



Community Air Monitoring Showcase Block 1

8:30 – 9:35 AM

Sotirios Papathanasiou

Particles Plus, Inc.

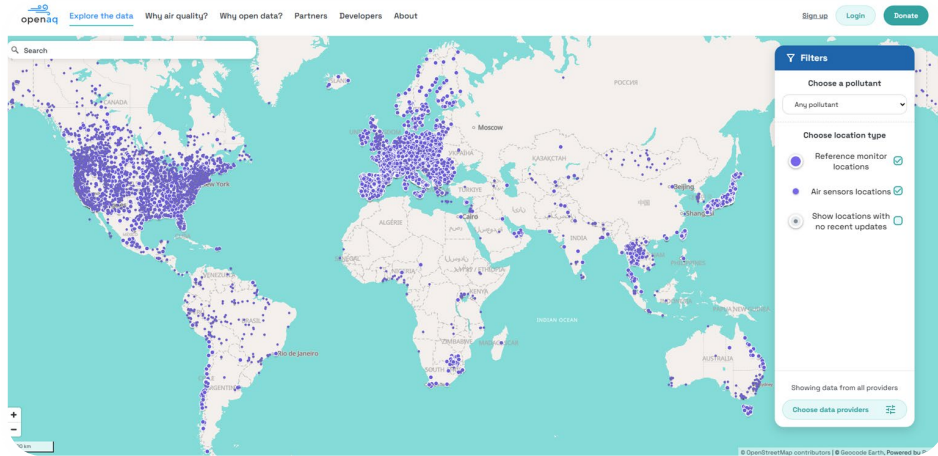




explore.openaq.org

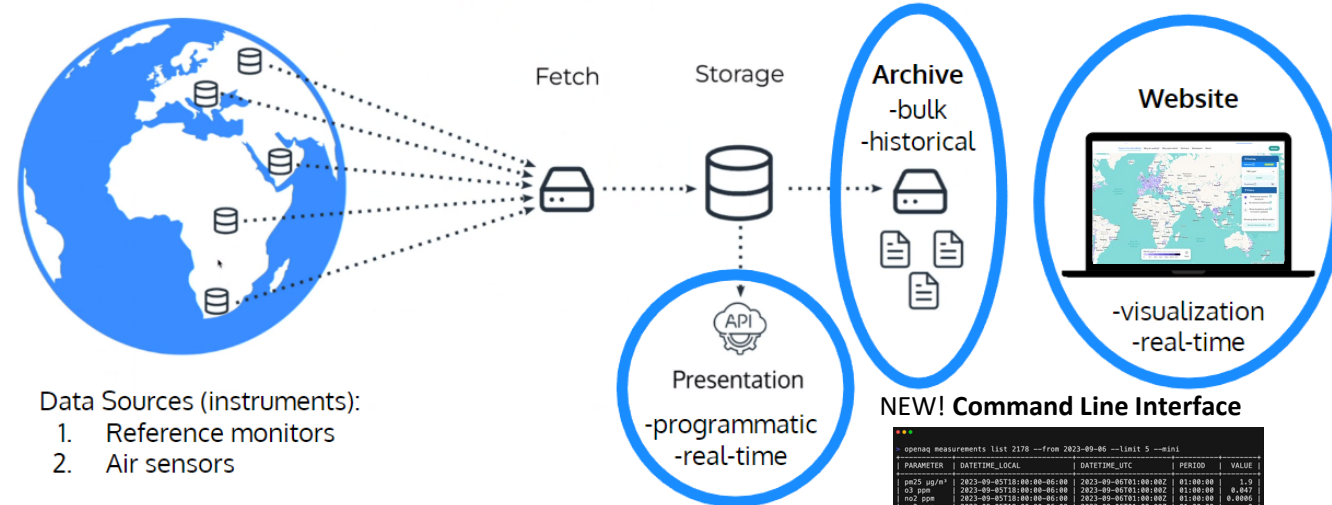
The world's largest *open-source* air quality data aggregator and harmonizer

“By providing universal access to air quality data, OpenAQ empowers a global community of changemakers to solve air inequality.”



explore.openaq.org

How the OpenAQ Data Pipeline Works



- Data Sources (instruments):
1. Reference monitors
 2. Air sensors

Data Sources (ground-based instruments)

1. Reference monitors
2. Air sensors (“low-cost” sensors)

1.2+ billion data points
>17,000 locations
113 countries

- PM_{2.5}
- PM₁₀
- Sulfur Dioxide (SO₂)
- Nitrogen Dioxide (NO₂)
- Carbon Monoxide (CO)
- Black Carbon (BC)
- Ozone (O₃)

```

openaq measurements list 2178 --from 2023-09-05 --limit 5 --min1

```

PARAMETER	DATEIME_LOCAL	DATEIME_UTC	PERIOD	VALUE
pm25 µg/m³	2023-09-05T18:00:00-05:00	2023-09-05T18:00:00-05:00	01:00:00	1.0
o3 ppb	2023-09-05T18:00:00-05:00	2023-09-05T18:00:00-05:00	01:00:00	8.047
no2 ppb	2023-09-05T18:00:00-05:00	2023-09-05T18:00:00-05:00	01:00:00	0.0000
so2 ppb	2023-09-05T18:00:00-05:00	2023-09-05T18:00:00-05:00	01:00:00	0
pm10 µg/m³	2023-09-05T18:00:00-05:00	2023-09-05T18:00:00-05:00	01:00:00	11

The OpenAQ API

api.openaq.org

docs.openaq.org

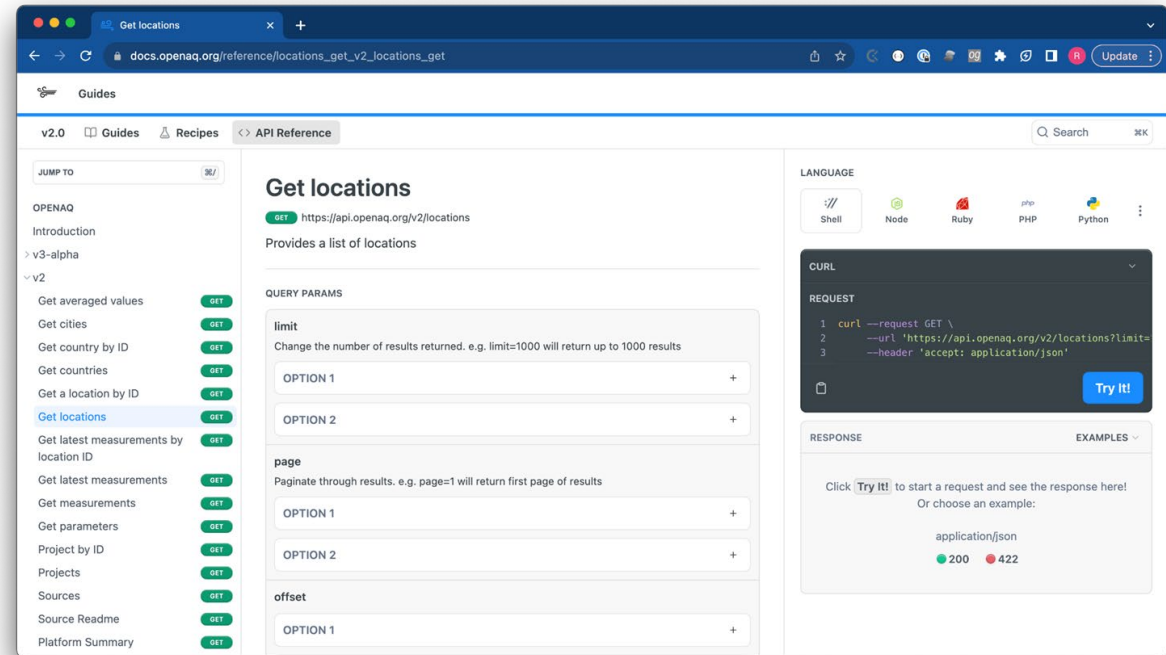
Swagger docs also available: api.openaq.org/docs

Python wrapper:
python.openaq.org

Command Line Interface
github.com/openaq/openaq-cli



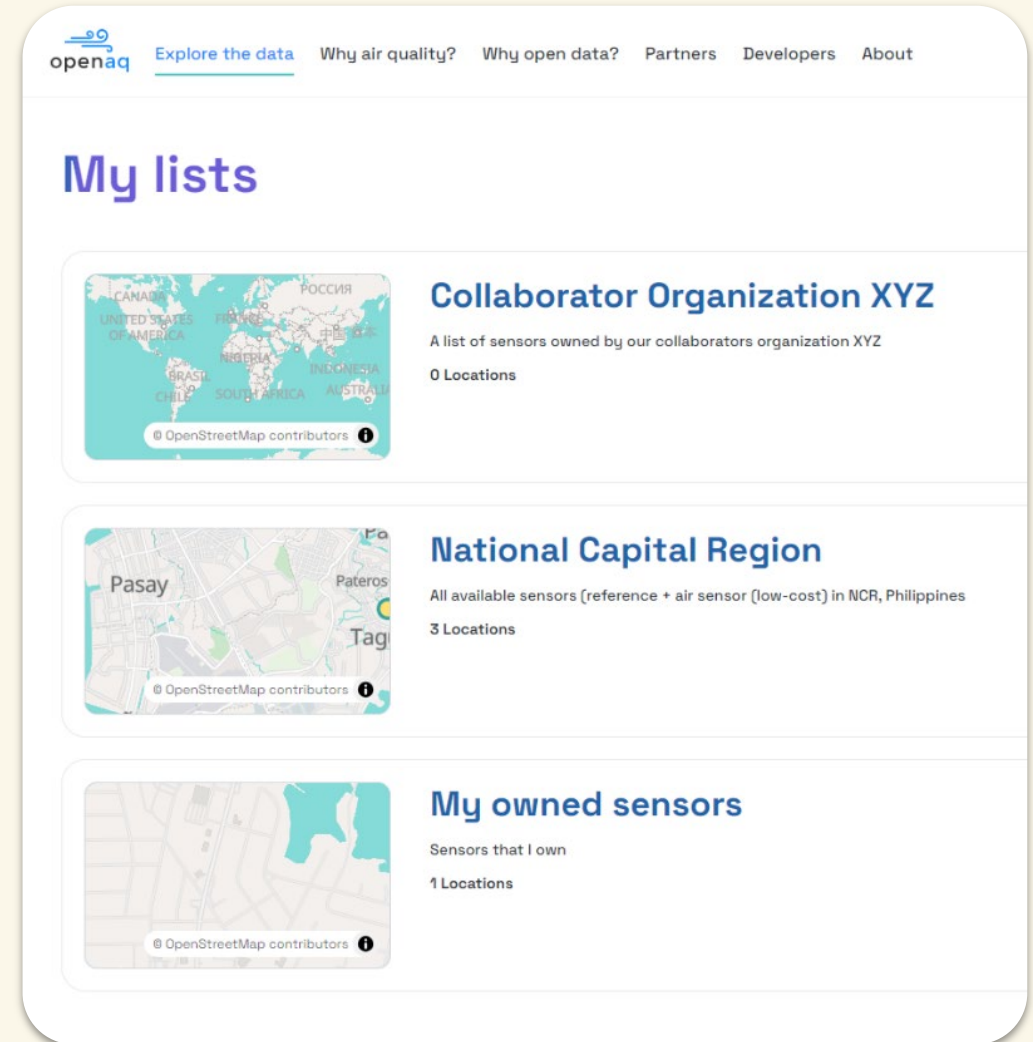
“Provide me a list of **locations** filtered to those that measure the **parameter PM_{2.5}** and **limit** the results to **1000** per page”



OpenAQ Custom Lists

- tailor OpenAQ platform to fit your project needs
- “bookmark” your sensors - whether you own them or not
- view them in your customized dashboard
- no need to build your own platform to see and manage sensors that you own / are interested in
- better collaboration
- comparative analysis
- *...and more*

bit.ly/OpenAQExplorerListsWalkthrough



The screenshot shows the OpenAQ website's 'My lists' section. At the top, there is a navigation bar with the OpenAQ logo and links for 'Explore the data', 'Why air quality?', 'Why open data?', 'Partners', 'Developers', and 'About'. The main heading is 'My lists'. Below this, there are three list cards, each featuring a map thumbnail and descriptive text:

- Collaborator Organization XYZ**: A list of sensors owned by our collaborators organization XYZ. 0 Locations.
- National Capital Region**: All available sensors (reference + air sensor (low-cost)) in NCR, Philippines. 3 Locations.
- My owned sensors**: Sensors that I own. 1 Locations.

Thank You!

- Do you operate or know of any reference monitors or air sensors but are not displayed in OpenAQ?
- Are you thinking of starting monitoring and need help with setting up an AQ platform?

Let's Connect.



explore.openaq.org



link.openaq.org/joinslack



[@OpenAQ](https://twitter.com/OpenAQ)



info@openaq.org



linktr.ee/openaq • docs.openaq.org



openaq.medium.com



github.com/openaq

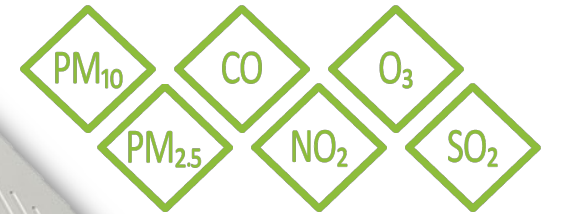


linkedin.com/company/openaq

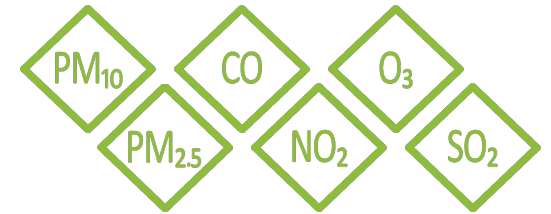
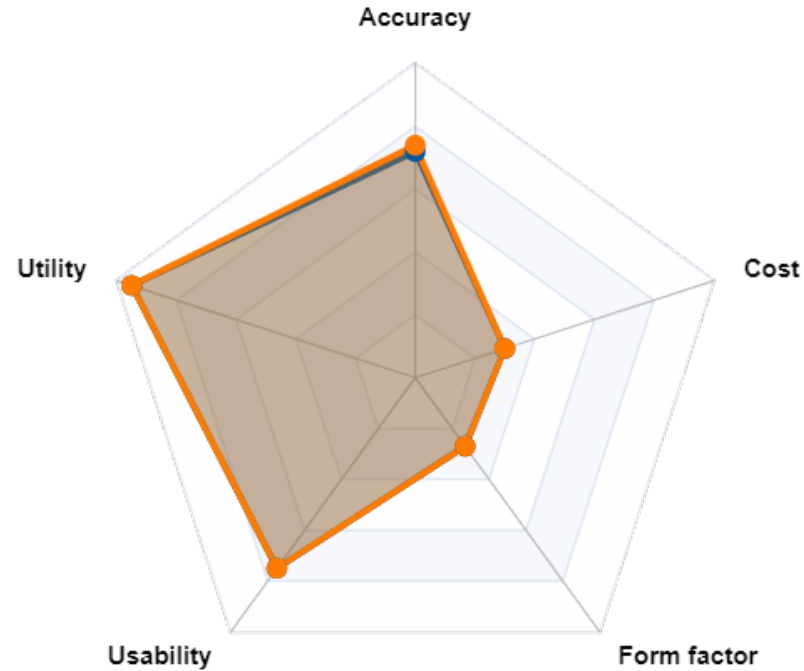
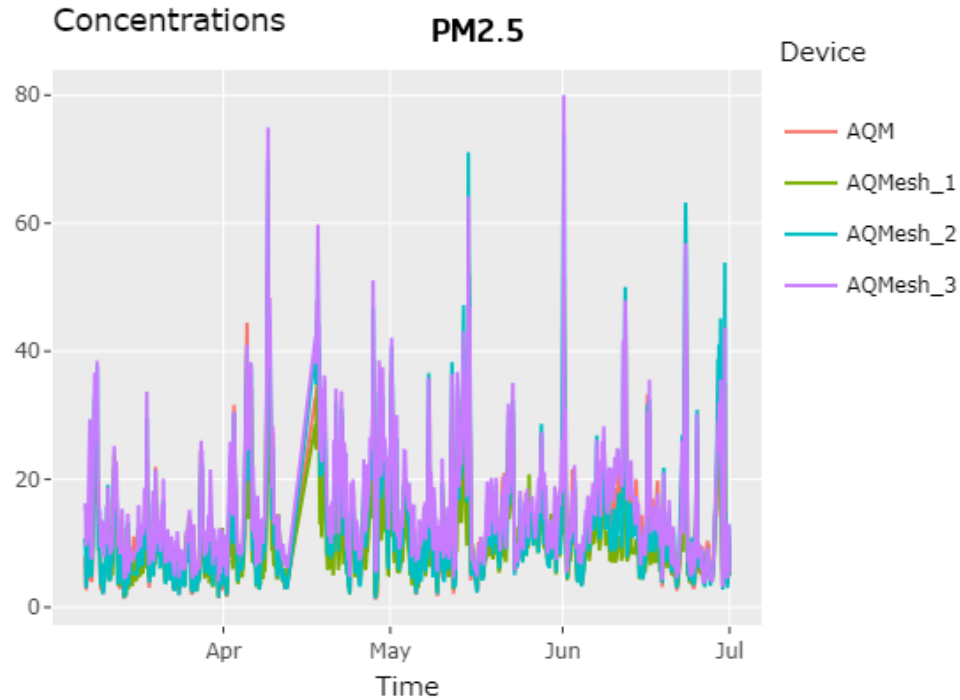
AQMesh



- Real-time air quality pod
- Electrochemical sensors for gas
- Optical light scattering for PM
- AT, BP, RH, WS, WD
- Outdoor/indoor applications
- Low cost operation



AQMesh



Data courtesy of Airparif 2023 challenge.

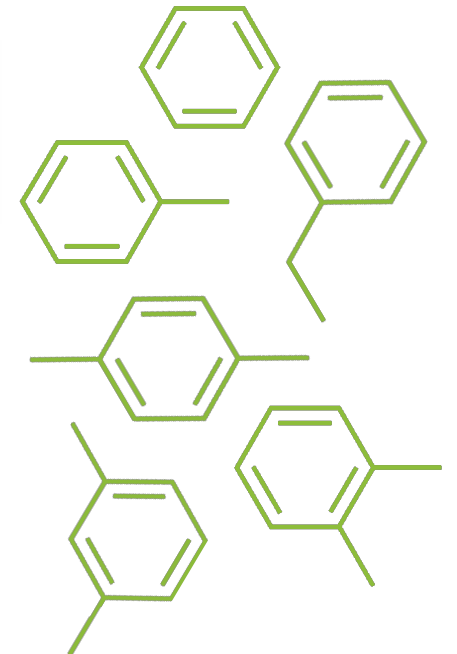


Booths 403/405

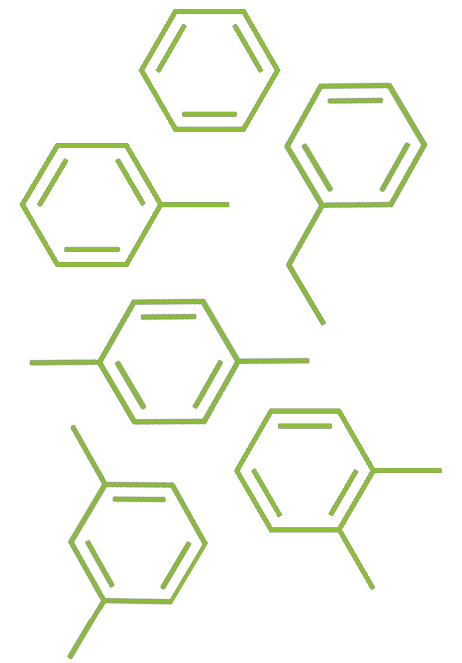
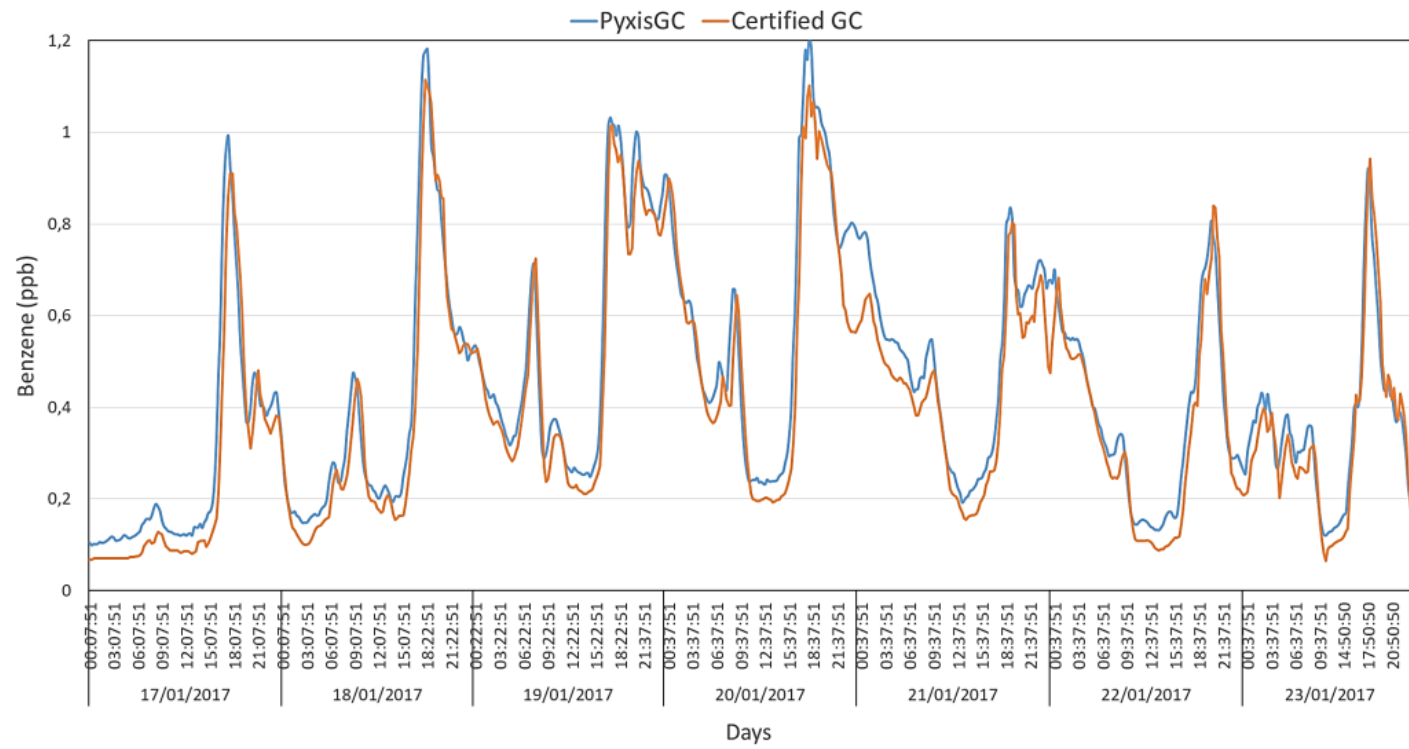
Pyxis GC



- Compact, reliable, indoor/outdoor micro-GC for benzene, toluene, ethylbenzene, xylenes
- Auto-generation of carrier gas
- Auto-calibration with reference canister for data stability
- Configurable ranges, cycle times, data outputs
- Low cost operation

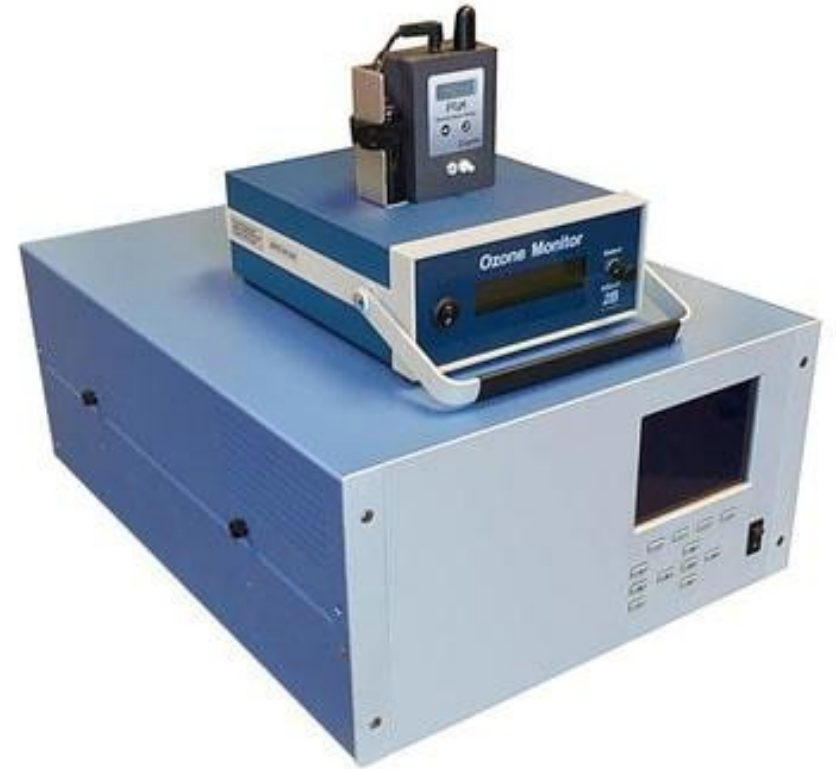


Pyxis BTEX



2B Technologies

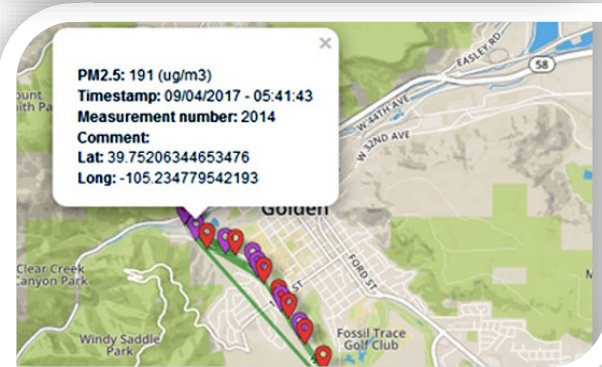
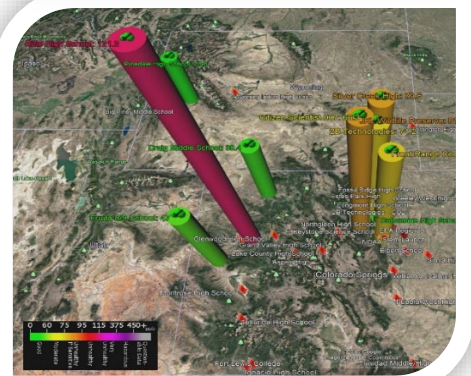
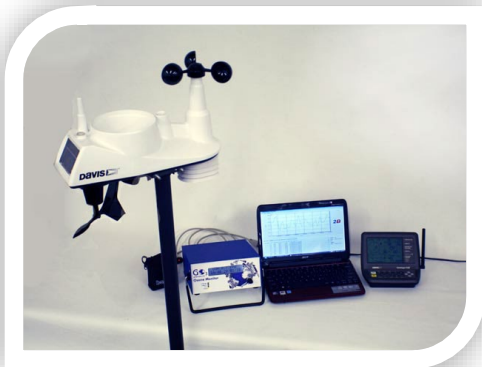
- Company founded in 1998
- Made our name miniaturizing conventional ozone analyzers without compromising performance
- All of our ozone and NOx monitors, as well as our calibrators are low-power (12V DC) and highly portable compared to the competition
- Ambient ozone and NOx monitors are US EPA certified as Federal Equivalent Methods (FEMs)



Applications Made Possible by **2B Tech** Ozone Monitors



The evolution of the AQ line of products



Global Ozone (GO3)
Project

AQTreks (PAM)

Community
Calibration Station

AQ Products



Personal Air Monitor (PAM)

AQLite

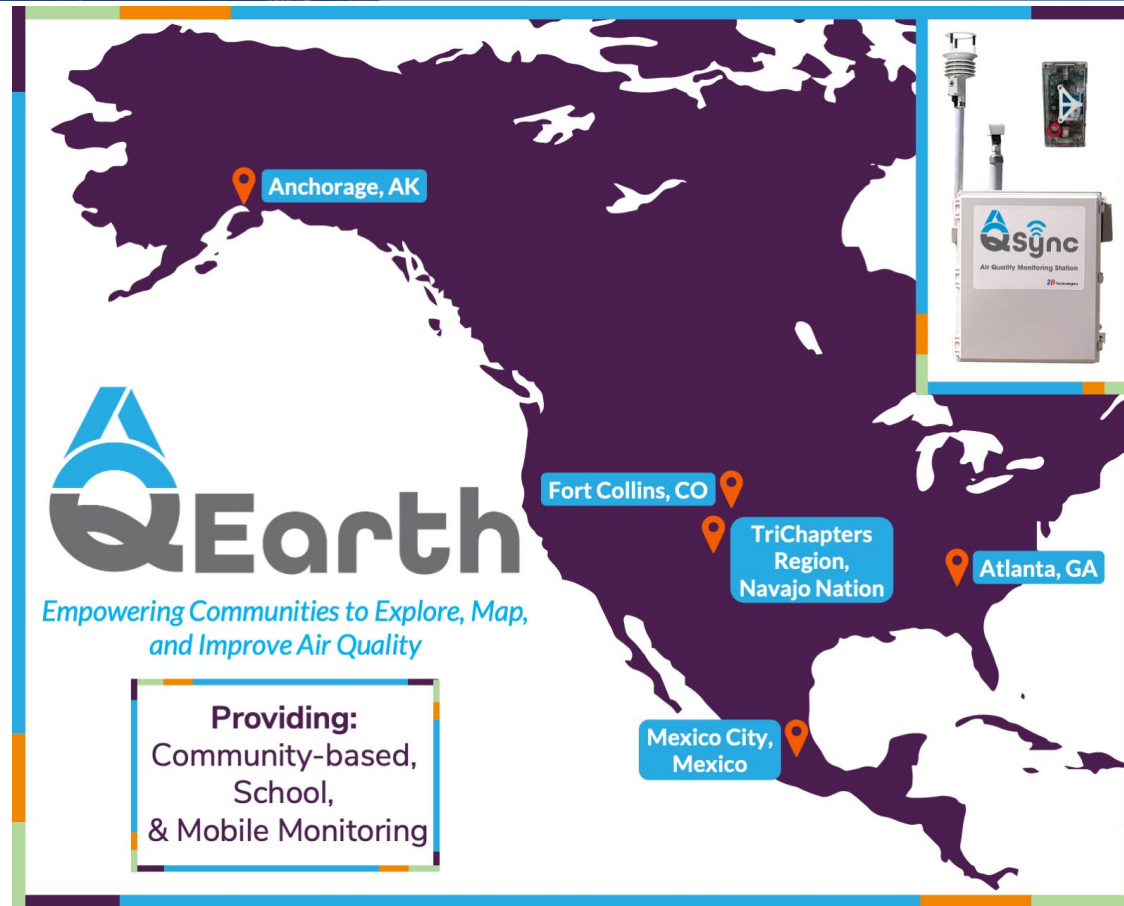


AQSync



AQEarth

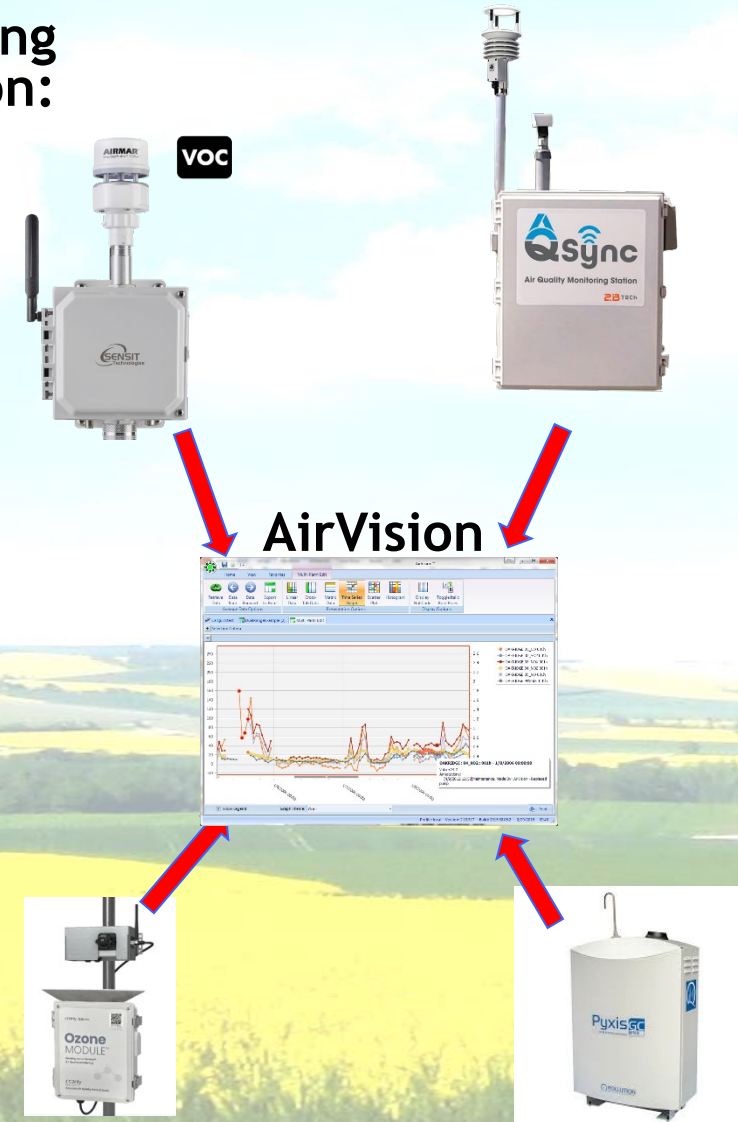
- Funded by NIH
- Set up air quality programs in five locations
 - Equipment
 - Backend data
 - Public data
 - Outreach and engagement
- Partners
 - TD Environmental
 - Montrose Environmental
 - City and County of Denver



Growing List of Sensor Compatibility

AirVision currently supports the following sensors for automatic data collection:

- 2BTech
- Aeroqual
- AirPointer
- AirQWeb
- Clarity
- Cirrus Research / Quantum Cloud
- Eagle.io
- Ecomeasure
- Ozium
- Pollution Guardian/Pyxis
- Sensit RAMP, SPOD
- QuantAQ
- Scentroid
- MetOne Comet Cloud
- CSI Web API
- Purple Air2



Acquiring The Data

Most SASs push data to a web gateway, and most now offer good APIs to collect the data.

- You would think JSON payloads and API endpoints would be consistent. They are not.
- AirVision has a *very flexible architecture* for parsing the JSON payloads.
- We can generally set up the method for any API and test within a few hours.

```
{ "status": "OK", "desc": "Operation success", "values":  
  { "record": { "measureid": "1794", "measuredate": "2021-04-19  
00:09:01", "chromfile": "pyxis_method_Chrom_2021_04_19_  
_00_09_01", "gasname": "Benzene", "idgas": "71-43-  
2", "conc": "0.163354999999983", "measureid": "1794", "measur  
edate": "2021-04-19
```

The screenshot displays the 'File Import Configuration' window in the AirVision application. The window title is 'AirVision' and it has tabs for 'Home', 'View', 'Favorites', and 'File Import Configuration'. The 'File Import Configuration' tab is active, showing a 'File Schema' section for the 'Pollution Guardian / Pyxis API' template. The 'File Layout' section includes 'Number of Header Lines' (1), 'Number of Footer Lines' (0), and 'Minimum Number of Columns' (0). The 'Field Delimiter' is set to 'Comma (allow quotes)' and the 'Sample Type' is 'JSON'. The 'Existing Data' section has 'Reset Record And Overwrite' selected. The 'Parameter Information' section shows 'Match Parameters from Row' selected. The 'Data Type' section has 'Average / Continuous' selected. At the bottom, there is a 'File Column Mapping' table with columns for 'Column Number', 'Data Field', 'Parse Format', and 'Flag Map'. The table contains three rows: '4 Date/Time' with parse format 'yyyy-MM-dd HH:mm:ss', '6 ParmIdentifier from meta tag', and '8 Value'. A red arrow points from the JSON payload above to the 'File Import Configuration' tab.

Column Number	Data Field	Parse Format	Flag Map
4	Date/Time	yyyy-MM-dd HH:mm:ss	
6	ParmIdentifier from meta tag		
8	Value		

Validating the Data

The data in the sensors often has the information needed to self-validate, but most gateways don't offer this.

- DAS vendors- again, a *very flexible system* that allows users to create multi-condition rules that look at all available data can help validate data in real-time.
- Sensor vendors could take on some of this work(e.g. compare A/B sensors, look at RH levels, etc) and consider including quality codes with the data stream.

But right now, this work mostly falls on external data management systems (for real-time systems).

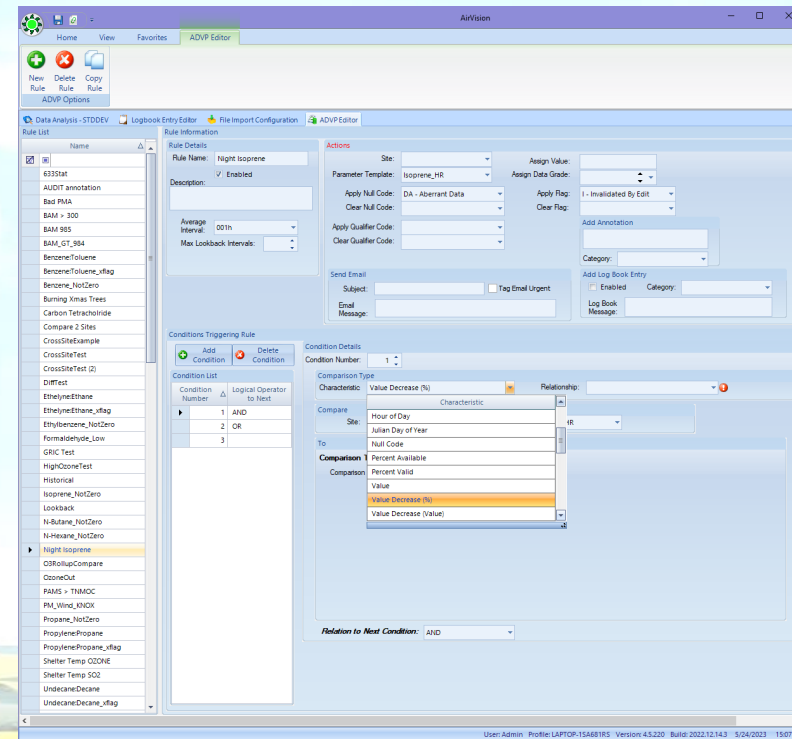


Automatic Data Validation Processor (ADVP)

Example rules of such a design:

- **RH > 90%**
- **PM2.5 > PM10**
- **Value varies > 30% from last hour**
- **Value differs > 30% from a nearby NAAQS sensor site**
- **Value differs > 30% from nearby small sensor site**
- **A / B sensors differ > 10% from each other**
- **Combine rules with other external conditions (WS for dust, BP changes)**

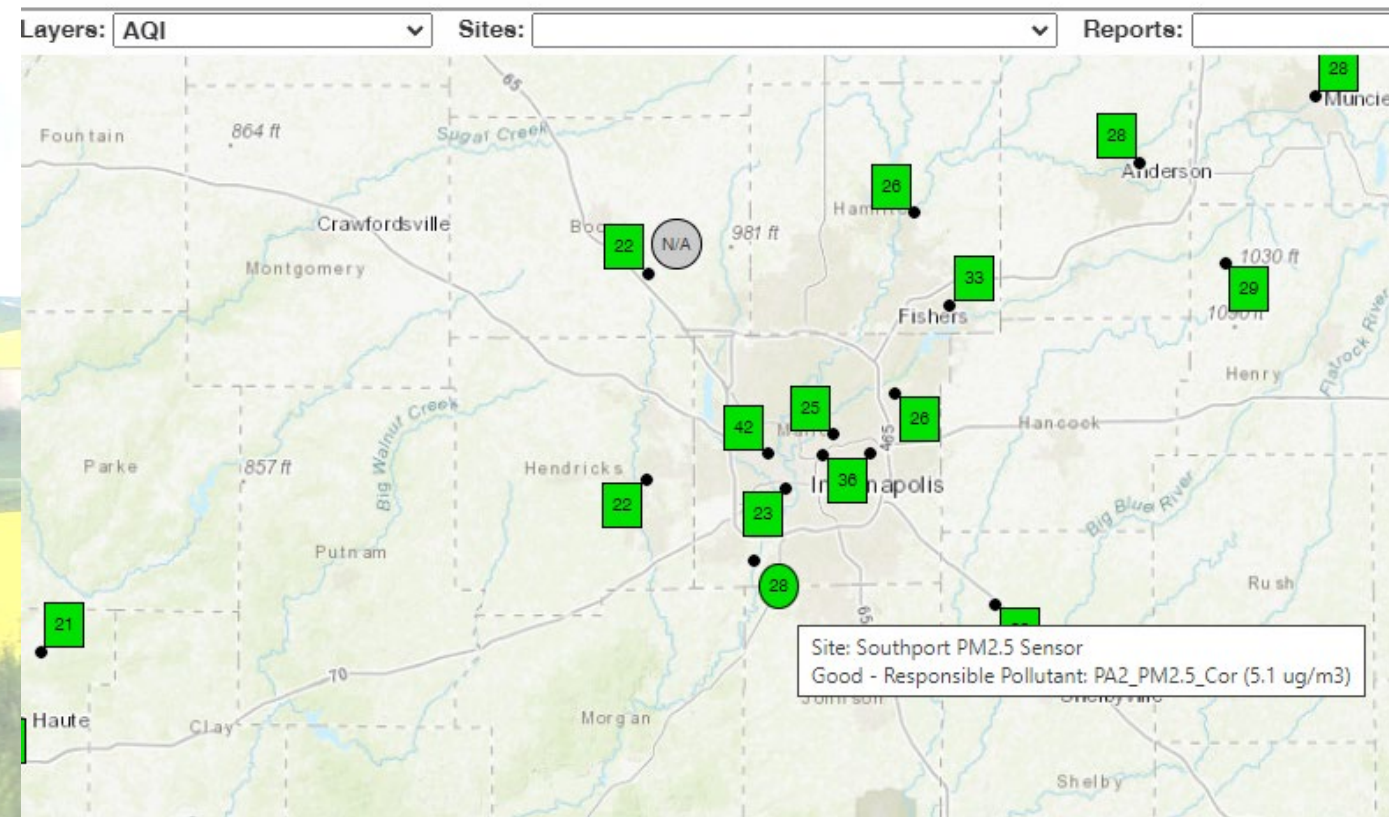
As you learn more about a particular sensor's quirks, can add additional qualifiers like daytime / nighttime,



Data Presentation: Updates to AgileWeb

AgileWeb can (if desired) integrate the small sensor data and distinguish regular reference/NAAQS sites from sensor data sites.

Being able to validate and adjust such data in real-time provides benefits to agencies, in particular during wildfire or emergency air quality events, while still communicating reference data vs. small sensor data.



aeroqual[®]

Methane Measurement for Community and Perimeter Air Monitoring

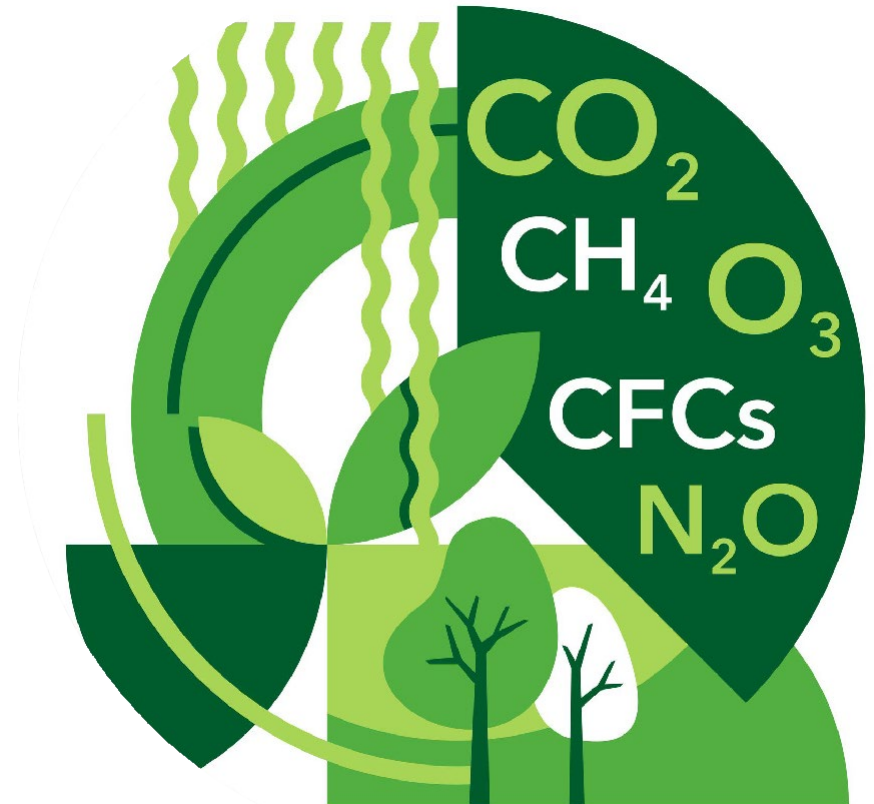
NAAMC 2024
Booth 510



Methane (CH₄) overview

Methane is a potent greenhouse gas that has a significant impact on the Earth's climate

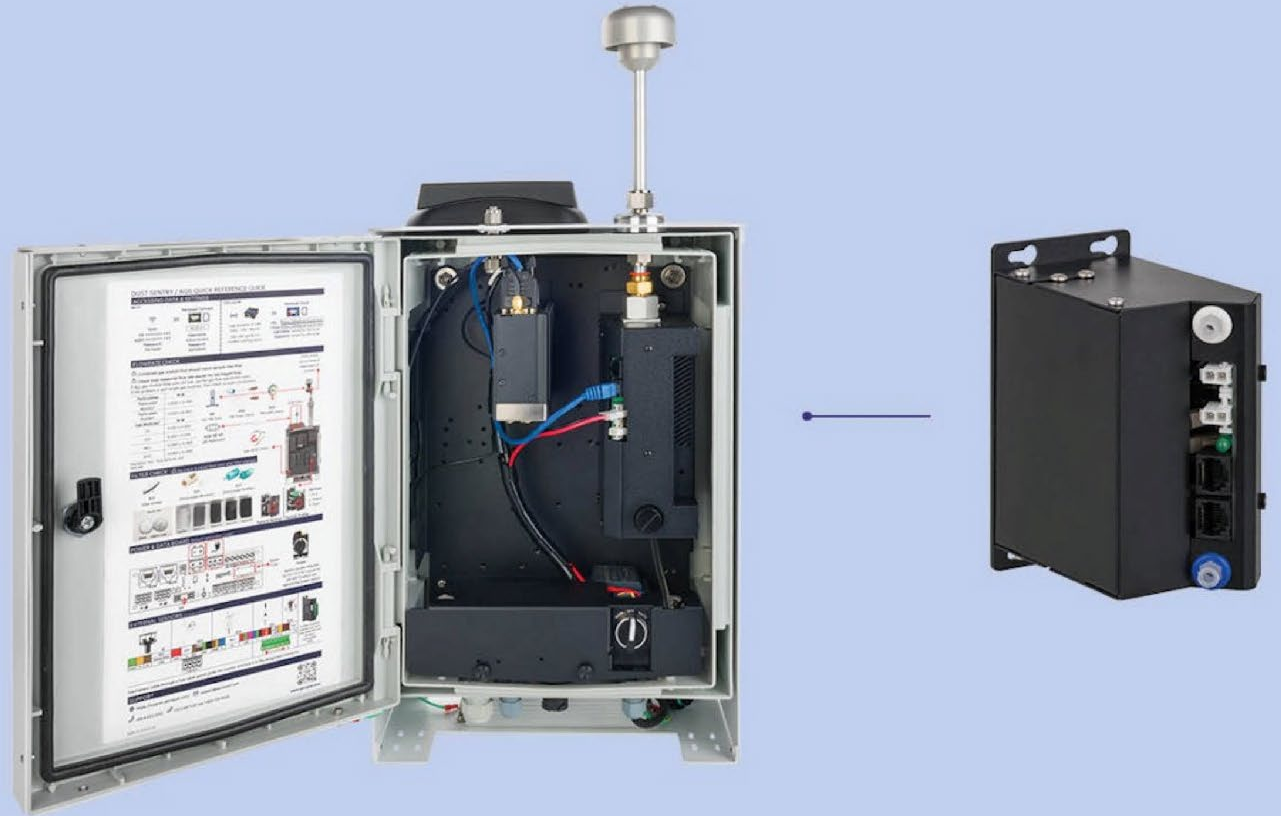
- Methane accounts for 16% of global emissions
- 28 times more potent than CO₂ for trapping heat
- Produced by natural and human activities
- Microbial digestion, fossil fuel production, transportation, and waste management
- Accurate, real-time, ambient methane measurement is crucial to understanding sources and developing mitigation strategies



Methane module measurement principle

Gas Sensitive Semiconductor (GSS) sensor

- Design minimizes drift using a proprietary scrubber to reduce interferences
- Sensor output is determined under baseline and sample conditions
- Proprietary algorithm calculates the methane concentration
- Flowrate is controlled by control orifice (60 mL/min)



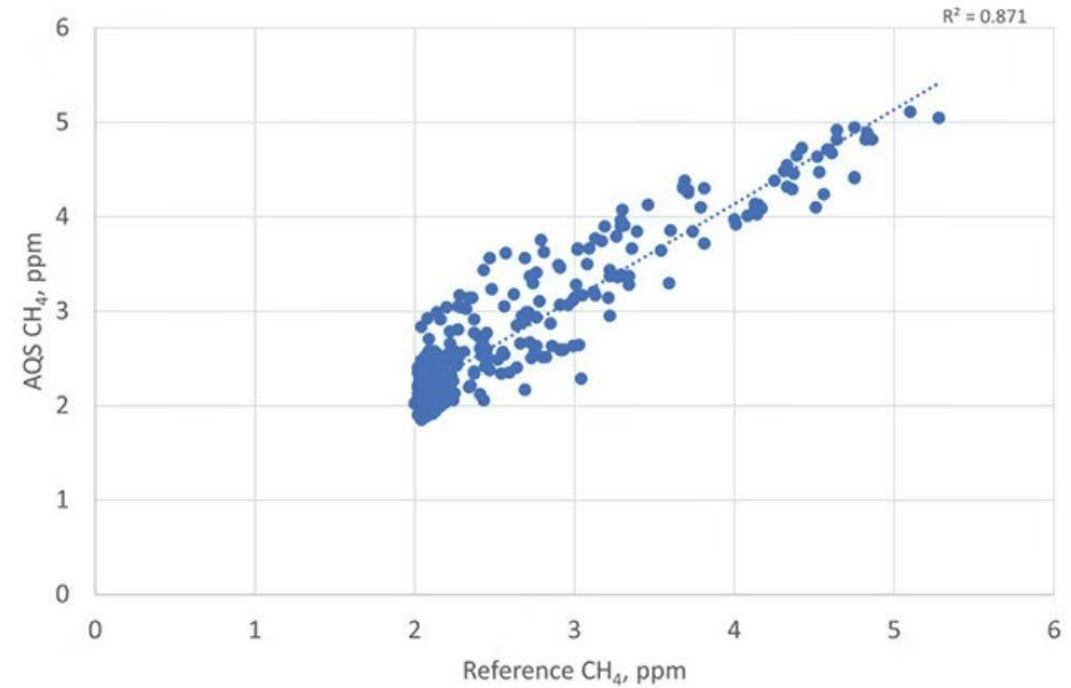
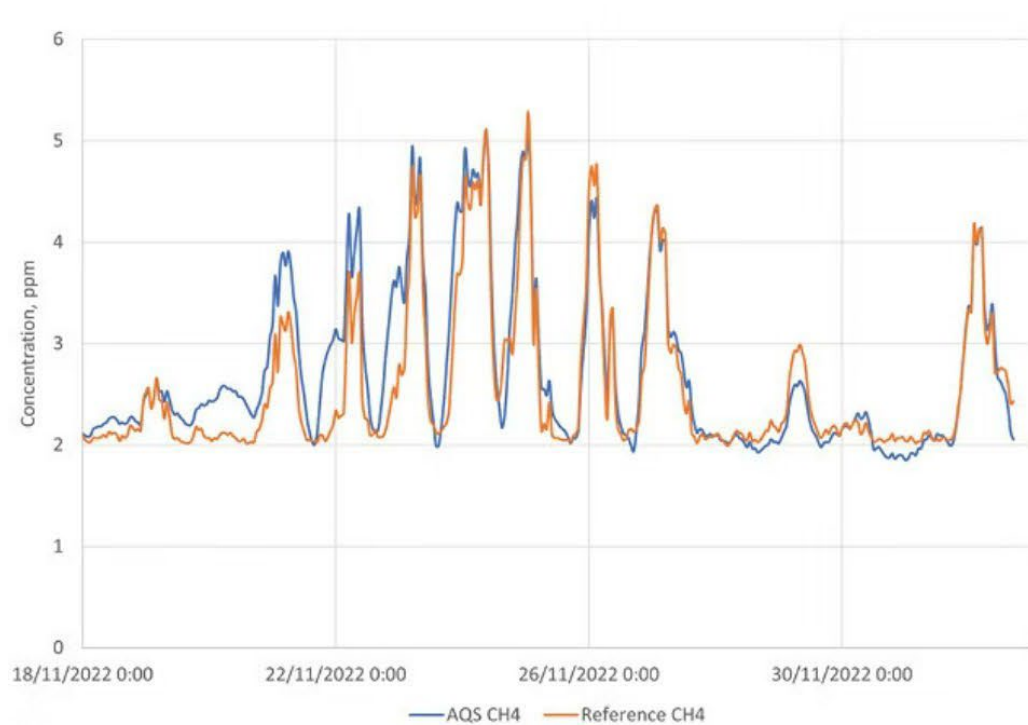
Methane module specifications and performance



	CH ₄ Analyzer Module
Range (ppm)	0 - 500
Display Resolution (ppm)	0.01
Noise: Zero (ppm); Span (% of reading)	0.02; 0.3%
Limit of Detection (ppm)	0.04
Precision	0.4% of reading
Linearity (% of FS)	<1%
24 hr Drift: Zero (ppm); Span (% of FS)	0.04; 1%

Field test results

Aeroqual AQS with a methane module was co-located with a Picarro methane analyzer (Nov 2022)



The methane module produced an R^2 of 0.87 and a mean absolute error (MAE) of 0.2 ppm. The low MAE value is indicative that the module has low zero and span drift.

Methane module applications



- Municipal landfills and waste management
- Brownfields and site remediation
- Methane gas capture
- Oil and gas emissions



aeroqual 

aeroqual.com

Visit us at booth 510

THE J. J. WILBUR COMPANY AND WTS, LLC



INSTRUMENTATION AND AIR QUALITY MONITORING SYSTEMS



WILBUR TECHNICAL SERVICES, LLC

WWW.JJWILBUR.COM

SENSORS BASED AIR QUALITY MONITORING

- ▶ Handhelds
- ▶ Wearables
- ▶ Fixed low cost sensors
- ▶ Perimeter Monitoring / Near Reference
- ▶ Mobile / Portable Reference Grade Systems to validate sensor data

SENSORS BASED AIR QUALITY MONITORING

- ▶ **Community Based Projects**
- ▶ **What is the question you are trying to answer?**
- ▶ **What is the goal of the data?**
- ▶ **What sensors to use, and how many?**
- ▶ **How will you share the data with the public?**
- ▶ **Publicly Facing Dashboard**
- ▶ **QR Codes, AQI Light, Integrated QA/QC of sensor data being shared with the public**

SENSORS IN THE WILD



NEAR REFERENCE / REFERENCE STATION



About TD Enviro

TD Enviro specializes in collecting and analyzing data using new technologies to provide insights about the air we breathe. Our focus on innovative solutions helps you effectively address air quality challenges.

What we do:

- Air Monitoring Programs
- Community-Based Environmental Work
- Training, Mentoring, & Capacity Building
- Data Management & Analysis
- Youth Education



All About Air Quality Bootcamp



- Funded by CARB
- 2-day intensive on Air Quality
- Designed for and attended by community groups
- Topics: fundamentals, emissions, pollutants, meteorology, measurements, health effects, regulations, accessing & using data, communications and advocacy, funding, and more.



Air Quality Monitoring Frameworks for the Northeast and Mid-Atlantic States

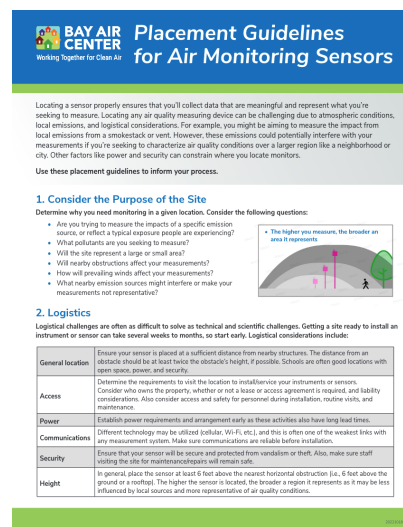
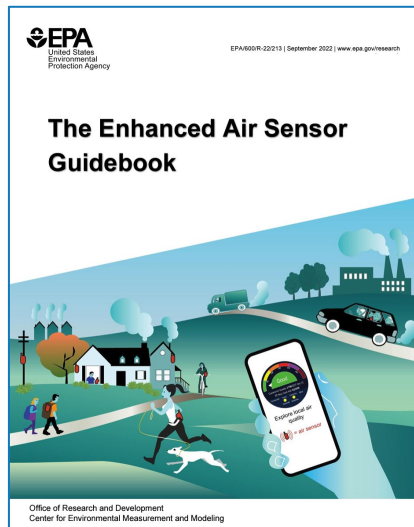
A framework and resources for planning and running a community air monitoring program intended for state air quality agencies to adapt or provide directly to community groups. Resources are publicly accessible and shareable.

Provides links and resources that are:

- More fundamental
- Simpler
- Approachable

Intended for agencies to:

- Adapt into own resources or distribute directly to community groups
- Start conversations with the community
- Support creating better air quality monitoring and results
- Build capacity with new organizations
- Build trust and avoid misunderstandings



Bay Air Center

Technical Resource Center for Community Groups

- Bay Area Air Quality Management District-sponsored community resource
- Provides AQ technical guidance, materials, and training to Bay Area community members and organizations, free of charge
- Supports efforts to understand and improve air quality



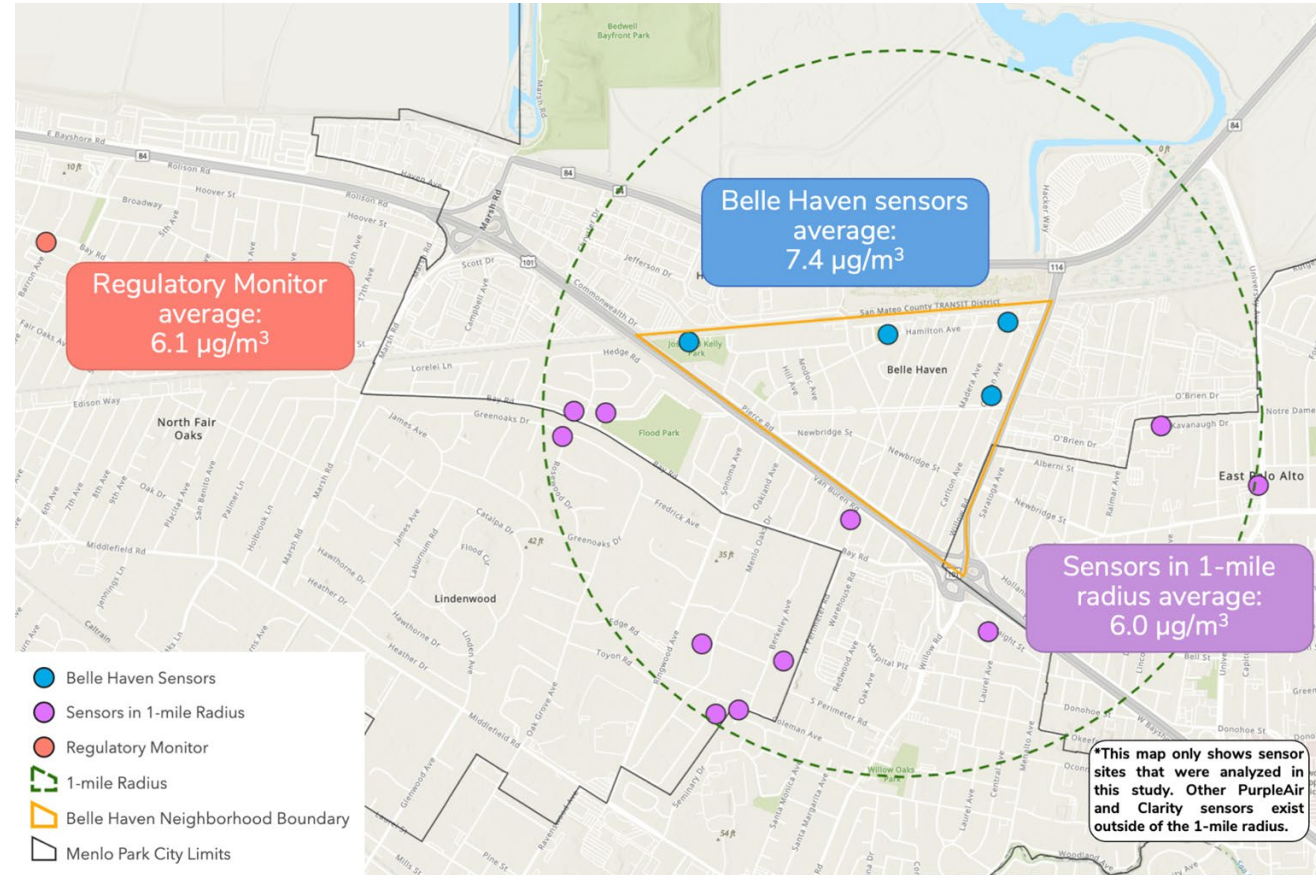
Working Together for Clean Air



BAY AREA
AIR QUALITY
MANAGEMENT
DISTRICT

Bay Air Center Support to Belle Haven

- Analyzed sensor data in and around the Belle Haven neighborhood of Menlo Park, CA
- Quality controlled sensor data
- Computed annual averages
- Belle Haven PM_{2.5} is below federal standard, but 23% higher than surrounding areas



Let's Talk

Trusted by Community

Understand Government

Independent

Technically Rigorous

Creative

TDEnviro.co
m

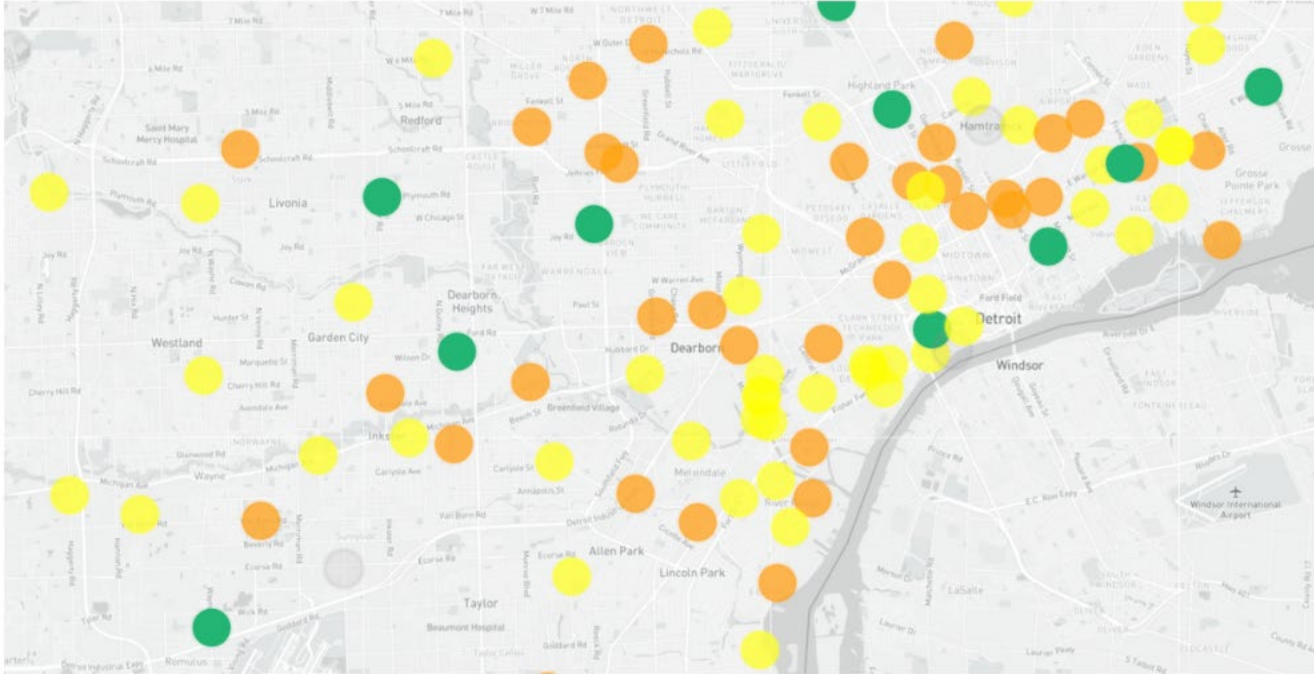


How can we help?

Reach out and we can help with any aspect of your air monitoring programs:

- Study design
- Measurements
- Data management
- Analytics
- Training & mentoring
- Community engagement
- Capacity building

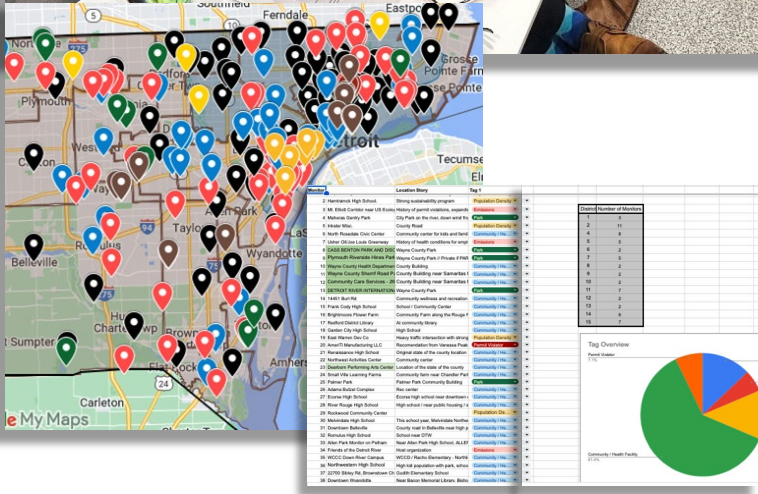
How's the Air, Wayne County?



Introducing Michigan's largest multi-monitor community air quality network: 100 monitors across Wayne County. Check out the air at JustAir.app.



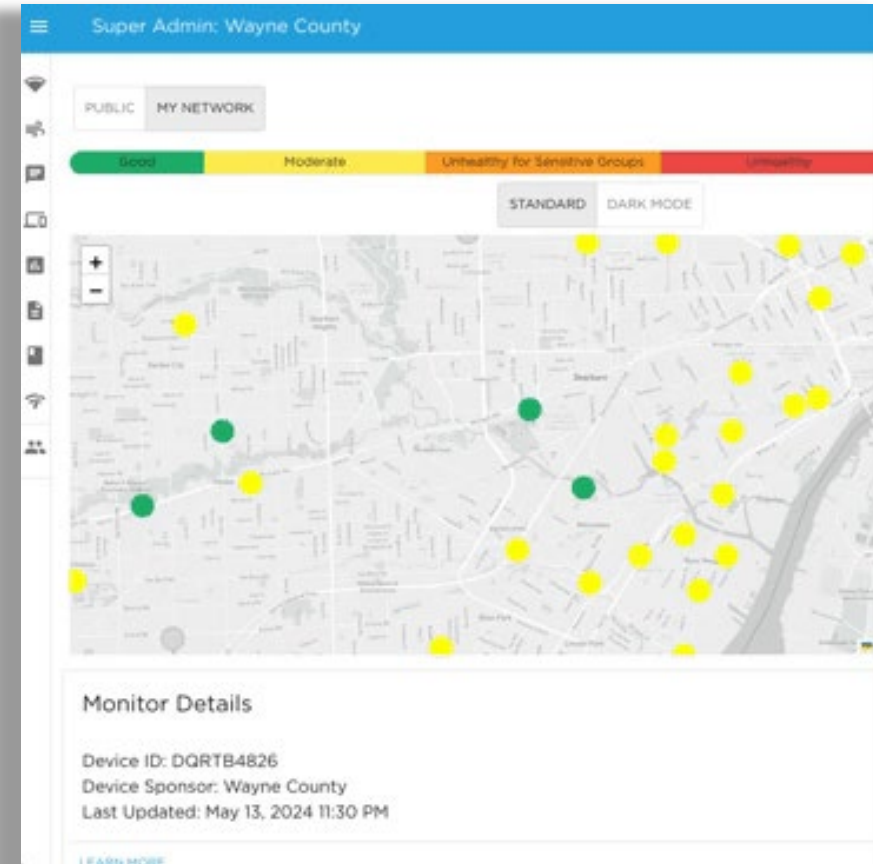
Planning



Deployment



Management



Super Admin: Wayne County

PUBLIC MY NETWORK

Good Moderate Unhealthy for Sensitive Groups Unhealthy

STANDARD DARK MODE

Monitor Details

Device ID: DQRTB4826
 Device Sponsor: Wayne County
 Last Updated: May 13, 2024 11:30 PM



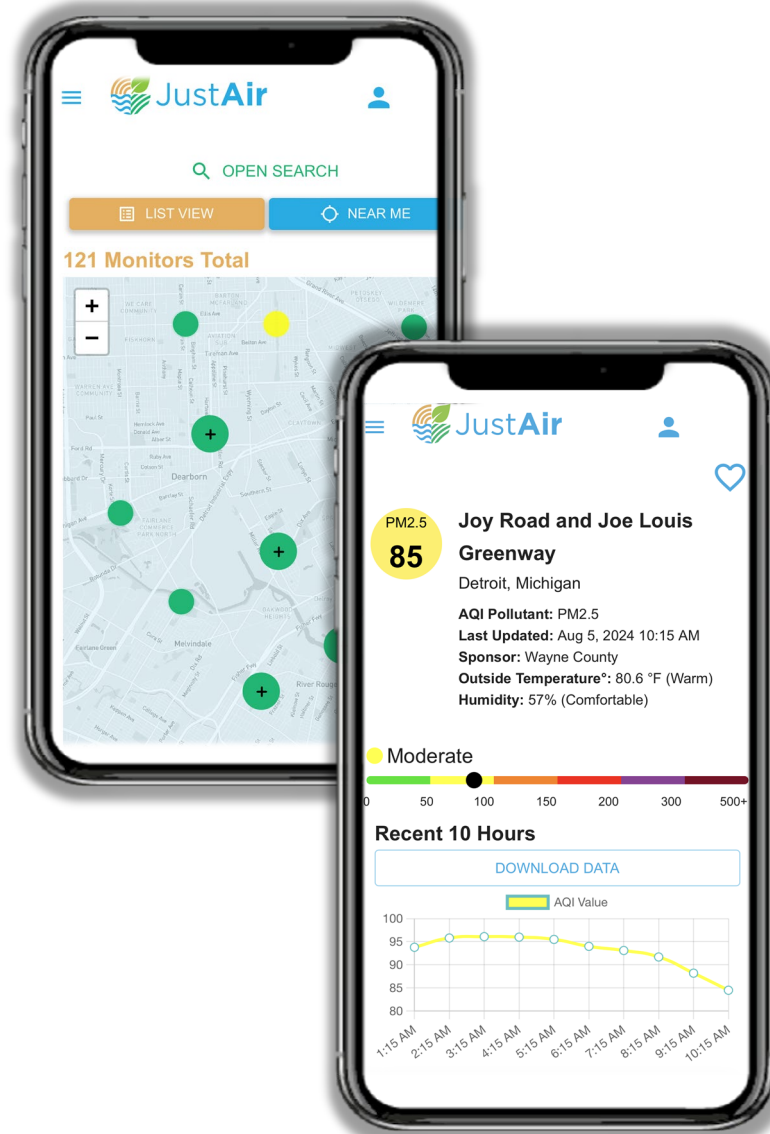
Follow Monitors Near
Where You Live, Work
and Play



Receive text Alerts
When Air Quality is
Poor



Make More Informed
Health and Safety
Decisions

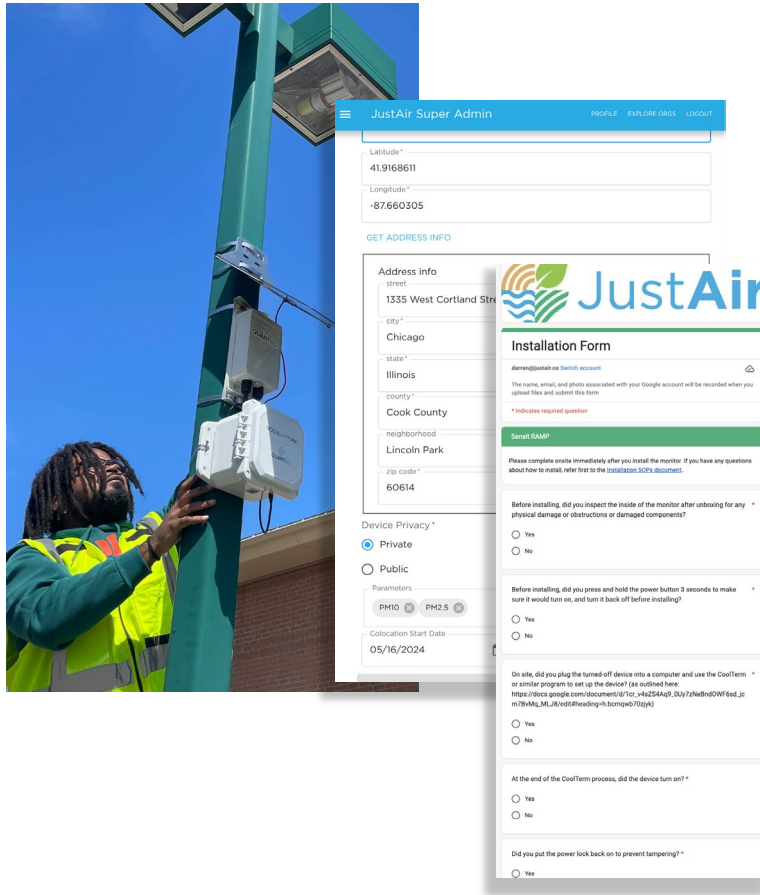
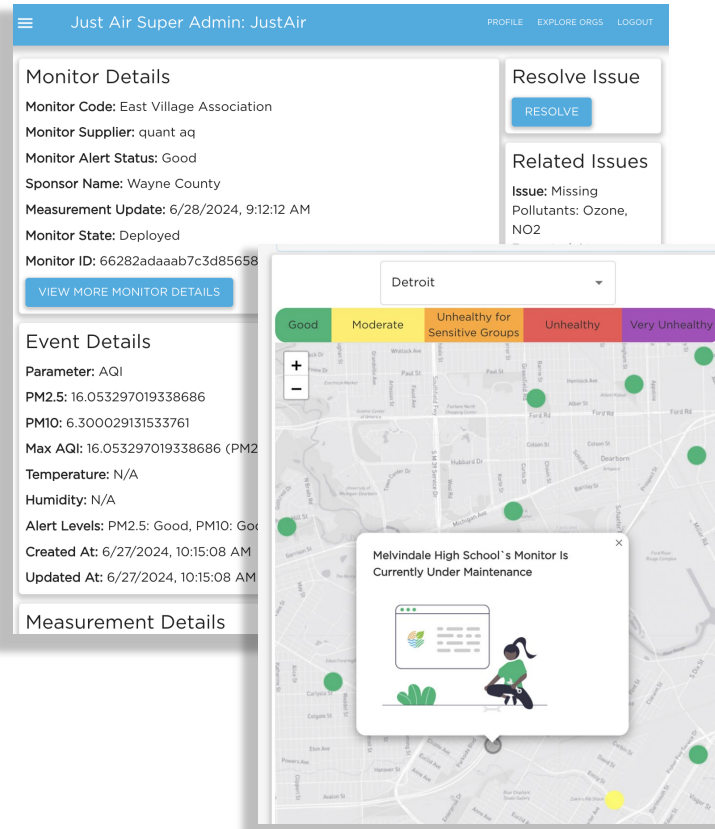


Sign up at JustAir.app

Quality Control

Incident and Anomaly Detection

Recovery and Reporting

Just Air Super Admin: JustAir PROFILE EXPLORE ORGS LOGOUT

Monitor Details

Monitor Code: East Village Association
 Monitor Supplier: quant aq
 Monitor Alert Status: Good
 Sponsor Name: Wayne County
 Measurement Update: 6/28/2024, 9:12:12 AM
 Monitor State: Deployed
 Monitor ID: 66282adaaab7c3d85658

[VIEW MORE MONITOR DETAILS](#)

Event Details

Parameter: AQI
 PM2.5: 16.053297019338686
 PM10: 6.300029131533761
 Max AQI: 16.053297019338686 (PM2.5)
 Temperature: N/A
 Humidity: N/A
 Alert Levels: PM2.5: Good, PM10: Good
 Created At: 6/27/2024, 10:15:08 AM
 Updated At: 6/27/2024, 10:15:08 AM

Measurement Details

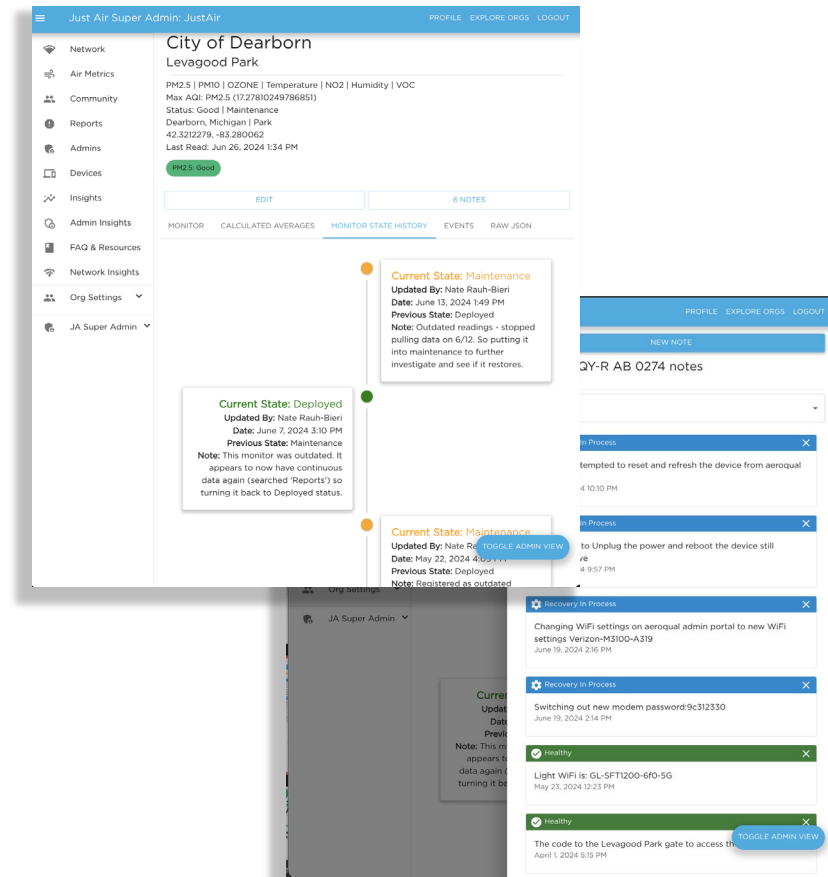
Resolve Issue
RESOLVE

Related Issues
Issue: Missing
Pollutants: Ozone, NO2

Map: Detroit

Good Moderate Unhealthy for Sensitive Groups Unhealthy Very Unhealthy

Melvindale High School's Monitor Is Currently Under Maintenance



Just Air Super Admin: JustAir PROFILE EXPLORE ORGS LOGOUT

City of Dearborn Levagood Park

PM2.5 | PM10 | OZONE | Temperature | NO2 | Humidity | VOC
 Max AQI: PM2.5 (17.27810249786851)
 Status: Good | Maintenance
 Dearborn, Michigan | Park
 42.3212219, -83.2800952
 Last Read: Jun 26, 2024 1:34 PM

PM2.5: Good

[EDIT](#) [6 NOTES](#)

MONITOR CALCULATED AVERAGES MONITOR STATE HISTORY EVENTS RAW JSON

Current State: Maintenance
 Updated By: Nate Rauh-Bieri
 Date: June 13, 2024 1:49 PM
 Previous State: Deployed
 Note: Outdated readings - stopped pulling data on 6/12. So putting it into maintenance to further investigate and see if it restores.

Current State: Deployed
 Updated By: Nate Rauh-Bieri
 Date: June 7, 2024 3:10 PM
 Previous State: Maintenance
 Note: This monitor was updated. It appears to now have continuous data again (searched 'Reports') so turning it back to Deployed status.

Current State: Maintenance
 Updated By: Nate Rauh-Bieri
 Date: May 22, 2024 4:05 PM
 Previous State: Deployed
 Note: Registered as outdated

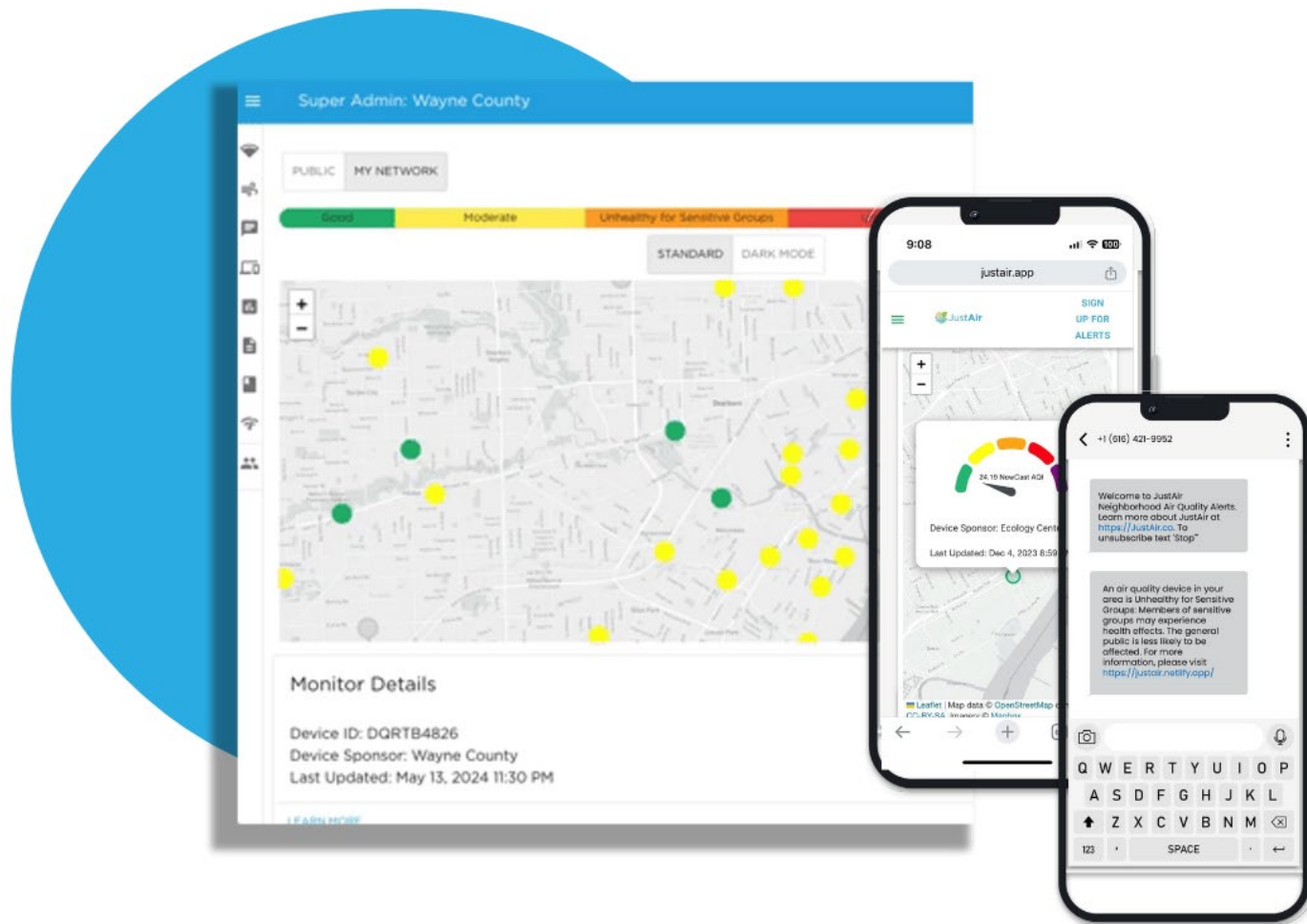
Recovery In Progress
 Changing WiFi settings on aeroqual admin portal to new WiFi settings Verizon-M3100-A319
 June 19, 2024 2:16 PM

Recovery In Progress
 Switching out new modem password:9c312330
 June 19, 2024 2:16 PM

Healthy
 Light WiFi is: GL-SFT1200-6F0-5G
 May 23, 2024 12:23 PM

Healthy
 The code to the Levagood Park gate to access the
 April 5, 2024 5:15 PM

Building the Future on Trust



Let's Get Started:
info@justair.co





Online Analytical Solutions Experts

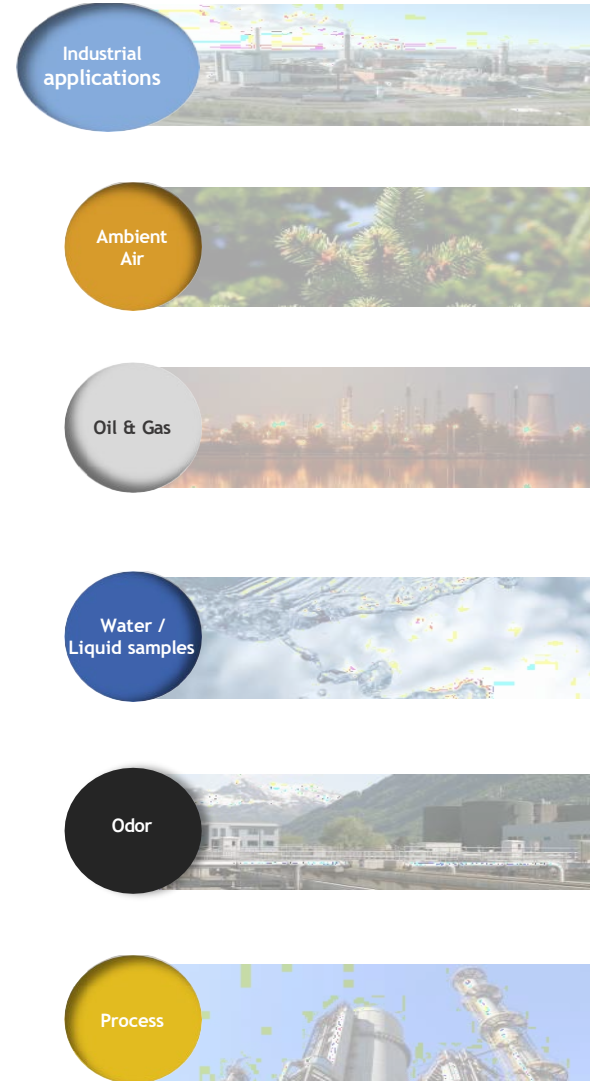
microVOC

Accurate, portable & user-friendly VOC analyzer

2024 National Ambient Air Monitoring Conference
Community Air Monitoring Showcase

Chromatotec®

Jean-Philippe AMIET - 2024/08/12



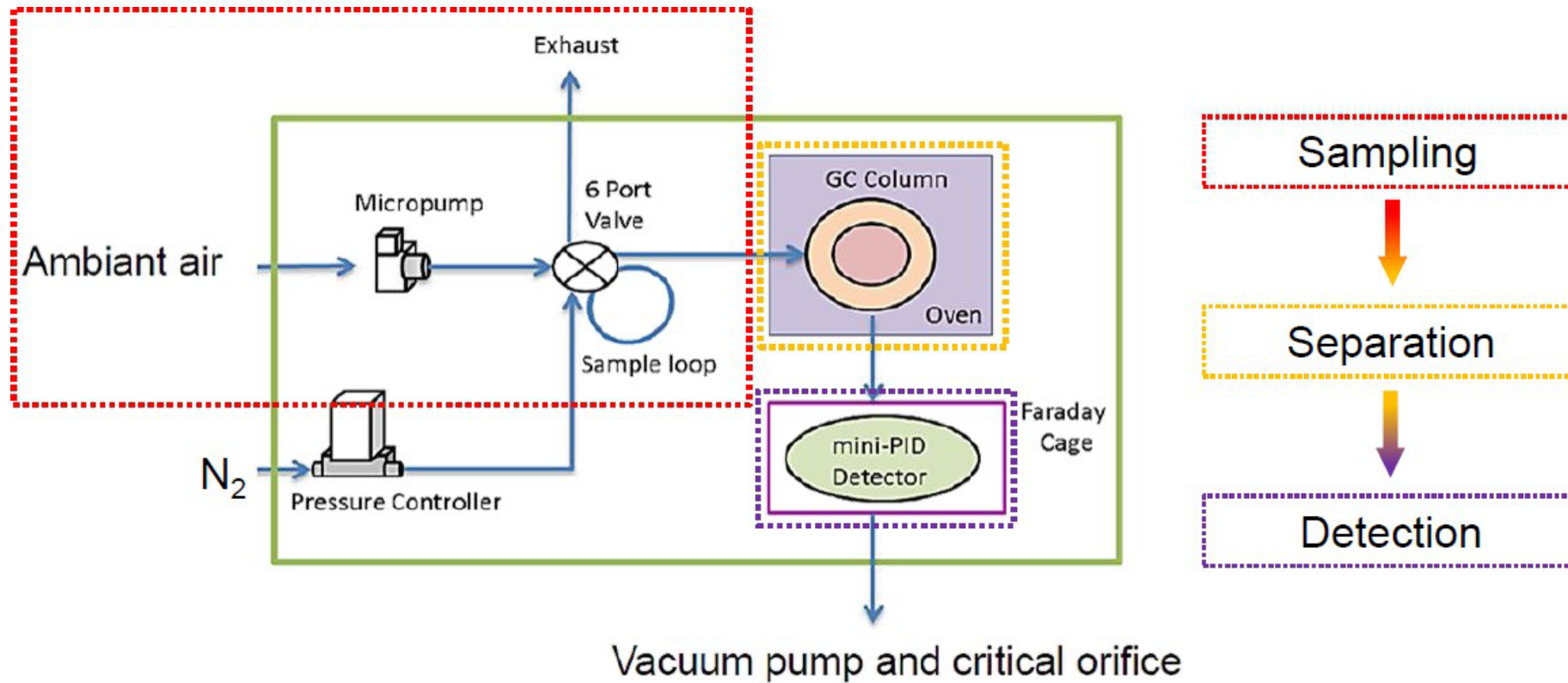
Technical Characteristics

Dimension	32 cm x 28 cm x 15 cm
Weight	6 Kg
Limit of detection	1 ppb < LOD < 5 ppb (BTEX)
Concentration range	0 - 1000 ppb (tunable)
Sampling	Loop - 200 μ L (tunable)
Carrier gas	Nitrogen (3mL/min)
Detection type	miniPID 10.6 Ev
Sample flow	17 ml/min
Cycle time	10 min



Developed in collaboration with CNRS Strasbourg

Schematic diagram



Results

Settings:

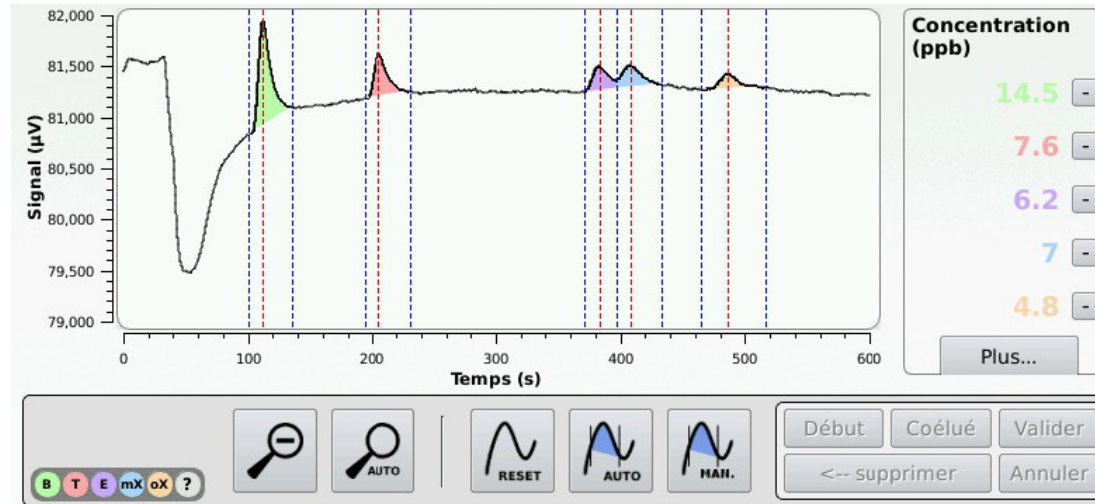
Column temperature: 58 °C

Sampling loop: 200 µL

Cycle time: 10 min

Sample flow: 17 mL/min

Pressure: 4 bar



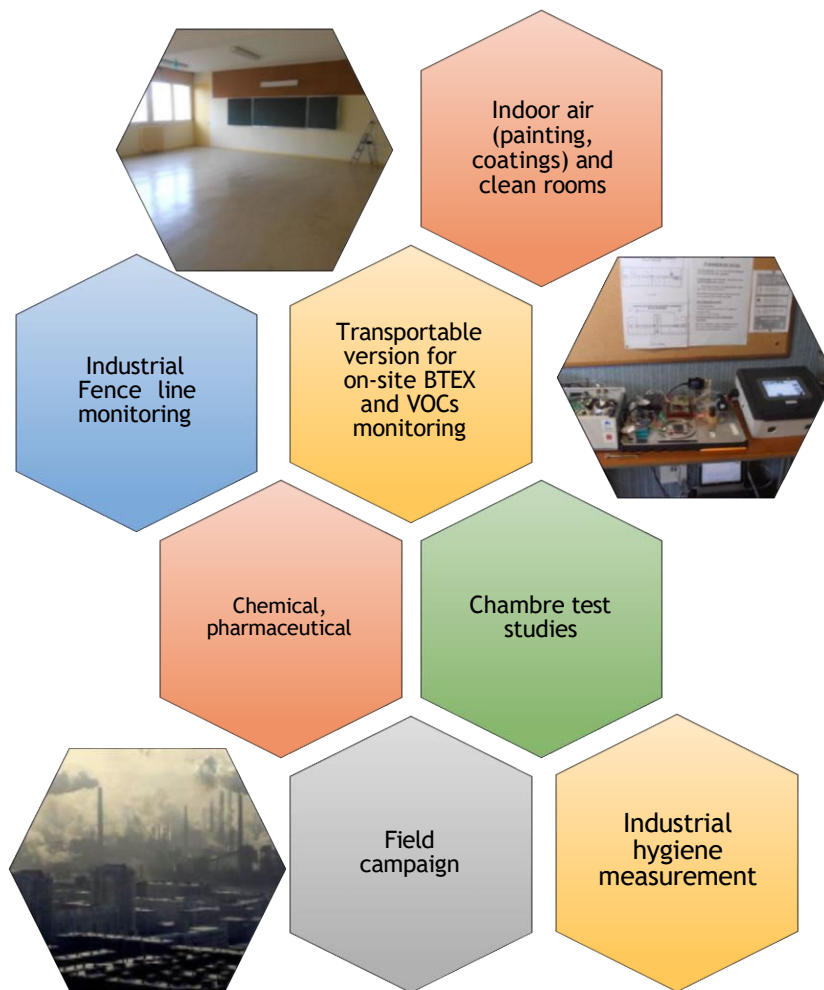
Retour Visual **Résultats détaillés** 17:4

Nom du fichier : 22-03-02_17-42.csv
Date de calibration : 2022-03-02_16-34

T. rétention (s) /	Composé	Concentration (ppb)	Aire	Intensité
111.7	benzene	14.5	11658	1033.6
205.3	toluene	7.6	5428.7	423.4
382.9	ethylbenzene	6.2	3569.9	238.4
407.8	mpxylene	7	4110.3	221.8
485.75	oxylene	4.8	2354.9	148.2

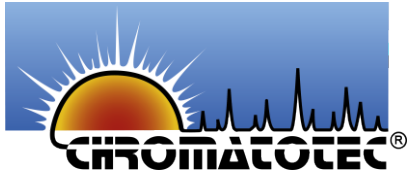
- Benzene = 14,5 ppb
- Toluene = 7,6 ppb
- Ethylbenzene = 6,2 ppb
- M&P-Xylenes = 7,0 ppb
- O-Xylene = 4,8 ppb

Applications



Advantages

- Easy to use
- Sensitive and fast measurement (LOD = 1 ppb - Cycle time = 10 min)
- Work sequence programming
- Battery life of 4 hours
- Storage on 32 GB SD card and data transfer to USB key
- Deployment in less than 5 minutes
- Minimal carrier gas consumption
- Analysis of other VOCs like: Methanol, Phenol, Acrolein, THT, TBM and other on request



Online Analytical Solutions Experts



Thanks for your attention



Break

9:35 – 9:50 AM