TES Thomson Environmental Systems
www.thomsongroup.com.au

clarity

Clarity Showcase

March 5th, 2025

Welcome!



David Lu
Co-Founder & CEO



Paolo Micalizzi
Co-Founder & CTO



Meiling Gao, PhD
Co-Founder & COO



Azlan Mirnezami
TES AQMS Category Manager

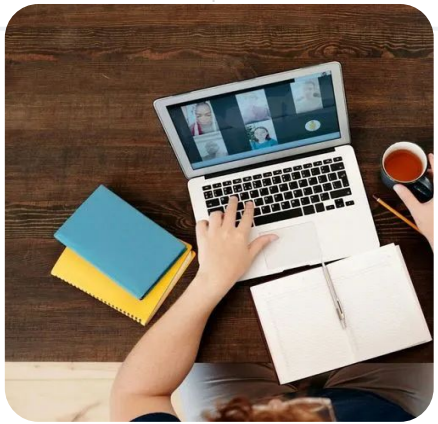

CELEBRATING 10 YEARS!
clarity

Introduced during last Showcase



Black Carbon Module

Global Calibration



Add-On Services

Introduced at the last Showcase

Black Carbon Module



Deploy anywhere

- Integrated heat shield & upgraded pump designed for multi-year outdoor use
- Optionally solar-powered with battery power system

Low-maintenance

- Easy to replace tape cartridge (once a year on average)
- Device status and notifications on Clarity Dashboard

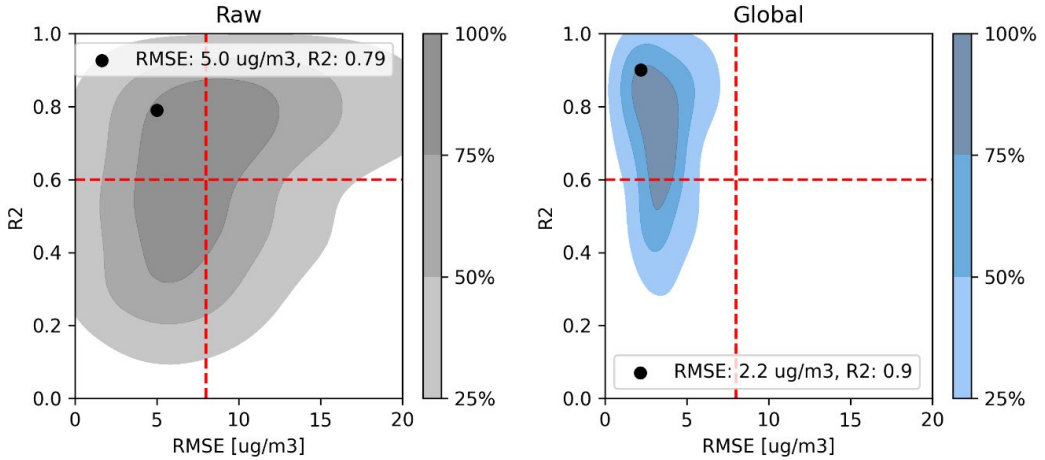
Research-grade measurements

- Accuracy comparable to Gold Standard (Magee AE33)
- Real-time source apportionment


RAC
For the better
brightline
DEFENSE
Black Carbon MODULE
clarity
AETHLABS

Introduced at the last Showcase

Global Calibration



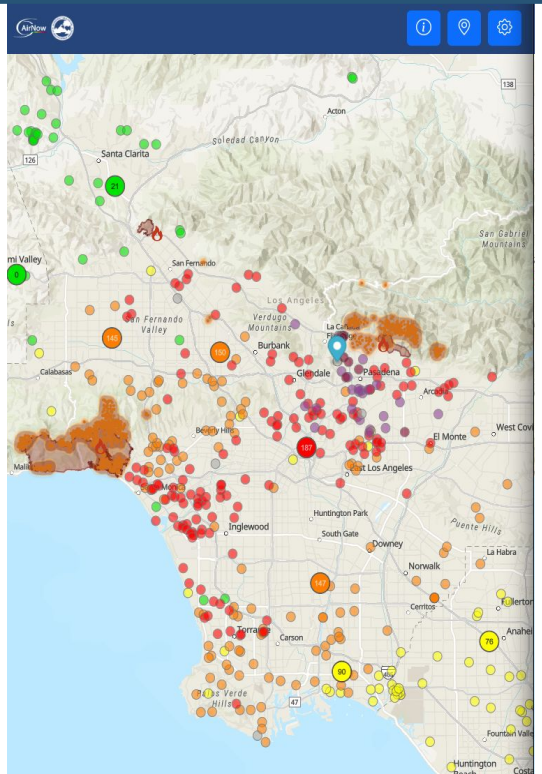
450+
Collocated Clarity Nodes

2,000+
Collocation Months

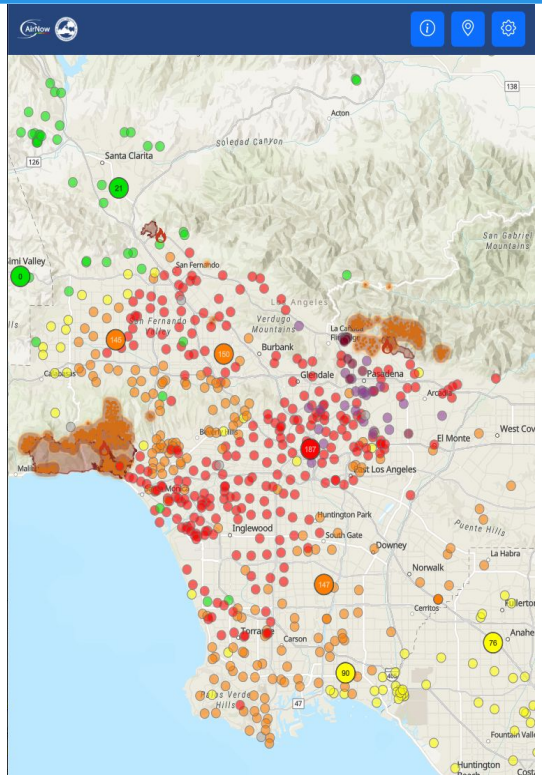
45+
Collocation Cities

6,000,000+
Collocated Measurements

EPA Fire & Smoke Map without Clarity



EPA Fire & Smoke Map with Clarity



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Introduced at the last Showcase

Add-On Services

RAC
For the better

National Environment Agency
Safeguard · Nurture · Cherish

ADB
ASIAN DEVELOPMENT BANK

Environmental Management Bureau
National Capital Region

Alkali Environmental

Adams County
Colorado

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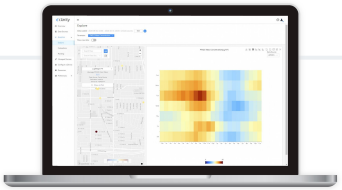
Sensing-as-a-Service℠



Air Monitoring Equipment

Measures all key air pollutants

- Quick and easy installation
- Solar-powered, always online
- Modular design for expandability
- Low-maintenance with free warranty



Clarity Cloud & Software

Cloud-based data analysis

- Natively-integrated IoT dashboard
- Secure data pipeline & storage
- Powerful APIs, analytics and visualization



Air Quality Expert Team

Scalable project support

- Highly qualified air quality experts
- Accurate and reliable data through Remote Calibration
- Responsive project management enabled by modern software stack

Guiding principles for Clarity products

1
Answer more questions

2
Trust your data

3
Accelerate your impact

Guiding principles for Clarity products

1

Answer more questions

2

Trust your data

3

Accelerate your impact

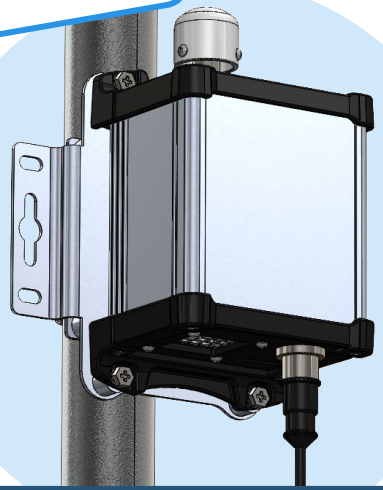
Two new Add-On Modules

Available now!



Multi-Gas Module

Piloting now!

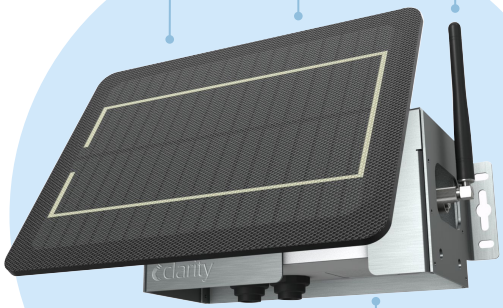


Dust Module

Weather/UV resistant (IPX3 Rated)

Solar powered

Global cellular connectivity



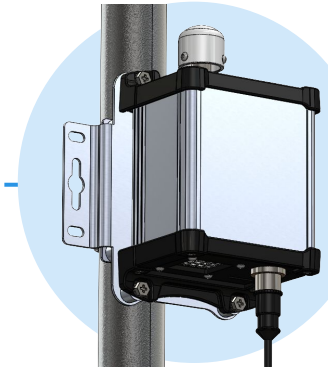
$PM_{2.5}$

NO_2

Easy installation < 10 minutes

Node-S provides power & cellular connectivity





Multi-Gas Module

Criteria pollutant and traffic emissions monitoring

Measurement Parameters

- Carbon Monoxide (CO)
- Ozone (O_3)
- Nitrogen Oxides (NO, NO_2 and NO_x)

Specifications

- Solar-powered — runs on Node-S power system
- UV-resistant, weatherproof housing



Available for purchase!



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Multi-Gas Module use cases

CO and wildfires

- CO is a byproduct of combustion, emitted by both wildfires and urban sources.
- Wildfires produce significantly more $PM_{2.5}$ per unit of CO than urban sources.
- The $PM_{2.5}$-to-CO ratio helps distinguish wildfire smoke from urban pollution.

NO_x and traffic

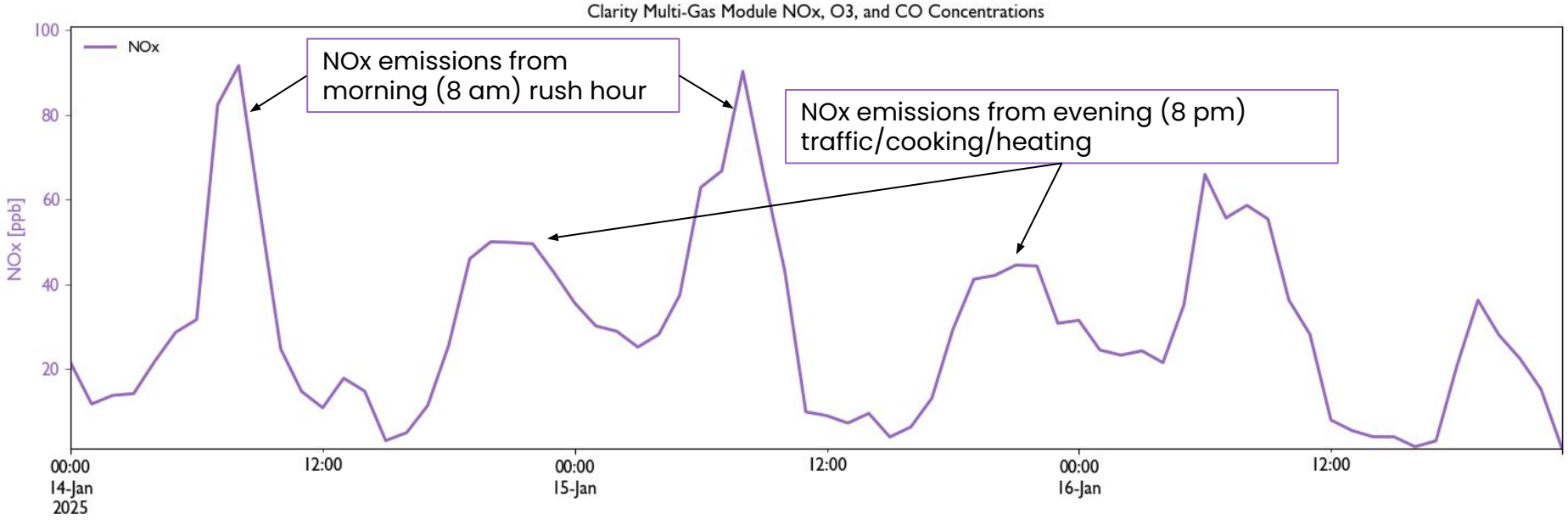
- High NO and NO_2 levels identify traffic-related pollution hotspots.
- A higher NO-to-NO_2 ratio indicates fresh emissions near the source, while a lower ratio suggests chemical transformation as the air moves further away

O_3 non-attainment and smog formation

- Quantify diurnal pattern of NO_x (morning, evening peaks) and O_3 (afternoon peak)
- Elevated NO_x and O_3 together signal strong photochemical activity and smog formation.

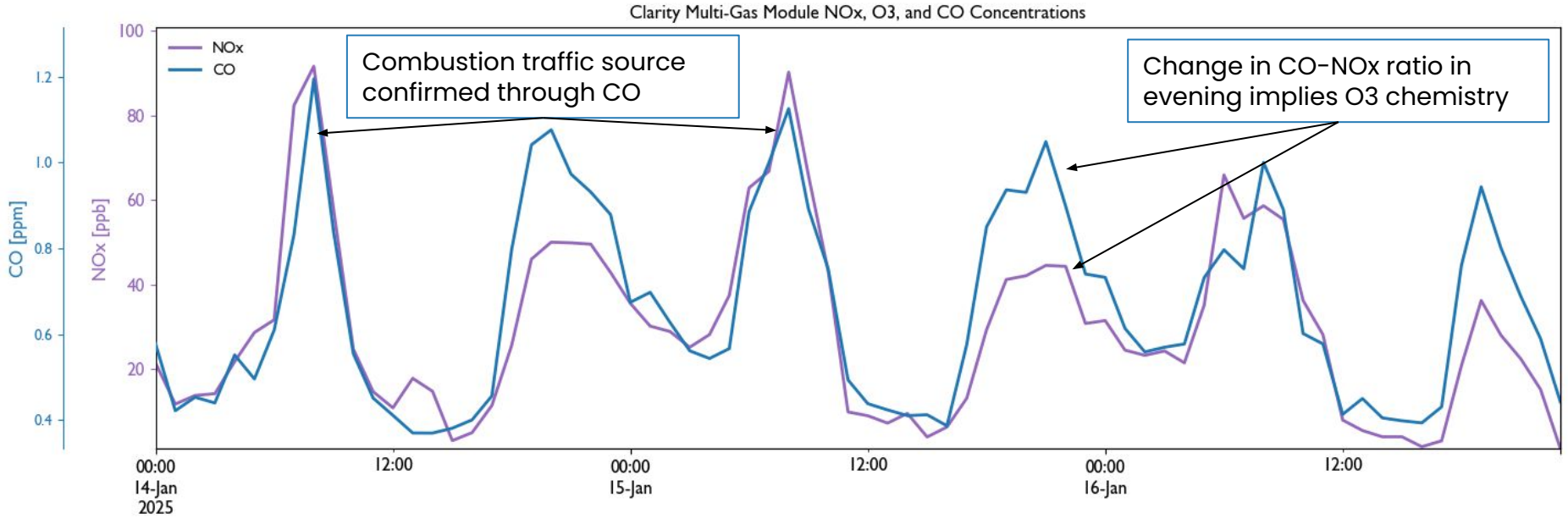


An example from Berkeley



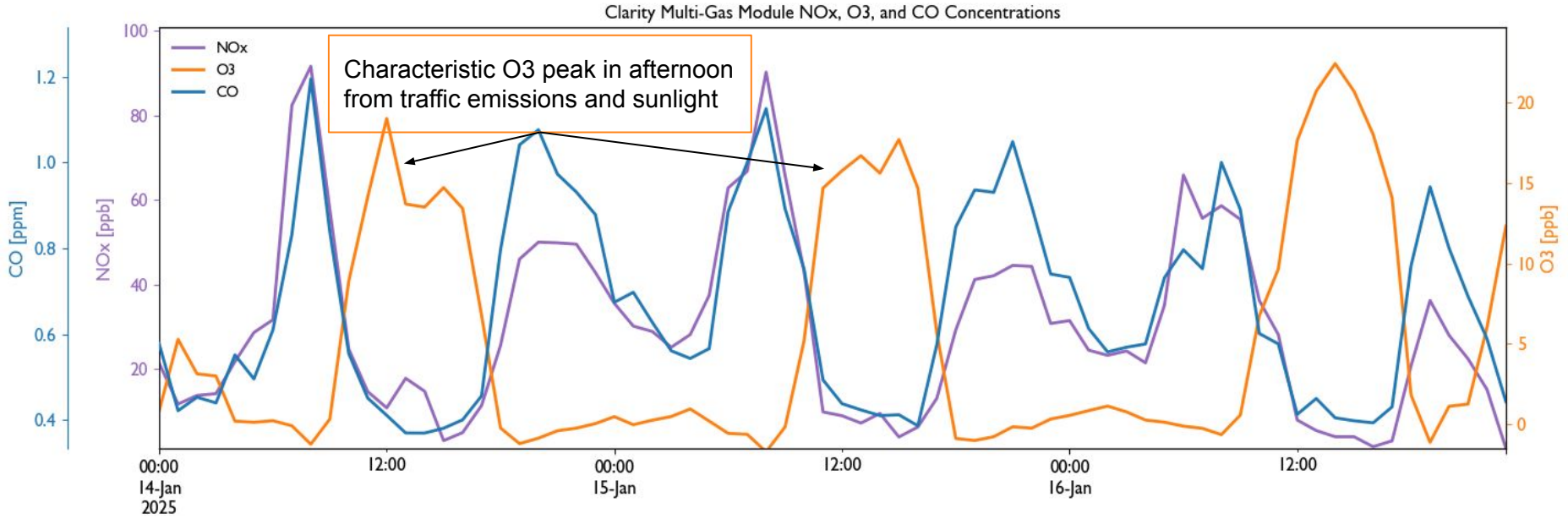


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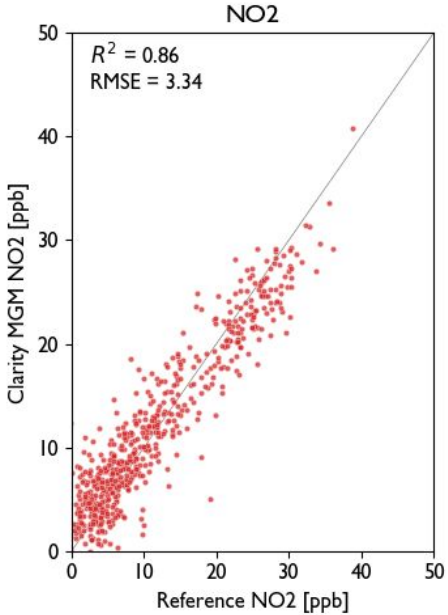


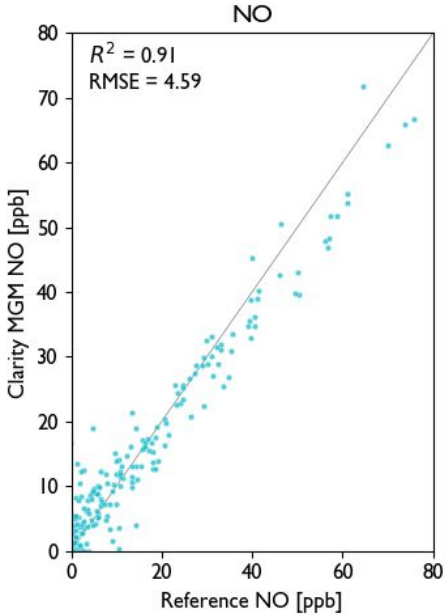
An example from Berkeley

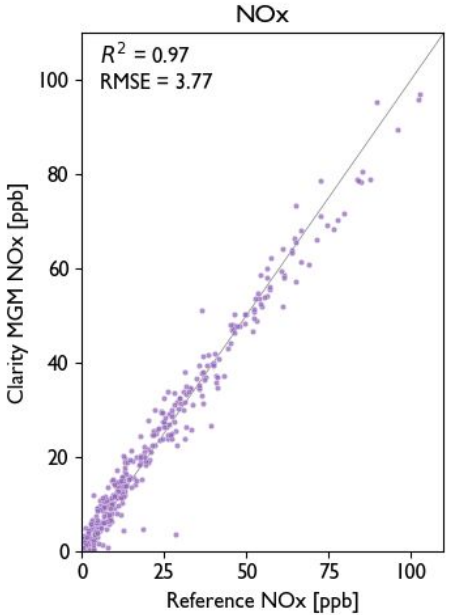


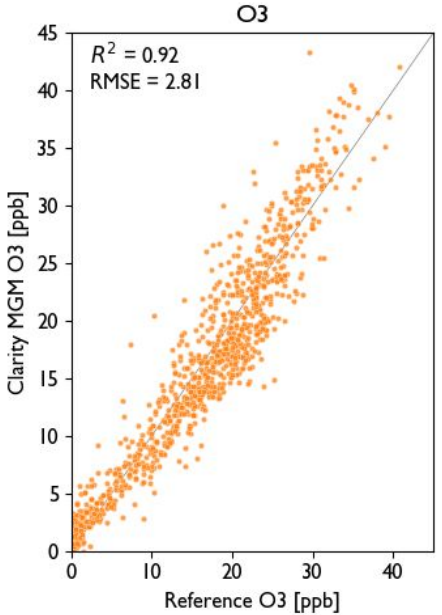


Preliminary performance data









Dust Module

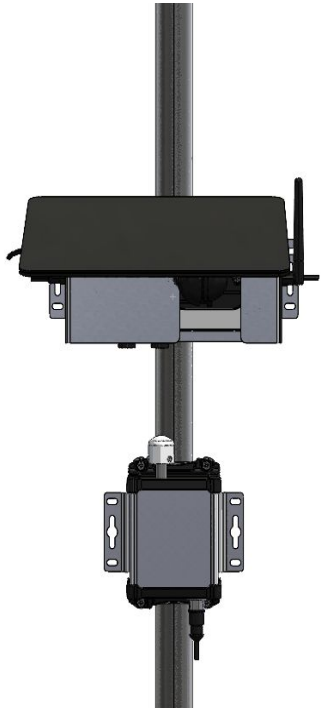
Accurate coarse mode PM detection

Measurement Parameters

- Particulate Matter (PM10)
- Total Suspended Particles (TSP)

Specifications

- TBD, still under development
- **Contact Clarity if you are interested in pilot testing!**



Available for pilots!



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Dust Module use cases

Fence-line dust control

- Ideal for industrial sites, mines, and construction sites
- Captures both fine particles (equipment exhaust) and coarse dust (blasting, drilling, earth-moving)

Community monitoring & transparency

- Builds trust by sharing real-time dust data with communities neighboring industrial operations
- Quantifies visible dust clouds and shows mitigation efforts

Health impact quantification

- Quantify coarse mode PM levels in areas with high natural dust resuspension, unpaved roads, wildfires ash

clarity

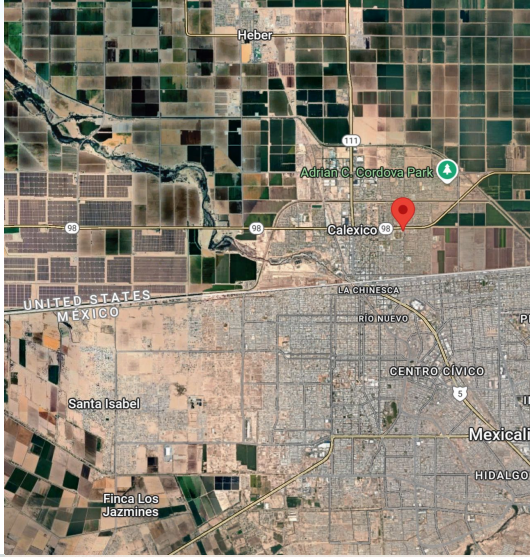
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Objective: Identify monitoring site with challenging test conditions.

Criteria:

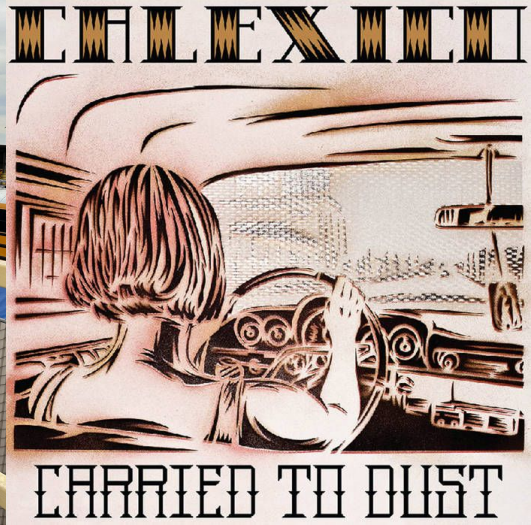
- $PM_{2.5}$ and PM_{10} FEM instrumentation
- Frequent PM_{10} concentrations peaks (>250 µg/m³)
- Distinct $PM_{2.5}$ / PM_{10} regimes (dust + urban sources)
- Elevated median PM_{10} levels

Finding: Calexico satisfied all criteria.

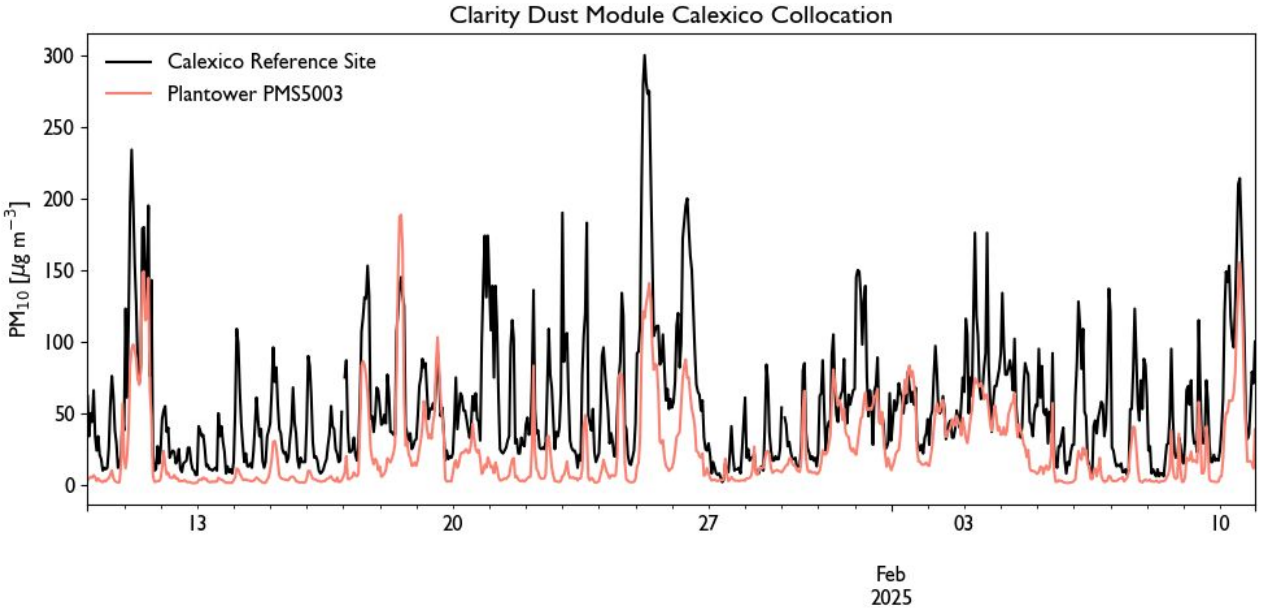


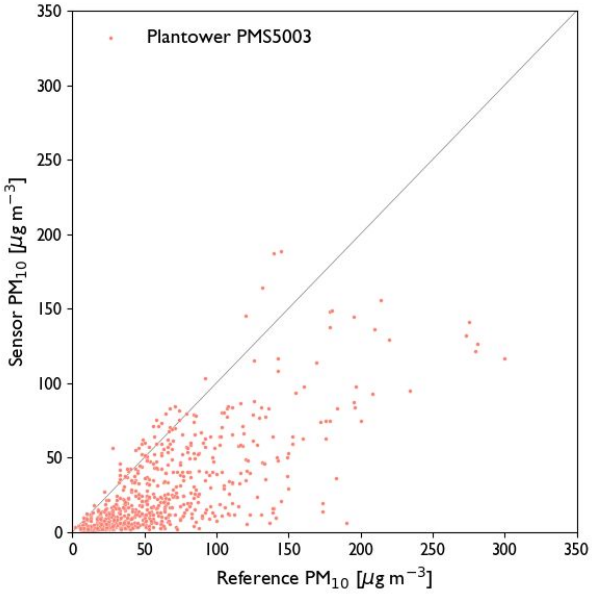






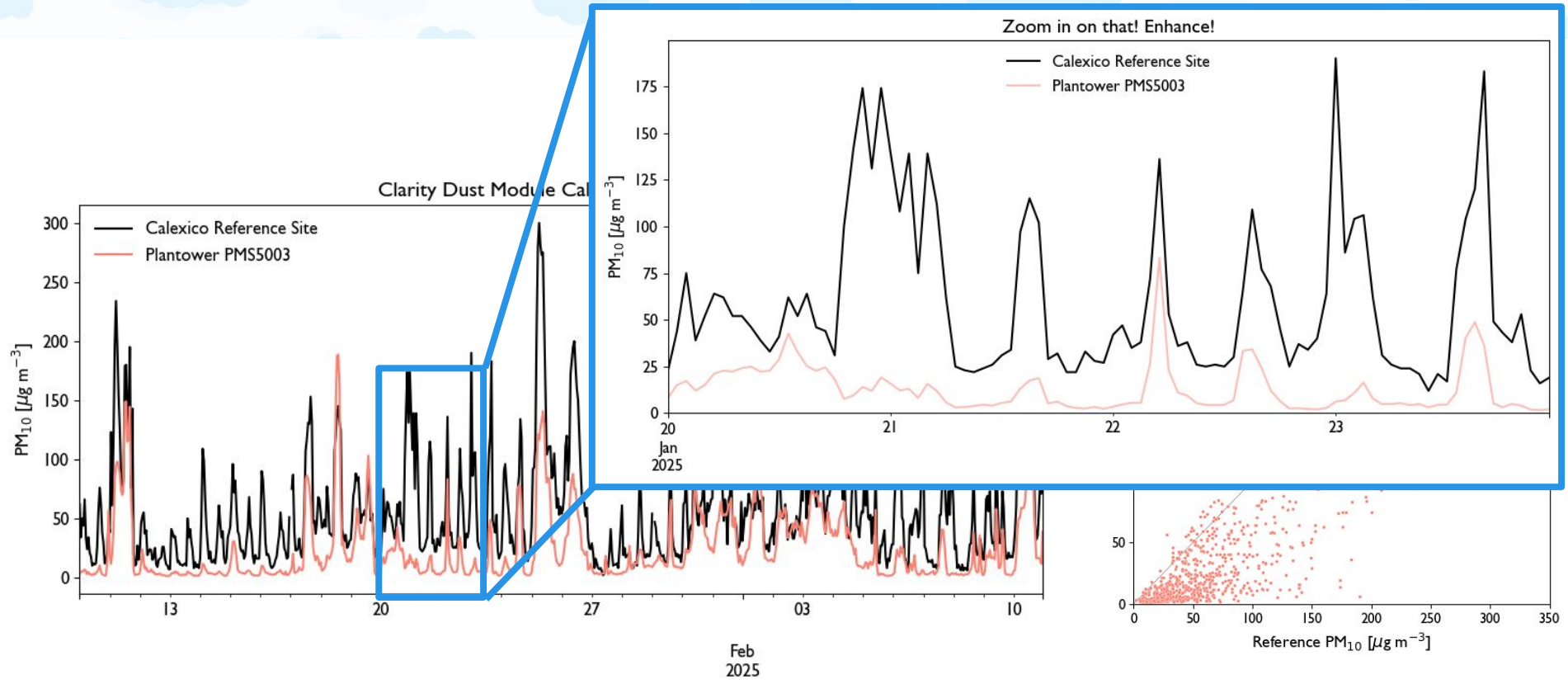
Dust Module


Clarity Dust Module Calexico Collocation
Calexico Reference Site
Plantower PMS5003
PM10 [μg m−3]
300
250
200
150
100
50
0
13
20
27
03
10
Feb
2025

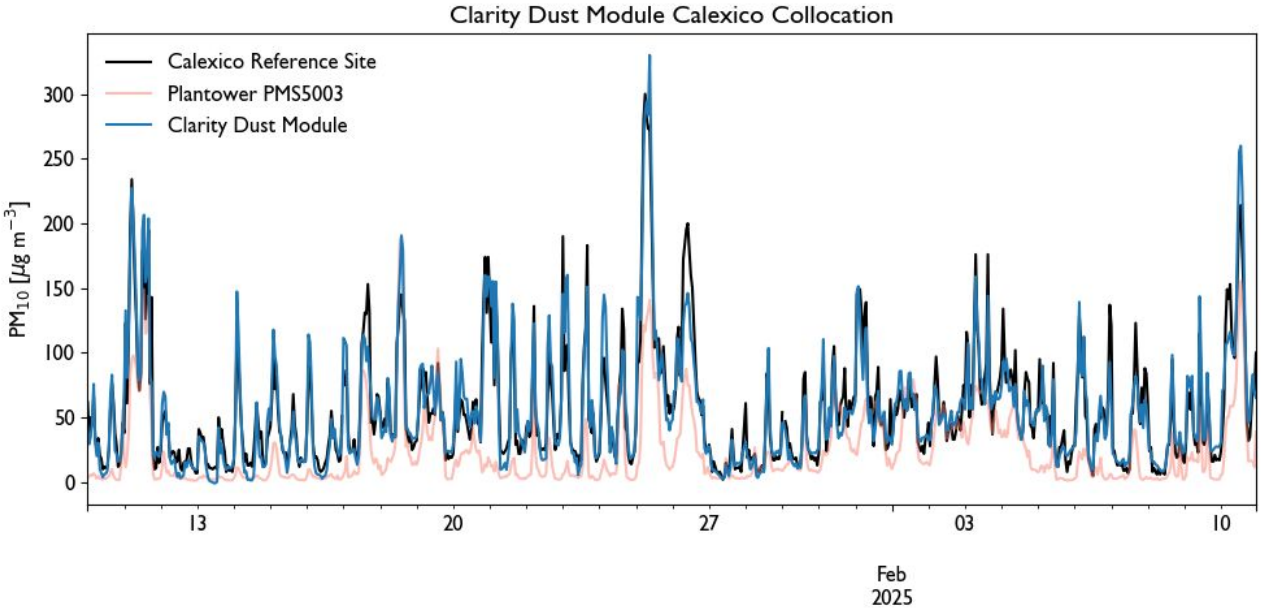

Plantower PMS5003
Sensor PM10 [μg m−3]
Reference PM10 [μg m−3]
350
300
250
200
150
100
50
0
0
50
100
150
200
250
300
350

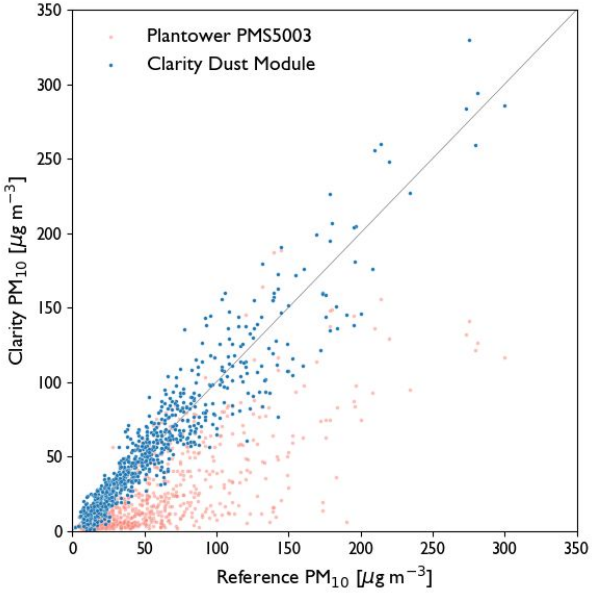
clarity

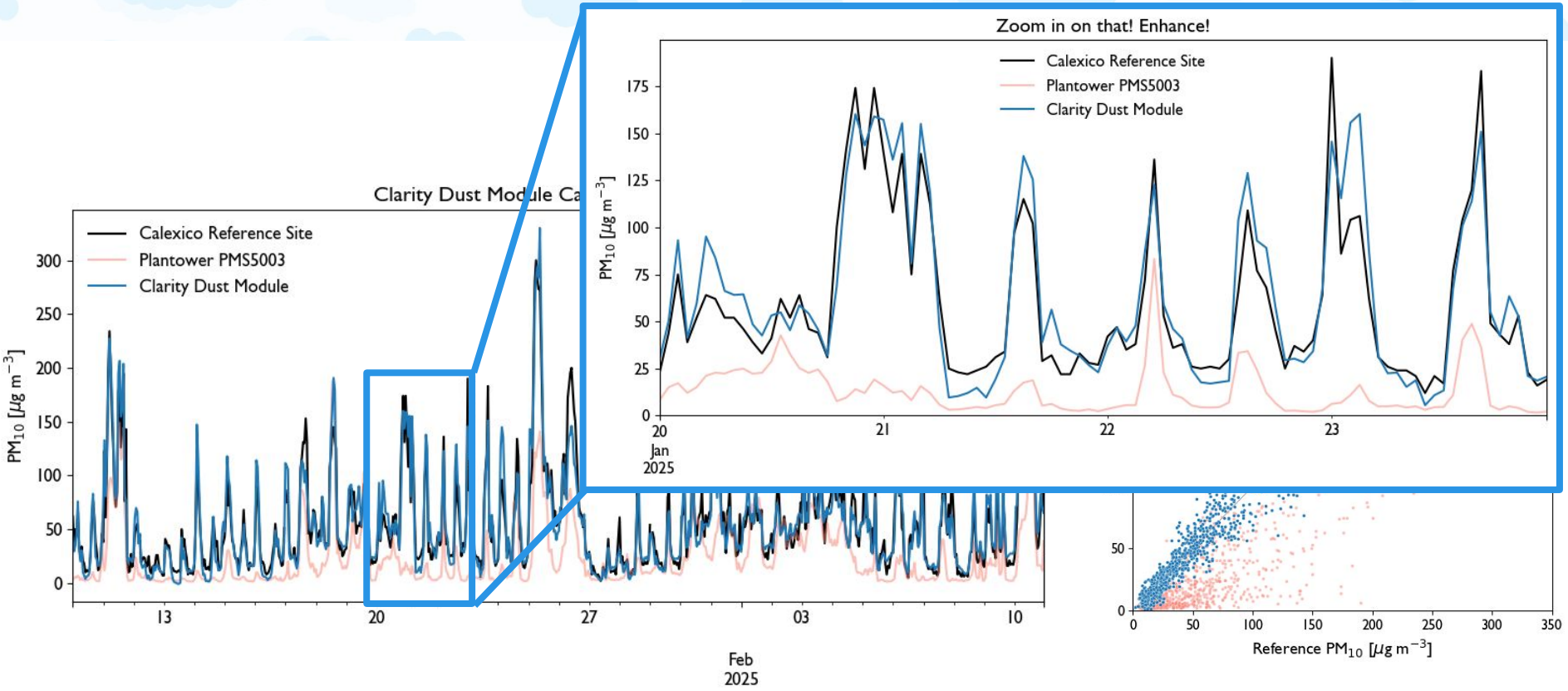
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Dust Module


Clarity Dust Module Calexico Collocation
Calexico Reference Site
Plantower PMS5003
Clarity Dust Module
PM10 [μg m−3]
0
50
100
150
200
250
300
13
20
27
03
10
Feb
2025


Plantower PMS5003
Clarity Dust Module
Clarity PM10 [μg m−3]
Reference PM10 [μg m−3]
0
50
100
150
200
250
300
350


Zoom in on that! Enhance!
Calexico Reference Site
Plantower PMS5003
Clarity Dust Module
PM10 [μg m−3]
175
150
125
100
75
50
25
0
20
Jan
2025
21
22
23
Clarity Dust Module Ca
Calexico Reference Site
Plantower PMS5003
Clarity Dust Module
PM10 [μg m−3]
300
250
200
150
100
50
0
13
20
27
03
10
Feb
2025
50
0
0
50
100
150
200
250
300
350
Reference PM10 [μg m−3]

Guiding principles for Clarity products

1

Answer more questions

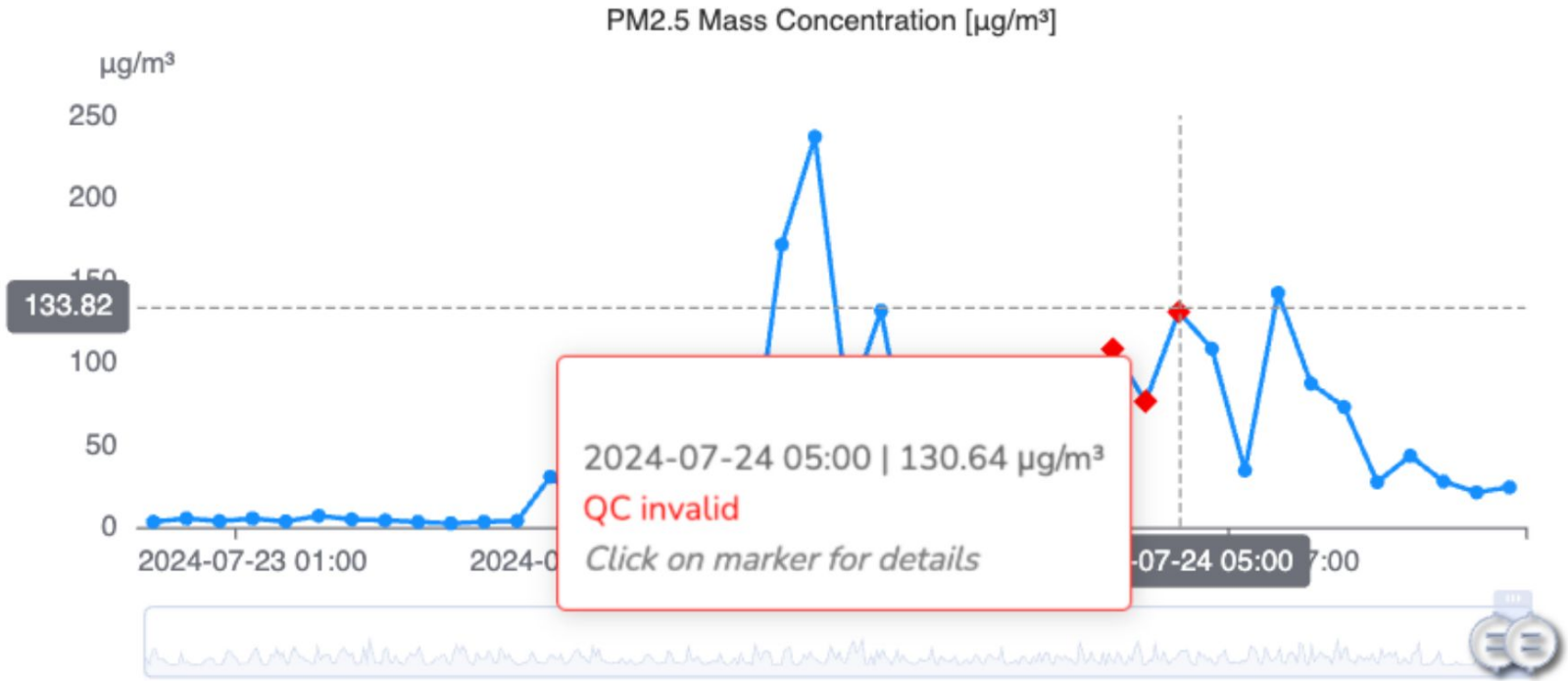
2

Trust your data

3

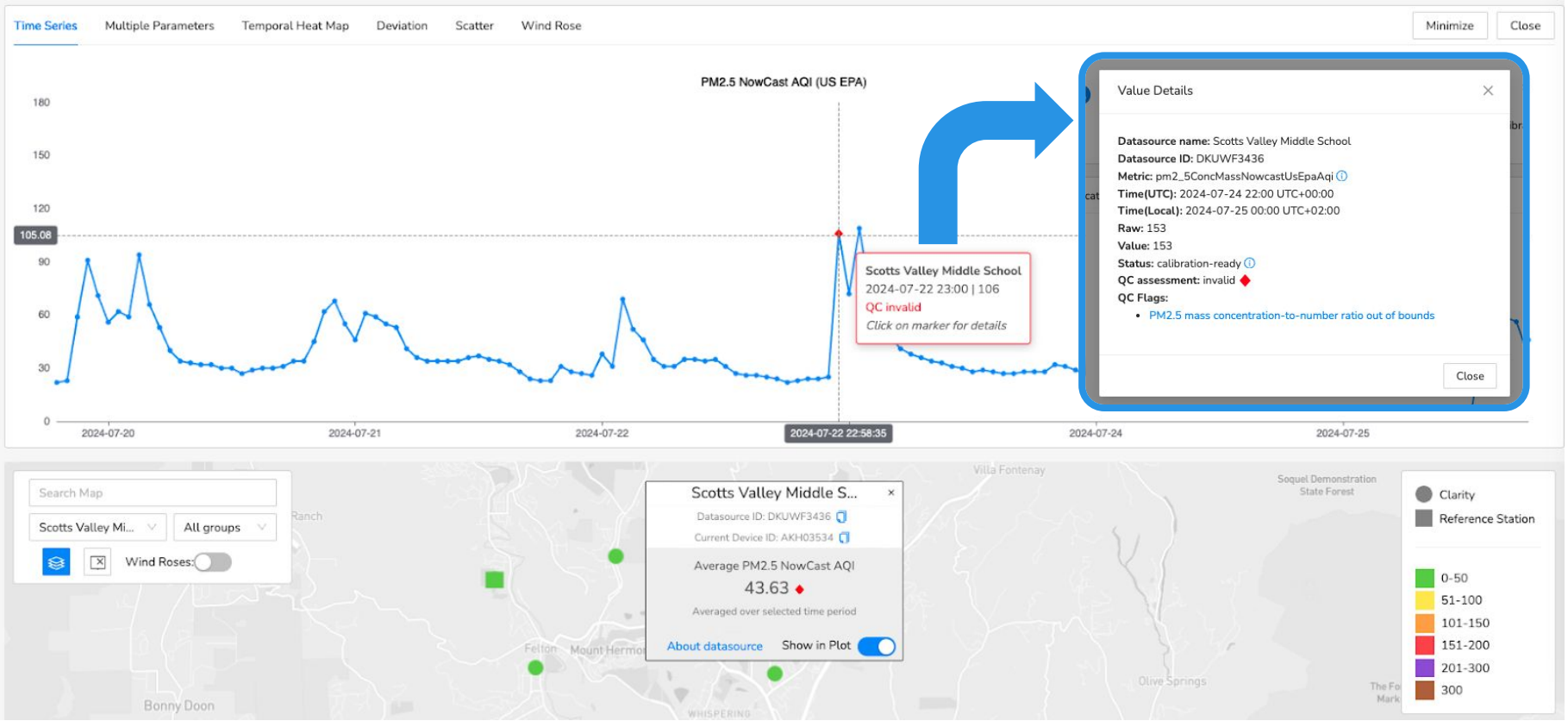
Accelerate your impact

Automated QC



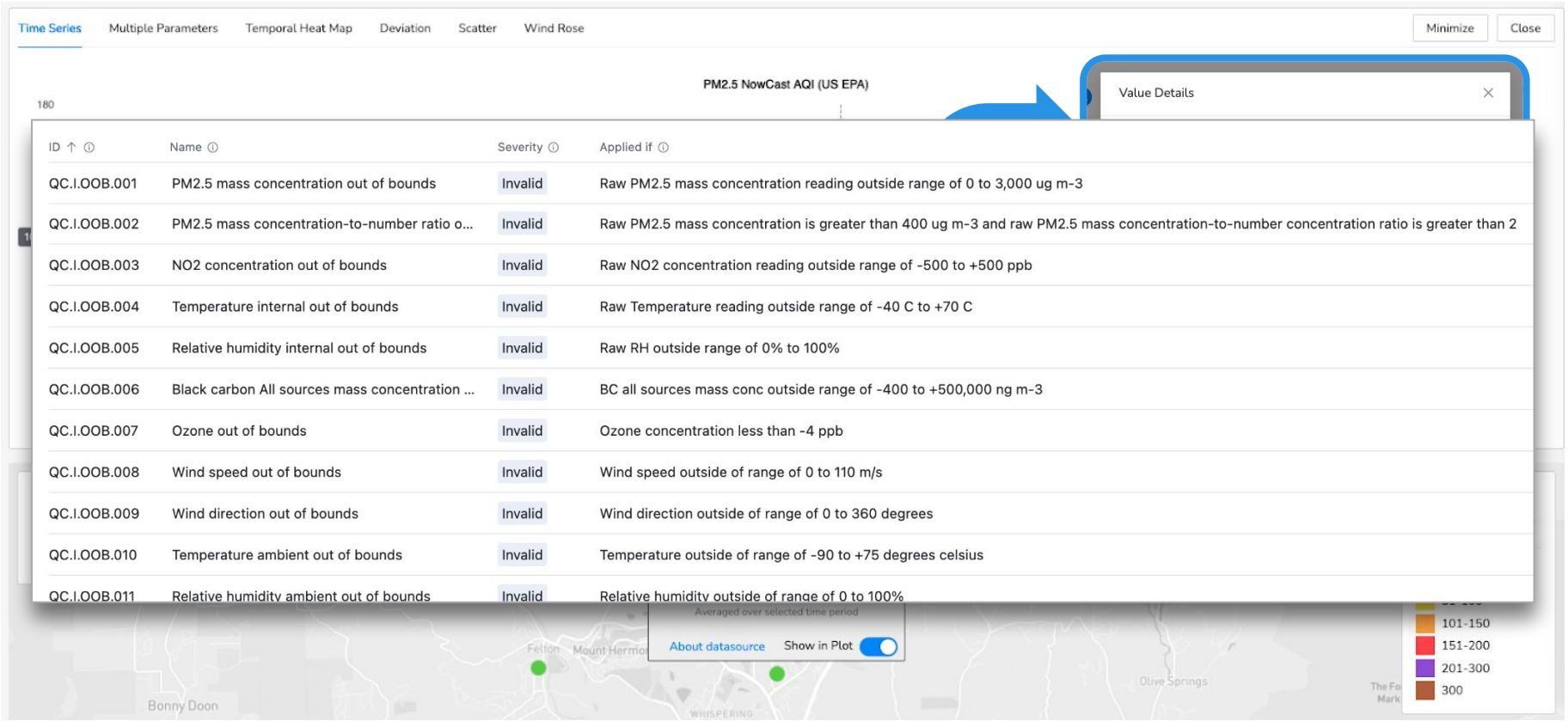
Automated QC in the Clarity Cloud

QC flags to easily identify suspicious measurements



Automated QC in the Clarity Cloud

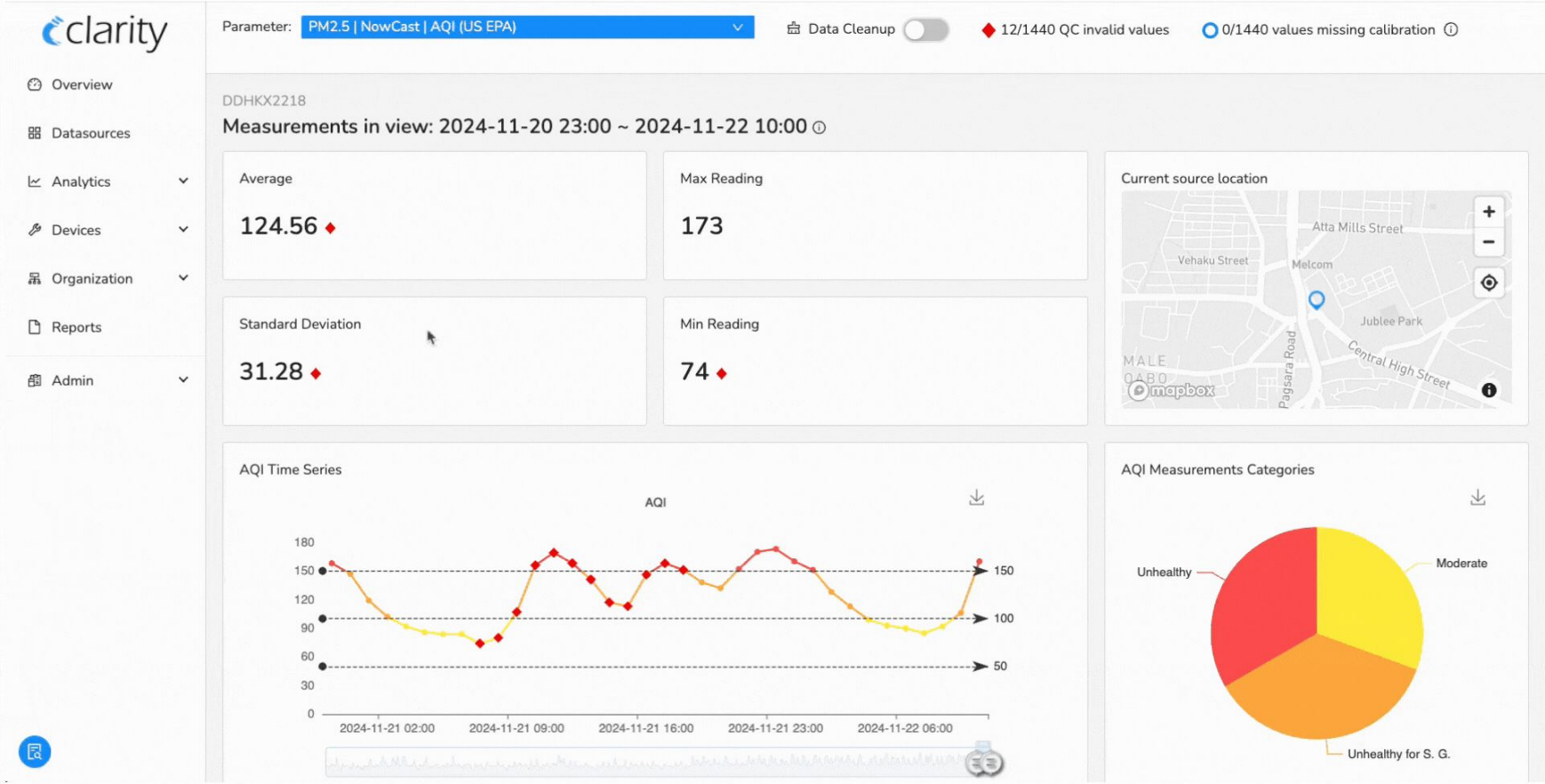
QC flags to easily identify suspicious measurements



ID	Name	Severity	Applied if
QC.I.OOB.001	PM2.5 mass concentration out of bounds	Invalid	Raw PM2.5 mass concentration reading outside range of 0 to 3,000 ug m-3
QC.I.OOB.002	PM2.5 mass concentration-to-number ratio o...	Invalid	Raw PM2.5 mass concentration is greater than 400 ug m-3 and raw PM2.5 mass concentration-to-number concentration ratio is greater than 2
QC.I.OOB.003	NO2 concentration out of bounds	Invalid	Raw NO2 concentration reading outside range of -500 to +500 ppb
QC.I.OOB.004	Temperature internal out of bounds	Invalid	Raw Temperature reading outside range of -40 C to +70 C
QC.I.OOB.005	Relative humidity internal out of bounds	Invalid	Raw RH outside range of 0% to 100%
QC.I.OOB.006	Black carbon All sources mass concentration ...	Invalid	BC all sources mass conc outside range of -400 to +500,000 ng m-3
QC.I.OOB.007	Ozone out of bounds	Invalid	Ozone concentration less than -4 ppb
QC.I.OOB.008	Wind speed out of bounds	Invalid	Wind speed outside of range of 0 to 110 m/s
QC.I.OOB.009	Wind direction out of bounds	Invalid	Wind direction outside of range of 0 to 360 degrees
QC.I.OOB.010	Temperature ambient out of bounds	Invalid	Temperature outside of range of -90 to +75 degrees celsius
QC.I.OOB.011	Relative humidity ambient out of bounds	Invalid	Relative humidity outside of range of 0 to 100%

Automated QC in the Clarity Cloud

Data Cleanup Toggle to easily remove QC-flagged measurements



Guiding principles for Clarity products

1

Answer more questions

2

Trust your data

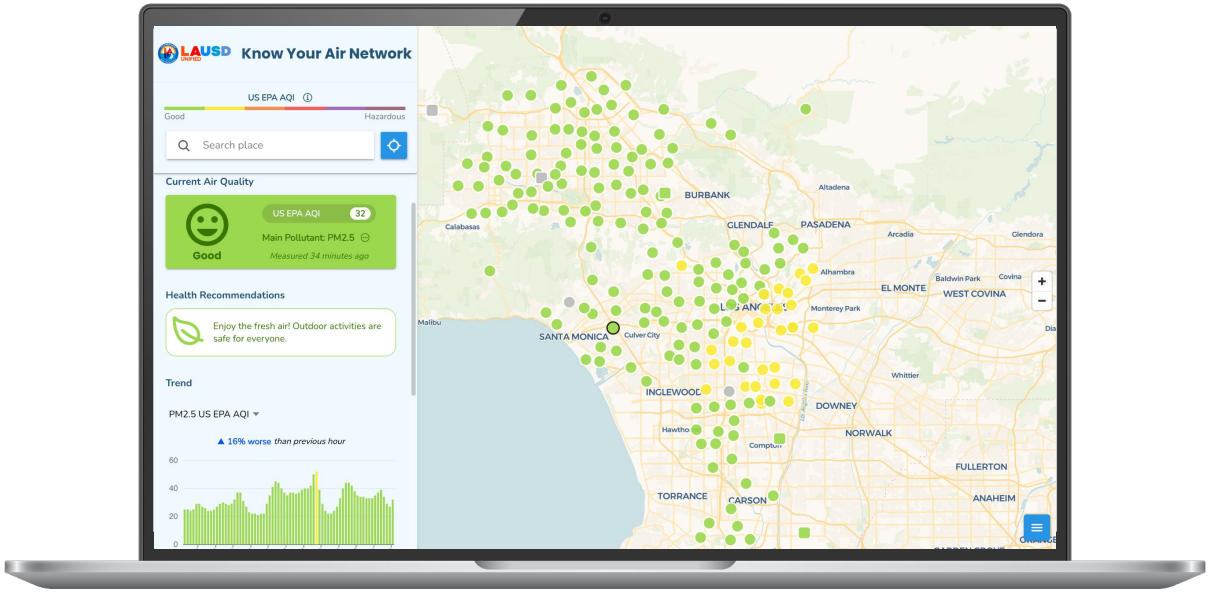
3

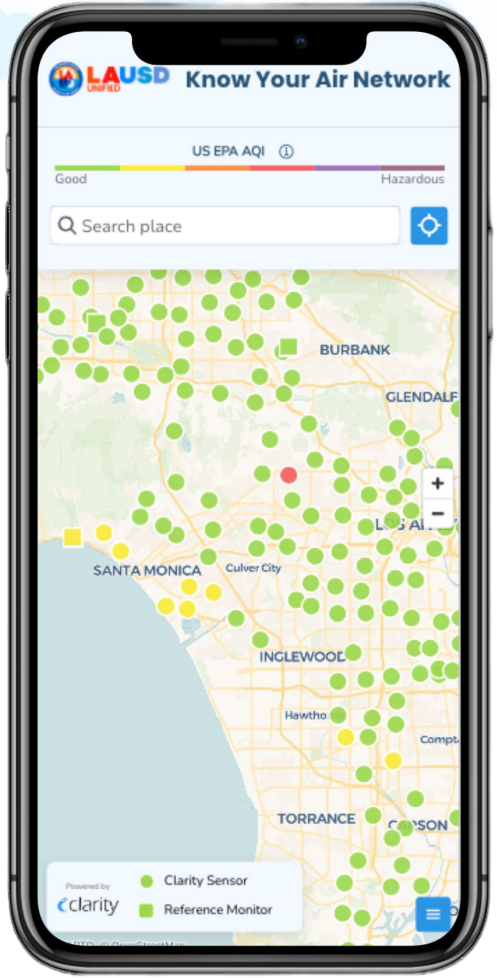
Accelerate your impact

clarity

2025 Clarity Showcase

New and improved OpenMap public data sharing platform



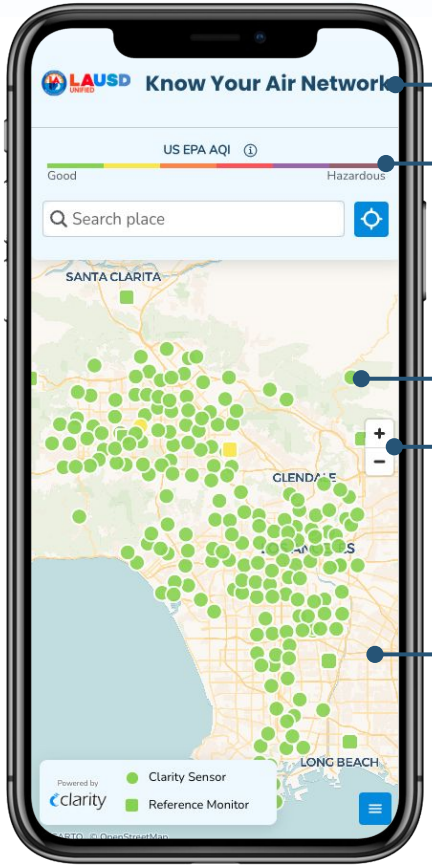


clarity

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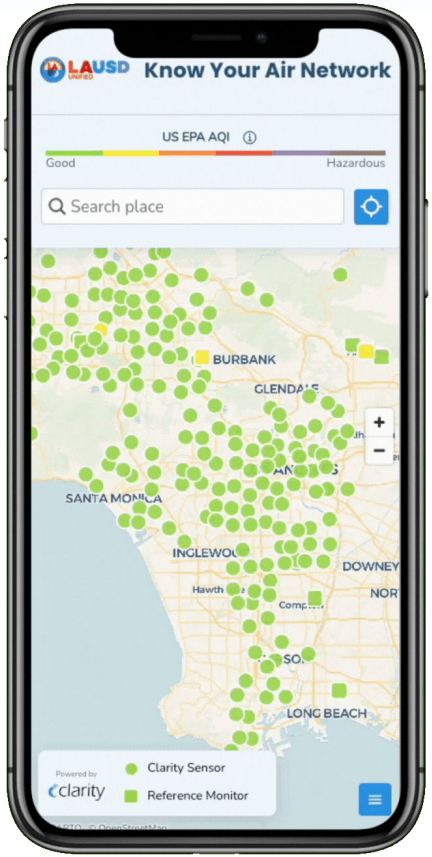
Customizable Branding

Configurable AQI

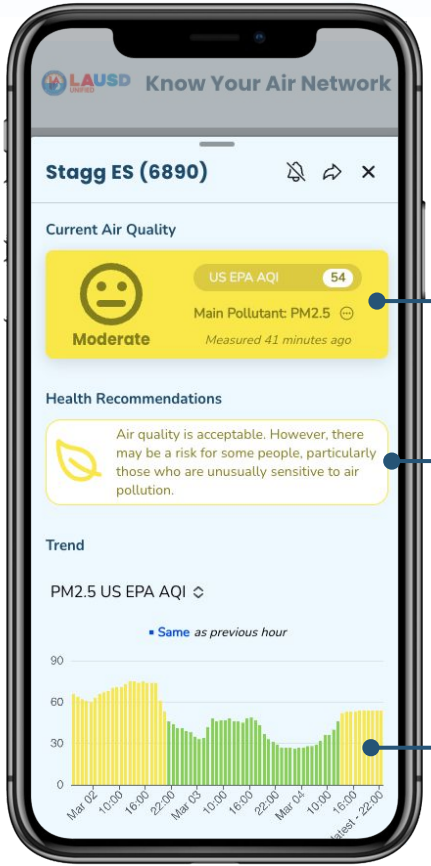
Live data

Intuitive map-based UI

Mobile friendly



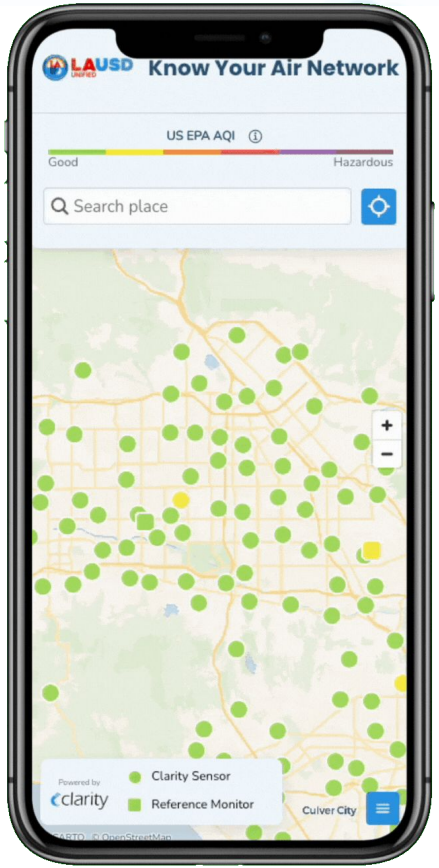
Easily search location and view relevant air quality information



Straightforward messaging

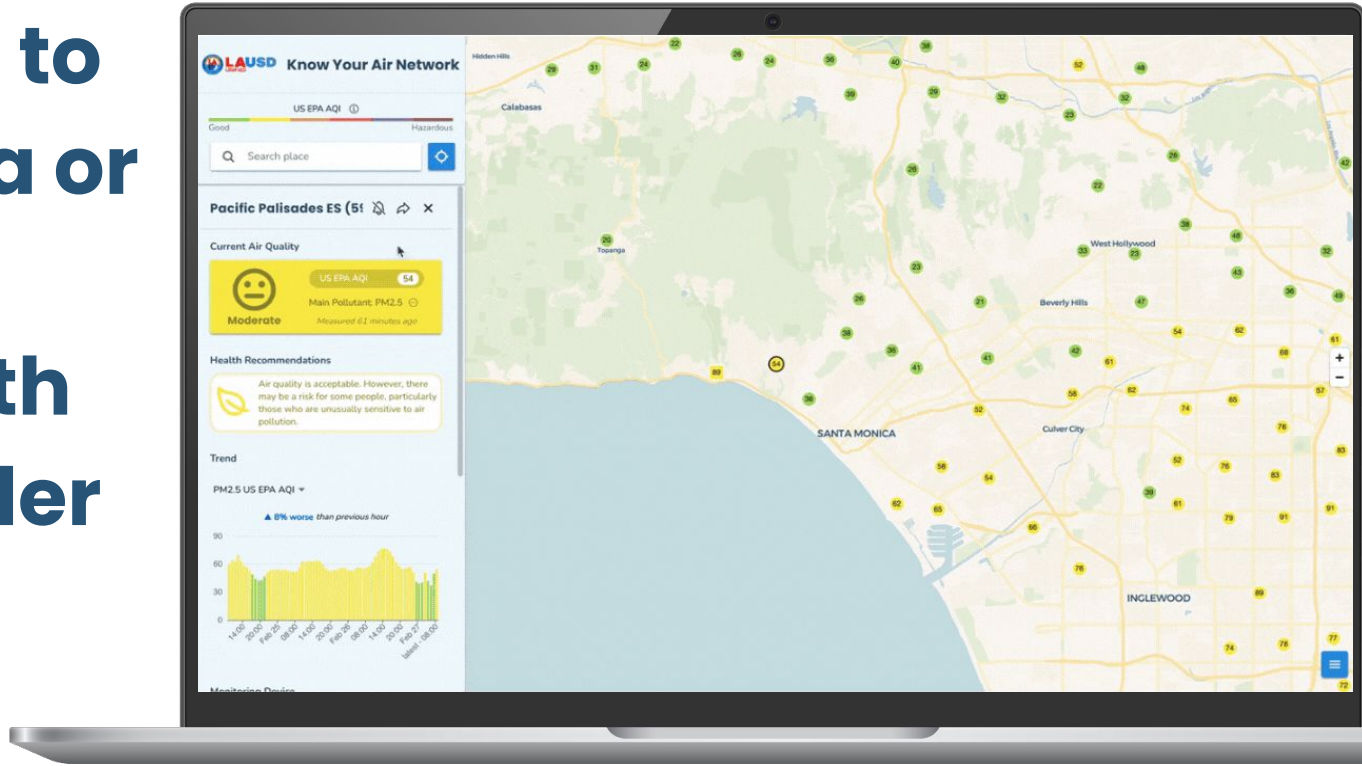
Modifiable AQI-based health tips

Clear charts

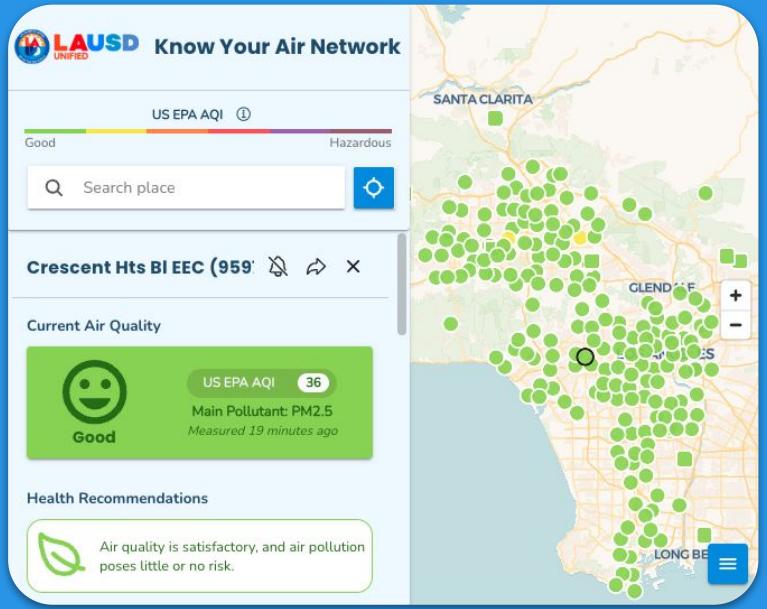


Subscribe to unhealthy air email notifications

Easily share to social media or embed on websites with widget builder

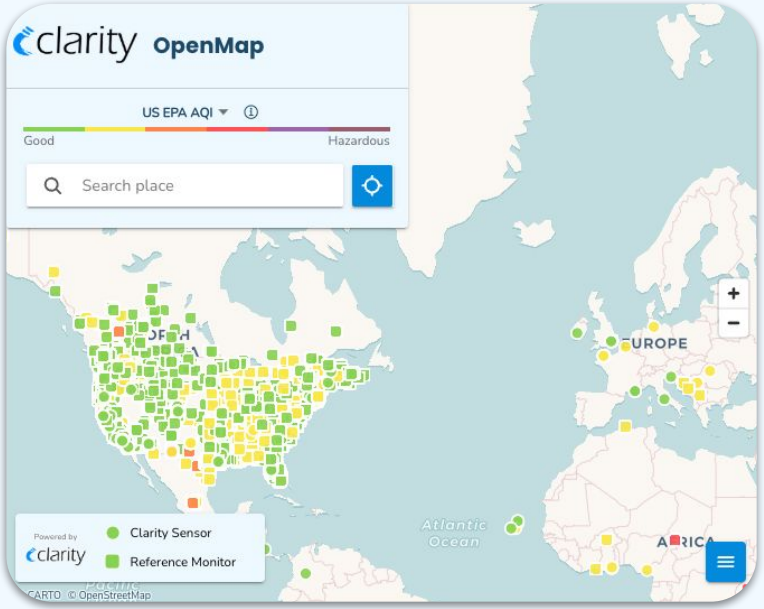


OpenMap Plus



Full-featured

OpenMap



Included with Sensing-as-a-Service

Guiding principles for Clarity products

1

Answer more questions

2

Trust your data

3

Accelerate your impact

New Add-On Services Available



Additional EPM Time



Data Analysis



Network Design Workshops



Program Design



Deployment Support



Air Quality trainings

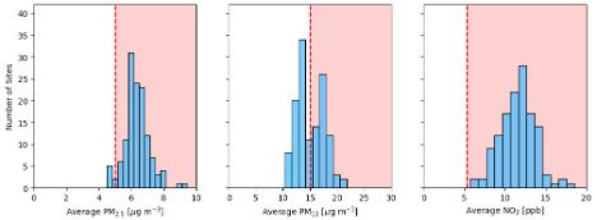
clarity

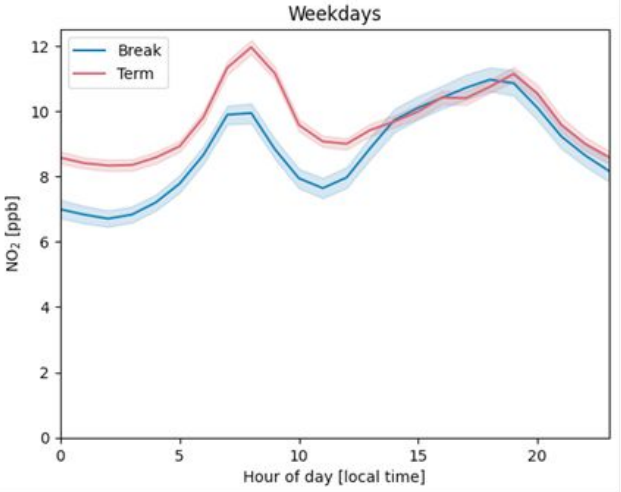
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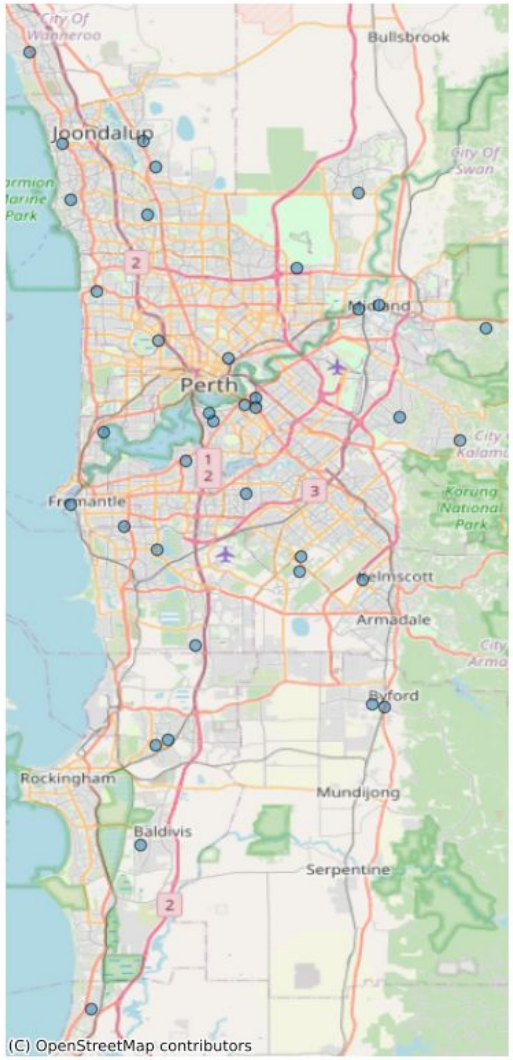
RAC For the better

Traffic-related air pollution in Perth, Australia

- Combination of **200+ Nodes and modeling covering 9,730 km^2**
- Examples of analyses: Relationship between traffic and road characteristics with air pollution; Global and regional air quality guideline exceedances, spatial variations across local governments
- Air pollution exposure at 37 schools
    - School-related traffic may contribute **15% increase** in NO_2 levels at schools in the mornings.
    - All 37 schools have recorded **at least 1 day above** the WHO recommendations for NO_2



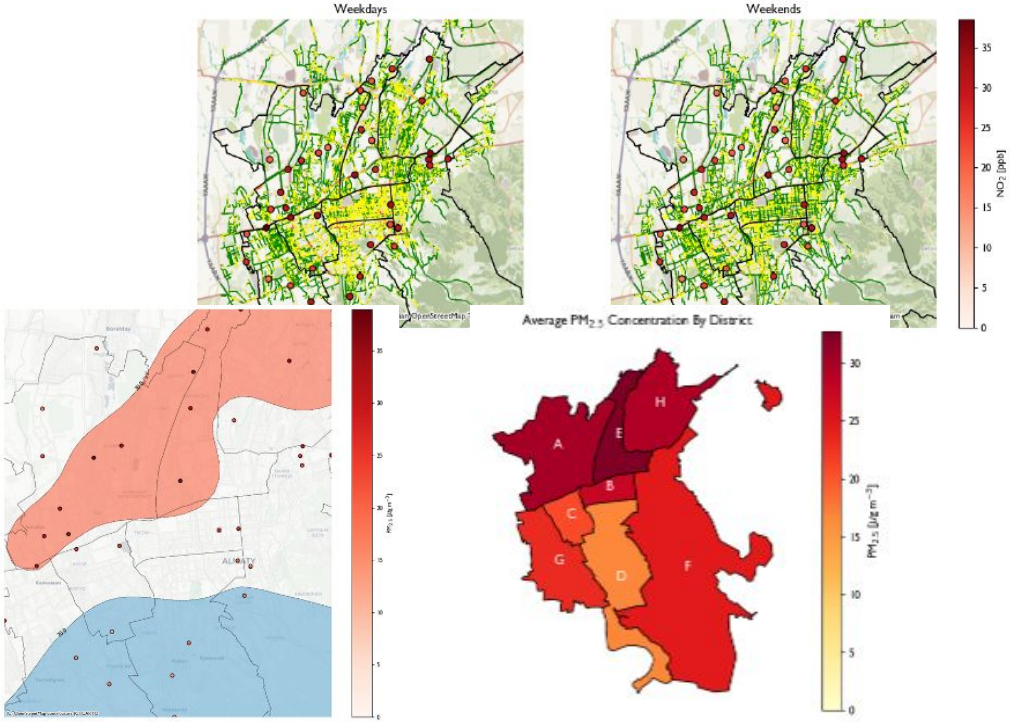




Low Emission Zone Recommendations for ADB and Almaty City, Kazakhstan

ADB ASIAN DEVELOPMENT BANK

- Combined multi-year 50 sensor network with GIS data to provide **recommendations for development of a Low Emission Zone (LEZ)**
- Data layers: traffic volume, pedestrian and bike lanes, public transit
- **Identified potential hotspots of air pollution** within the city to provide recommendations for which areas to target for initial LEZ planning efforts

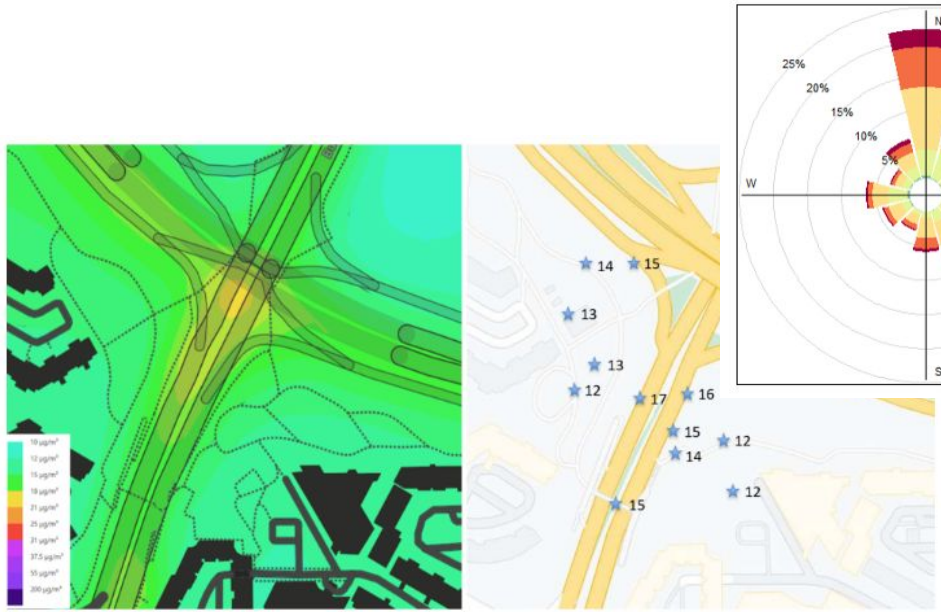


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Air Pollution at Residential Estates in Singapore near major expressways

National Environment Agency
Safeguard · Nurture · Cherish

- Combination of monitoring and modeling
- Estimated air pollution concentrations within residential estates to **inform urban planning policies**
- Examples: exceedances of AQG, distance from roadway analyses, vertical distribution, seasonal (monsoon versus inter-monsoon)



https://www.undp.org/policy-centre/singapore/blog/innovative-air-quality-monitoring-singapore-insights-low-cost-sensor-study-national-environment-agency-nea

Guiding principles for Clarity products

1

Answer more questions

2

Trust your data

3

Accelerate your impact

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Multi-Gas Module

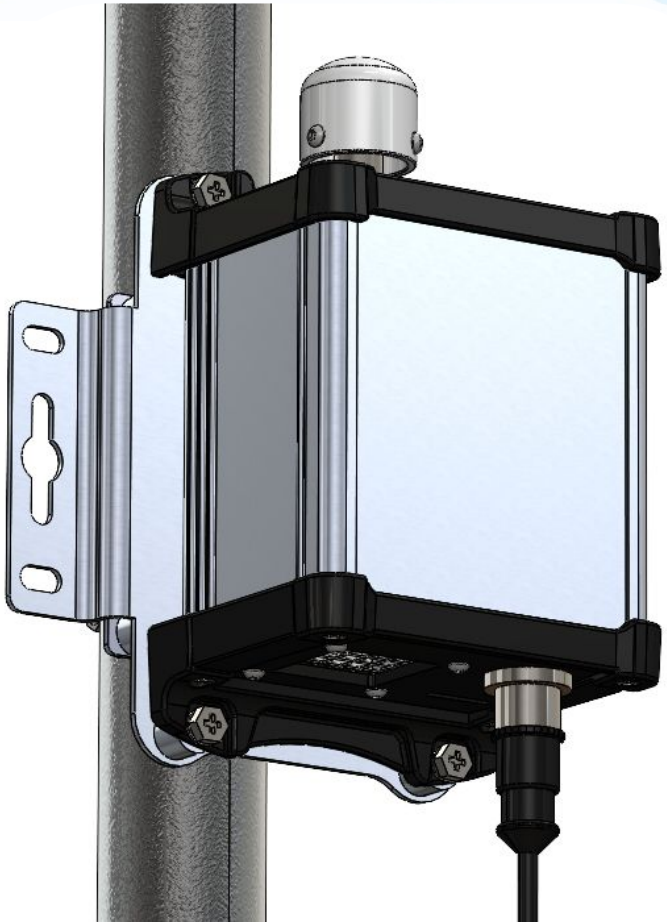
Available for purchase!

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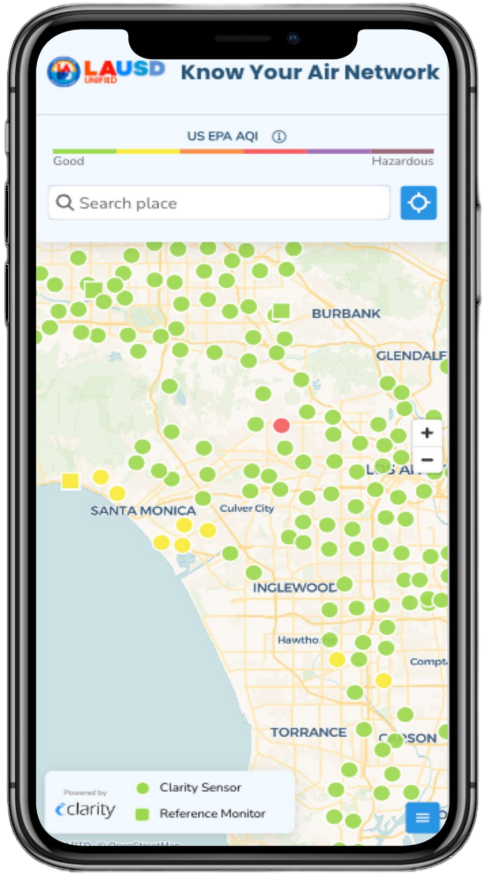
Dust Module

Available for pilot testing!



Automated QC

Available on API & Dashboard!



OpenMap Plus

Contact us for pricing!



Additional EPM Time



Data Analysis



Program Design



Deployment Support



Network Design Workshops



Air Quality Trainings

Add-On Services

We're here to help!

Sensing-as-a-Service℠

Air Monitoring Equipment



Multi-Gas Module
New

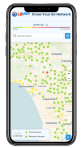


Dust Module
Coming Soon

Clarity Cloud & Software

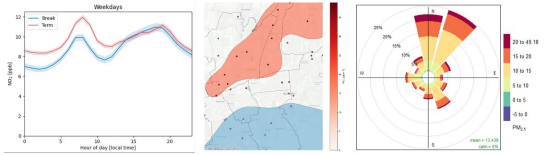


Automatic QC
New



New Openmap
New

Air Quality Expert Team



Enhanced Add-On Services
New

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2025 Clarity Showcase

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COMMUNITY AIR SENSOR WORKSHOP 2025

March 18–19, 2025

10 AM – 2 PM ET (tentatively)
Online (link will be provided)

Register here:

communityairsensor.org

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