.0	≤ 30.0	≤ 5.0	≤ 5.0	-	-
Deployment Value	4.6	4.1	0.4	0.3	1460	61

*This value is only a recommendation for ensuring data quality and is not included in the list of target values discussed in Section 4 of the Performance Testing Protocols, Metrics, and Target Values for Fine Particulate Matter Air Sensors document.

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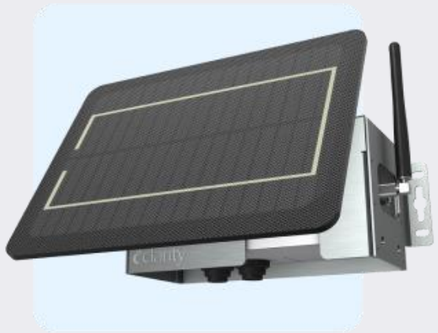
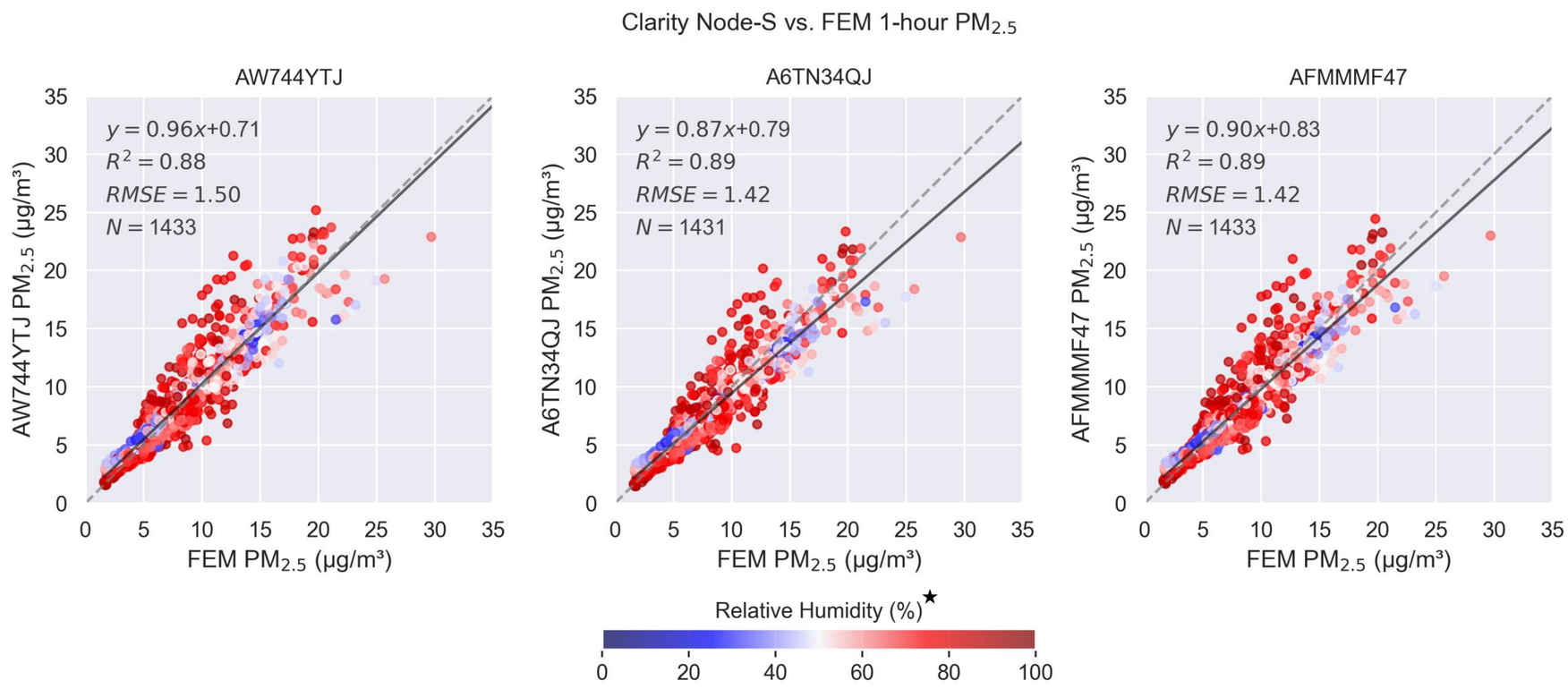
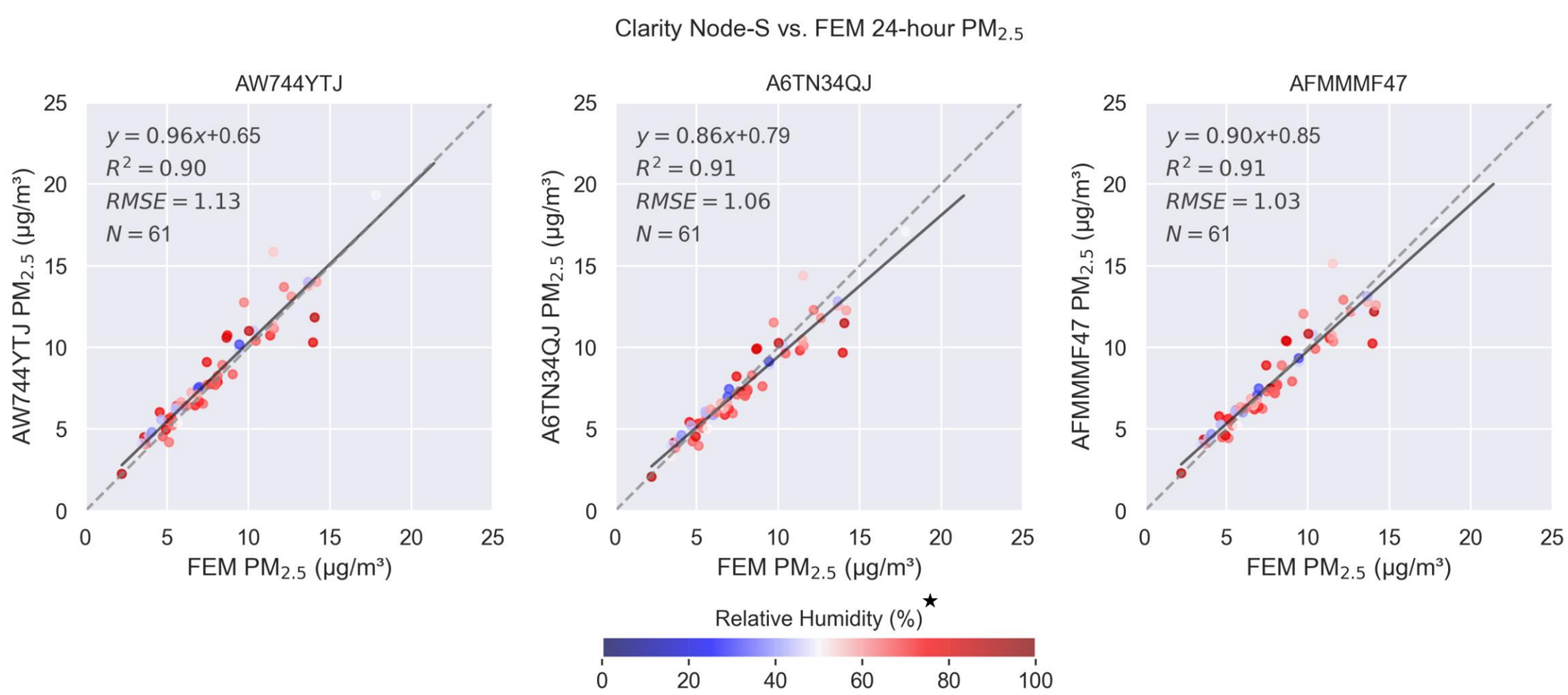


Sensor-FRM/FEM Scatter Plots





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