Community Air Monitoring Showcase Block 1

8:30 – 9:35 AM

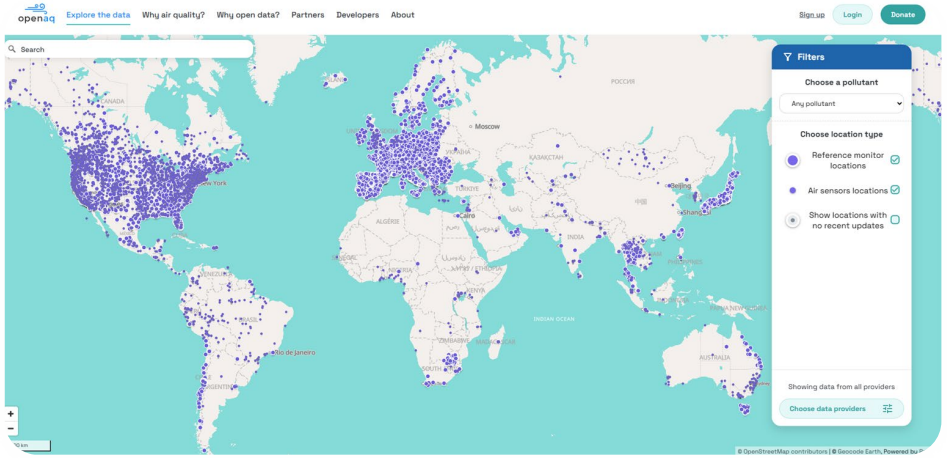
Sotirios Papathanasiou

Particles Plus, Inc.

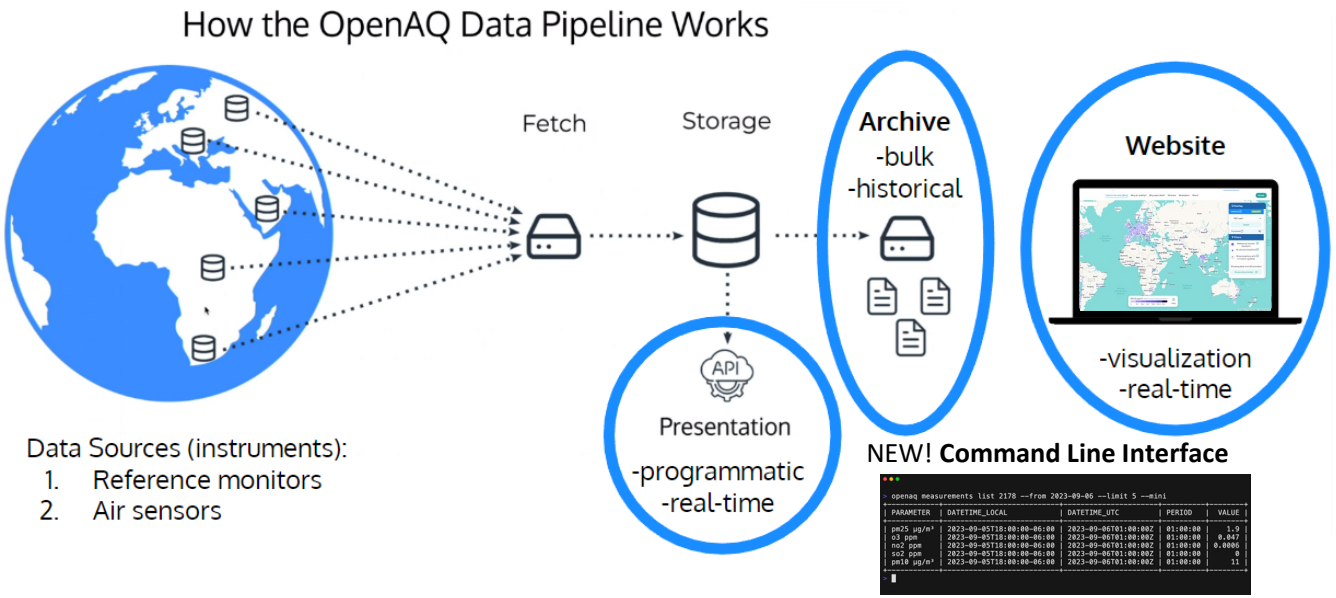
explore.openaq.org

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



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

- $PM_{2.5}$
- PM_{10}
- Sulfur Dioxide (SO_2)
- Nitrogen Dioxide (NO_2)
- Carbon Monoxide (CO)
- Black Carbon (BC)
- Ozone (O_3)

Data Sources
(ground-based instruments)

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

The OpenAQ API

api.openaq.org

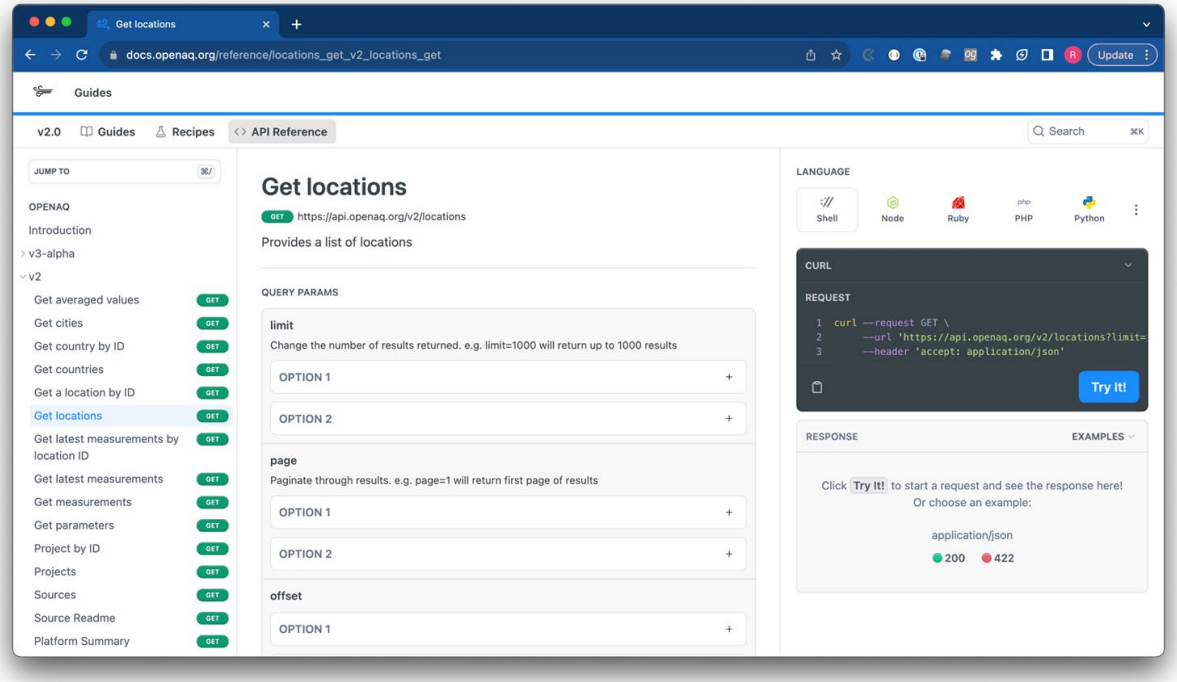
docs.openaq.org

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

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

Python wrapper:
python.openaq.org

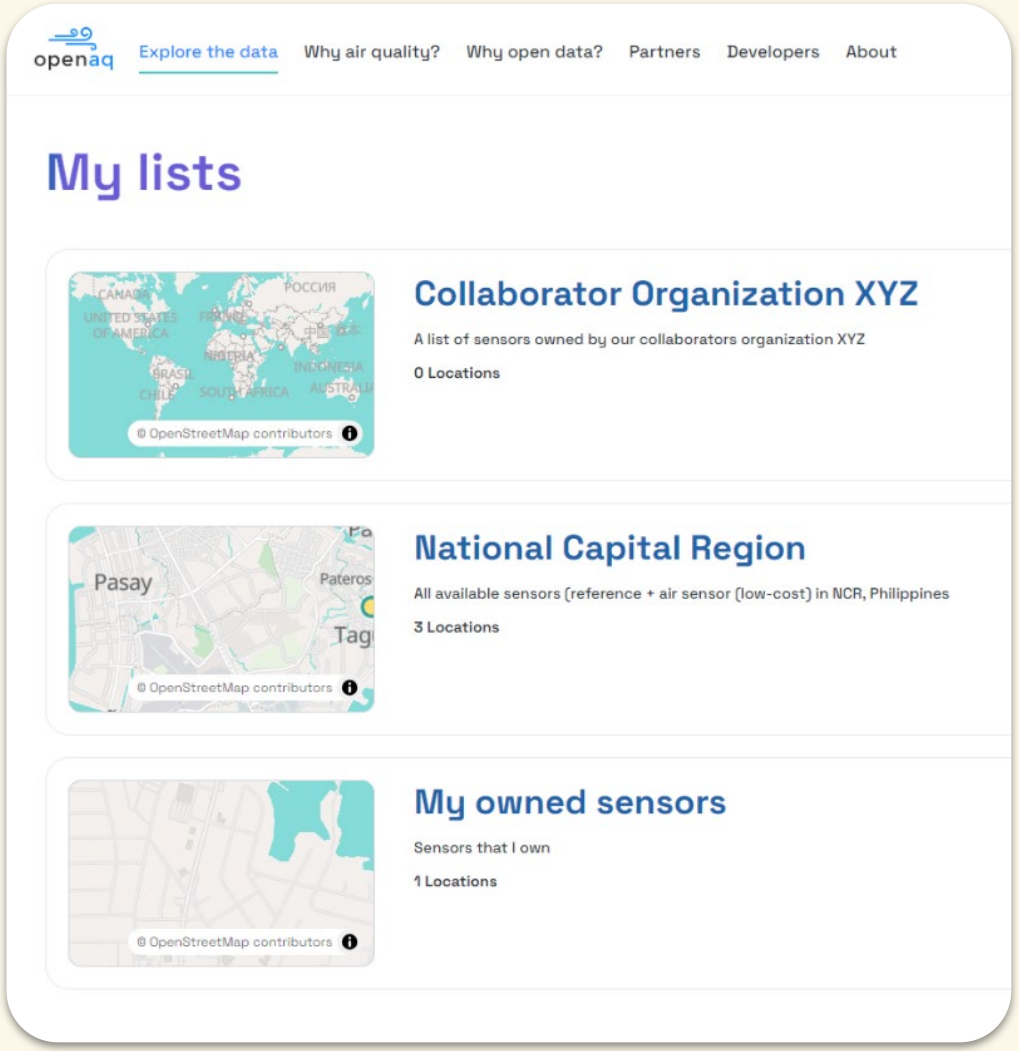
Command Line Interface
github.com/openaq/openaq-cli



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



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

 info@openaq.org

 linktr.ee/openaq • docs.openaq.org

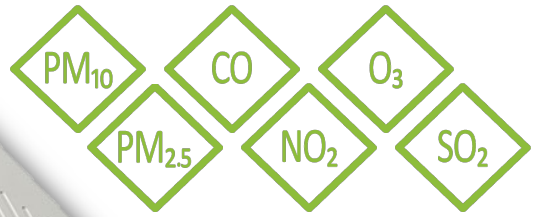
 openaq.medium.com

 github.com/openaq

 linkedin.com/company/openaq

AQMesh

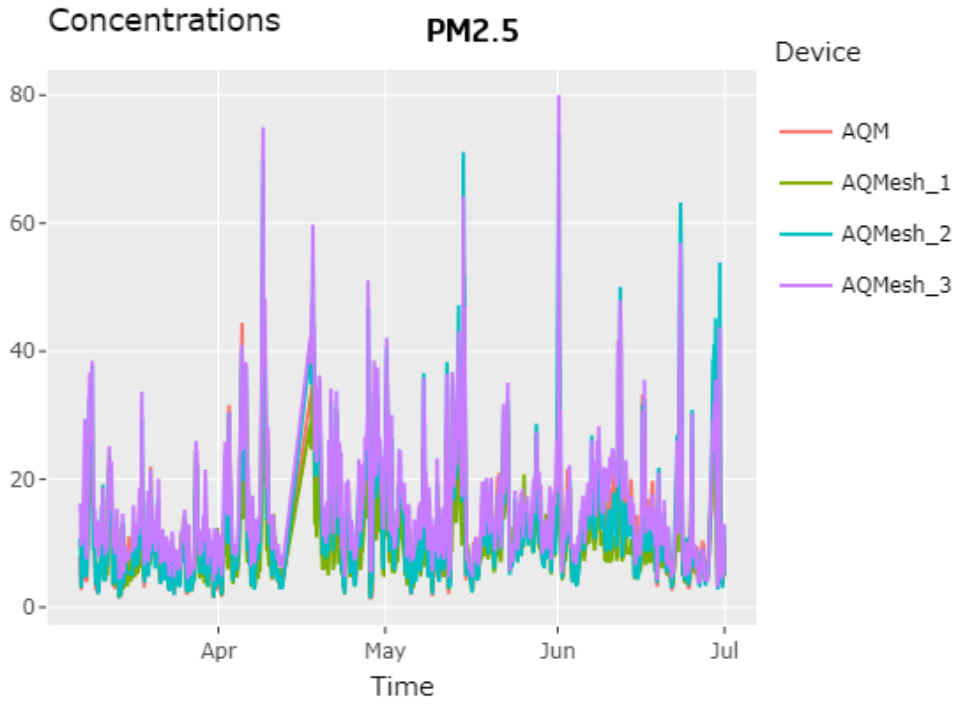
- Real-time air quality pod
- Electrochemical sensors for gas
- Optical light scattering for PM
- AT, BP, RH, WS, WD
- Outdoor/indoor applications
- Low cost operation

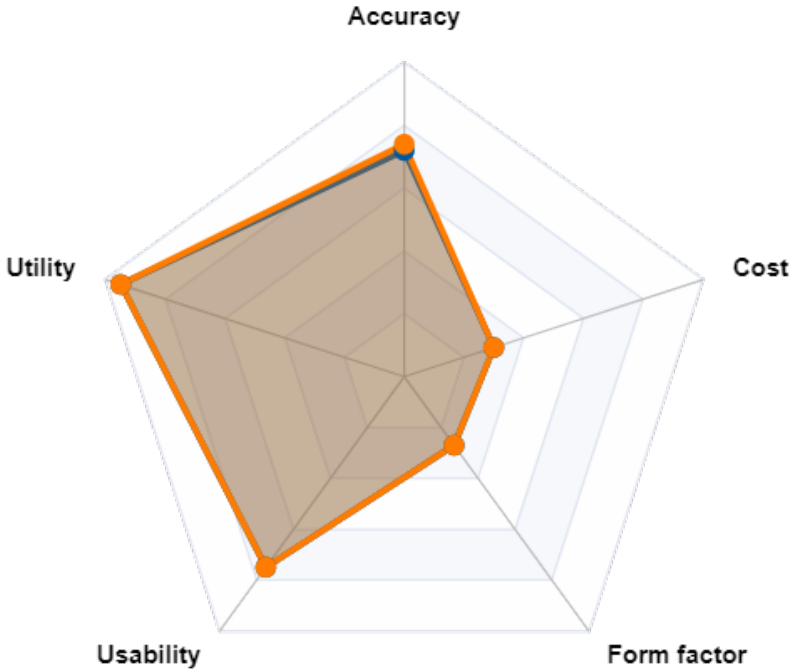


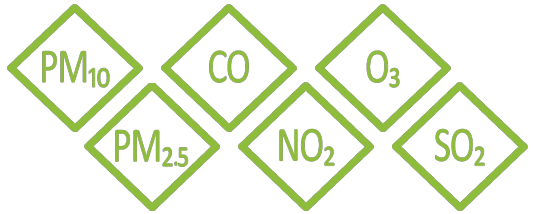
ambilabs®

Booths 403/405

AQMesh







Data courtesy of Airparif 2023 challenge.

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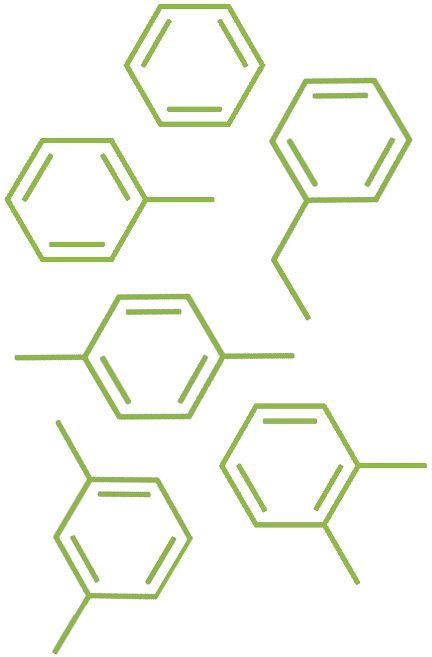
Pyxis GC

- 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



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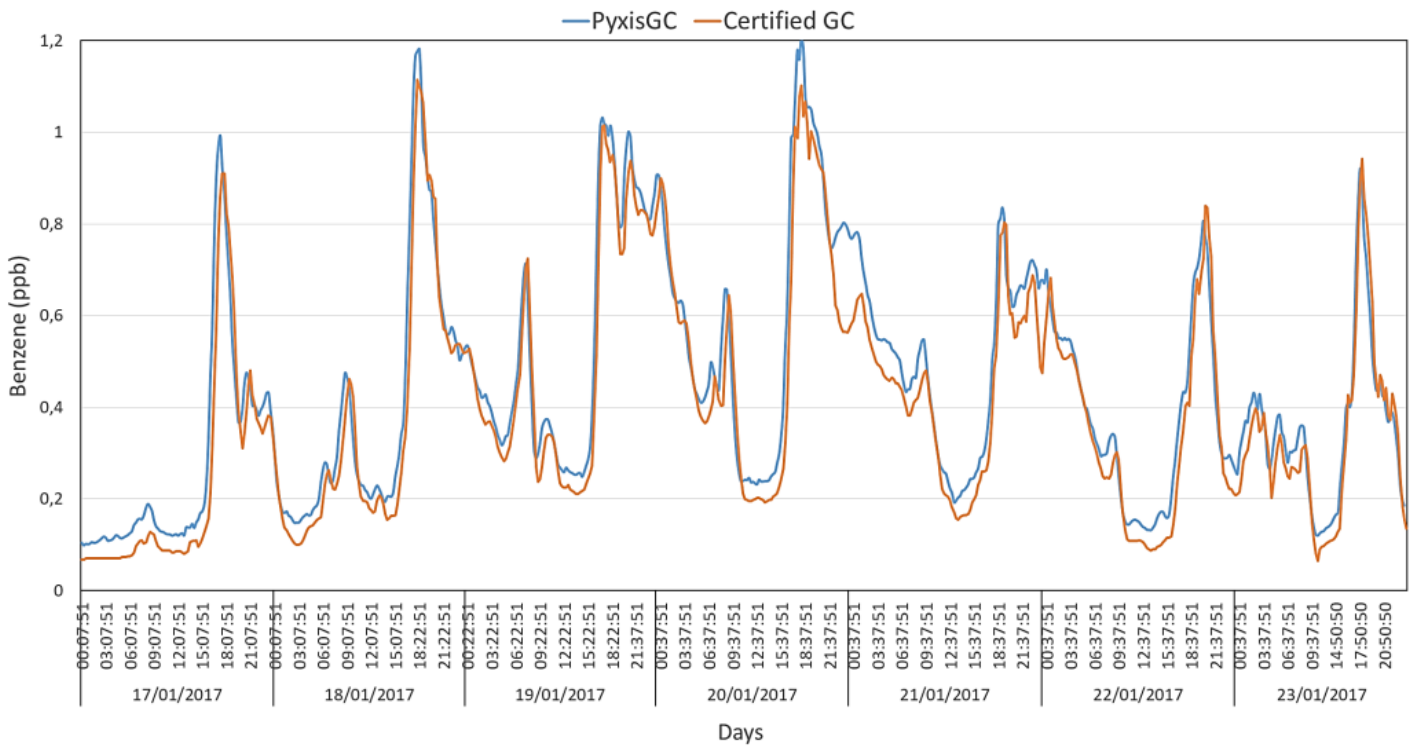
Pyxis BTEX



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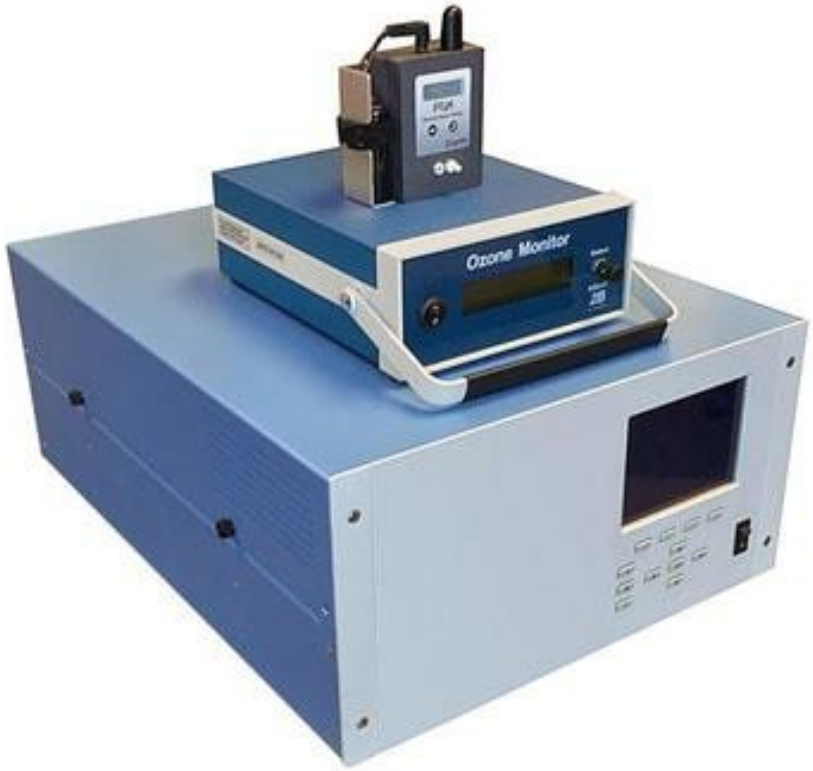
2B Technologies

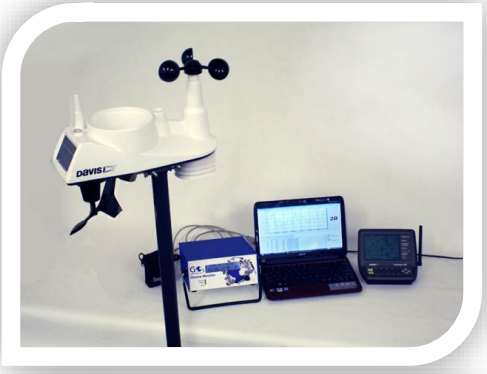
- Company founded in 1998
- Made our name miniaturizing conventional ozone analyzers without compromising performance
- All of our ozone and NOx monitors, as well as our calibrators are low-power (12V DC) and highly portable compared to the competition
- Ambient ozone and NOx monitors are US EPA certified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

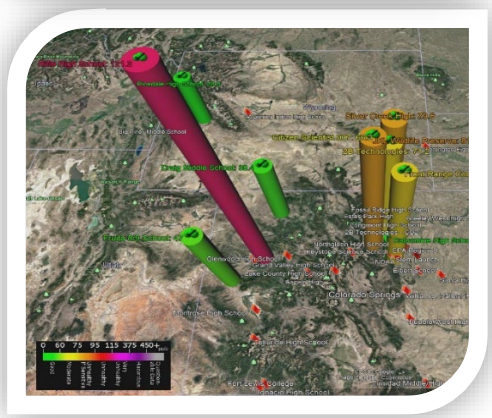


Applications Made Possible by 2B Tech Ozone Monitors

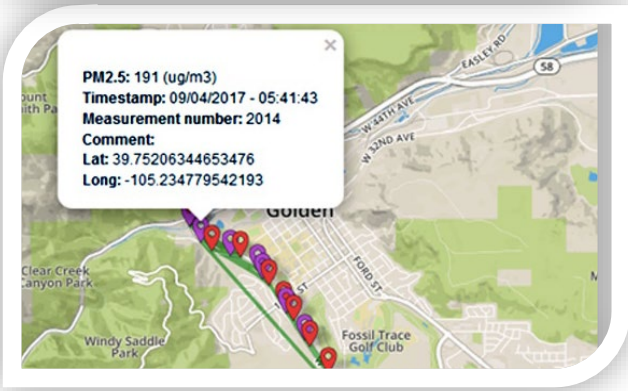
2B Tech

The evolution of the AQ line of products





Global Ozone (GO3) Project



AQTreks (PAM)

Community Calibration Station

2B Tech

AQ Products

Personal Air Monitor (PAM)

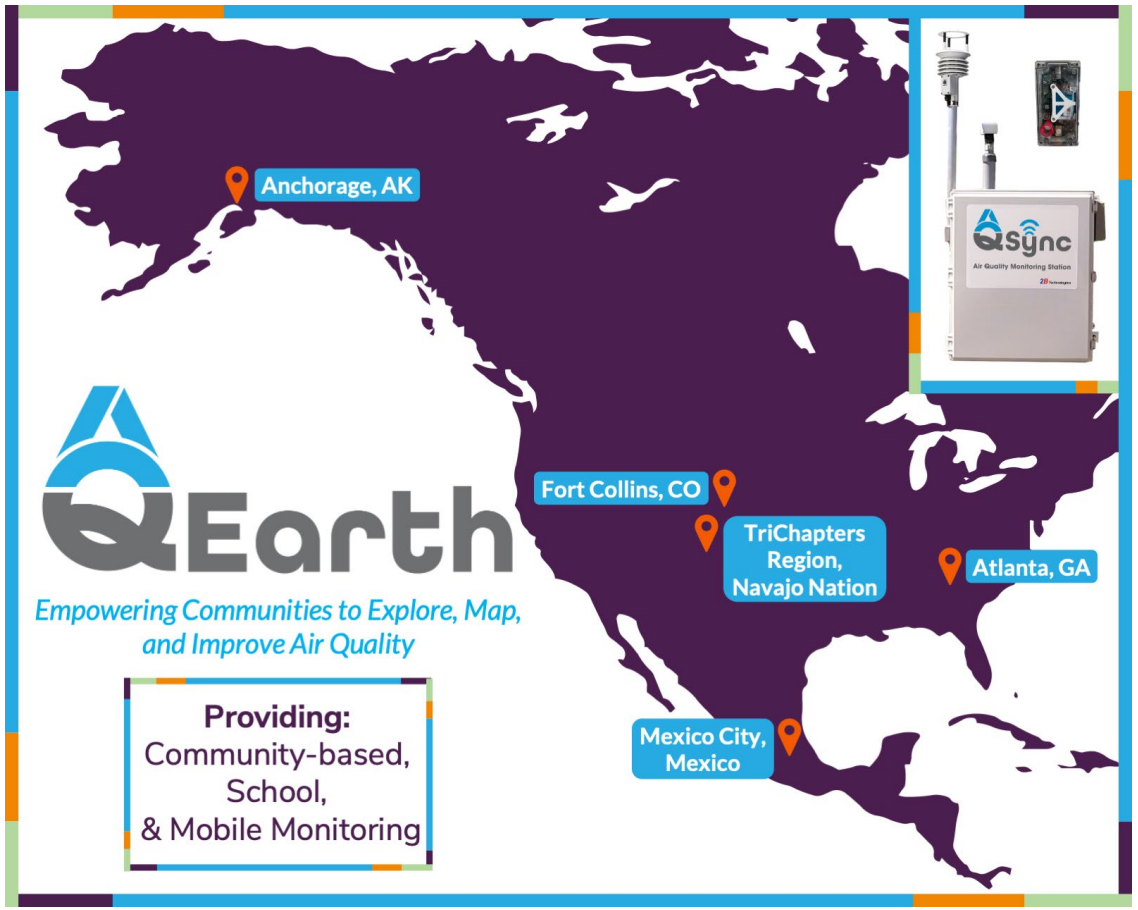
AQLite

AQSync

2B Tech

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

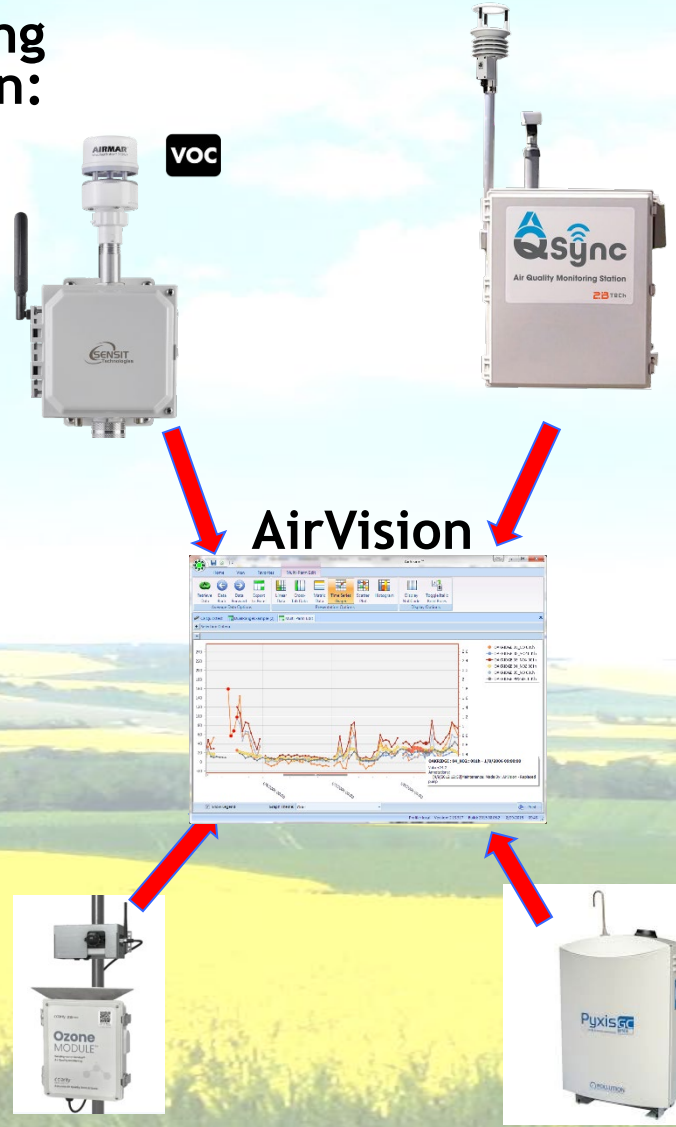


2B Tech

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



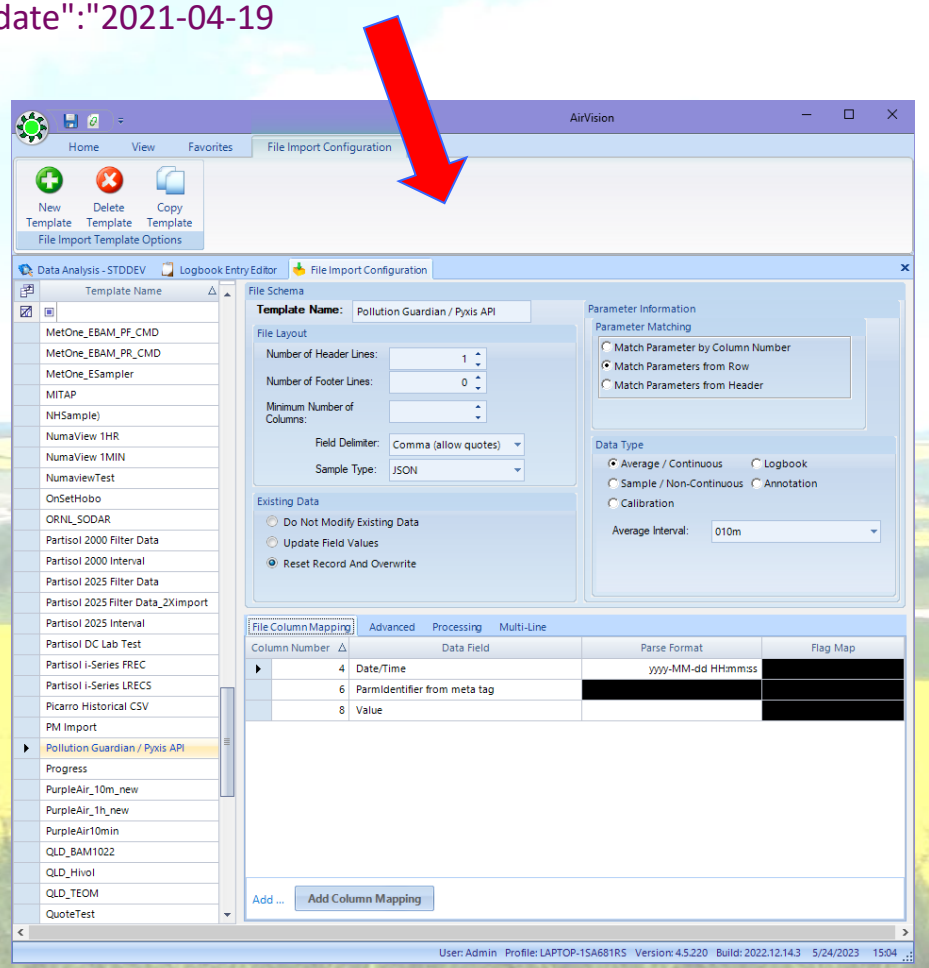
Agilaire LLC

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,"measuredate":"2021-04-19



Agilaire LLC

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).

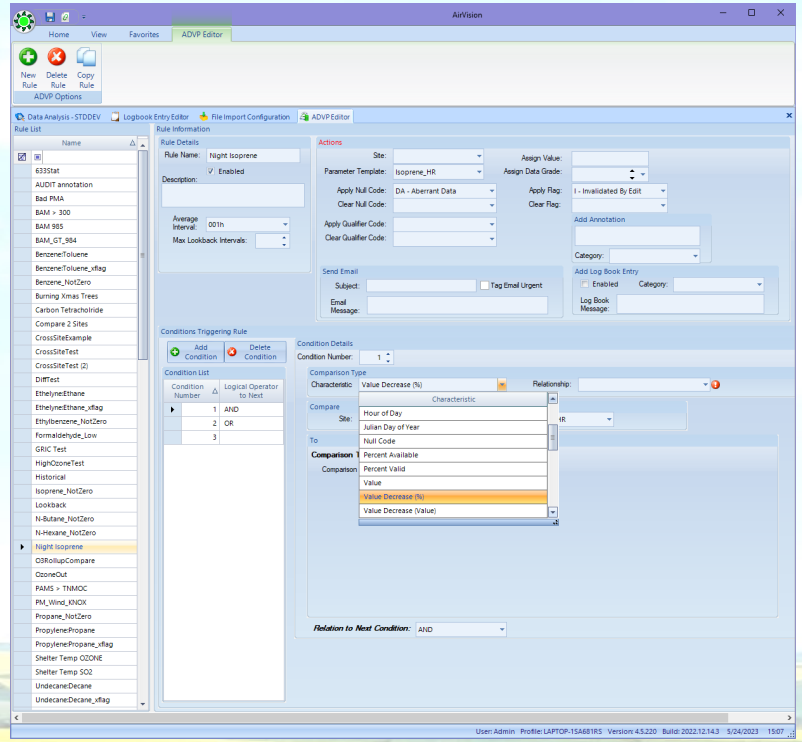
Agilaire LLC

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)

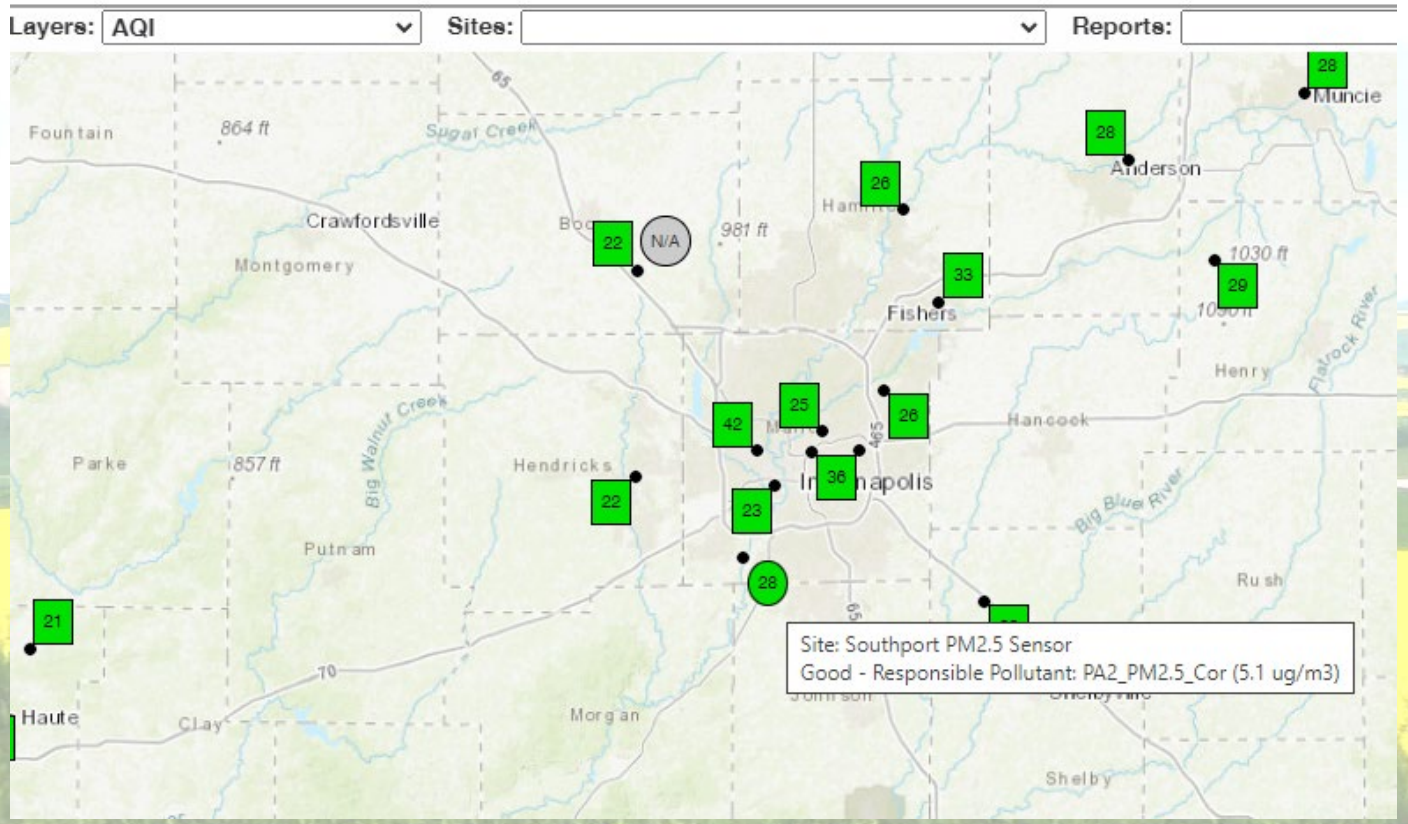
As you learn more about a particular sensor's quirks, can add additional qualifiers like daytime / nighttime,



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.



Agilaire LLC

aeroqual

Methane Measurement for Community and Perimeter Air Monitoring

NAAMC 2024
Booth 510

Methane (CH_4) overview

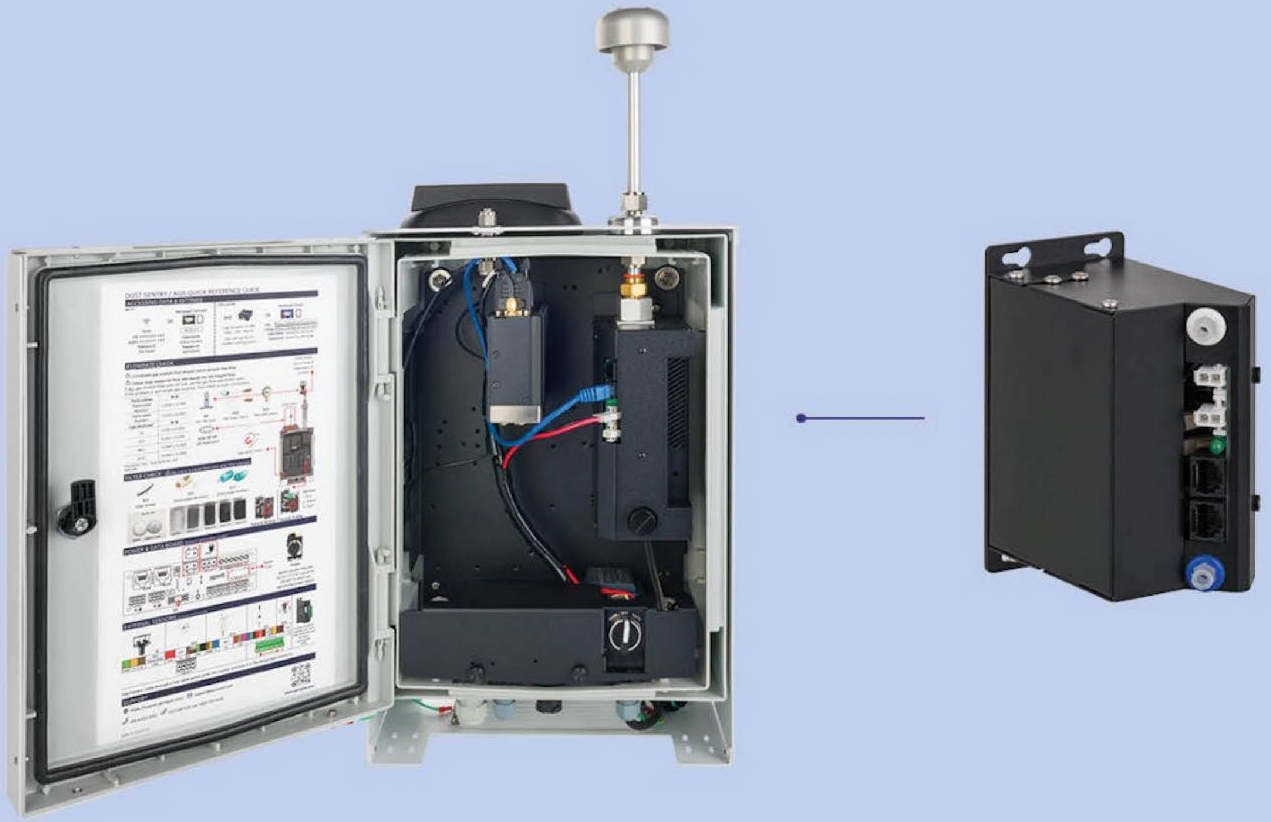
Methane is a potent greenhouse gas that has a significant impact on the Earth's climate

- Methane accounts for 16% of global emissions
- 28 times more potent than CO_2 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)

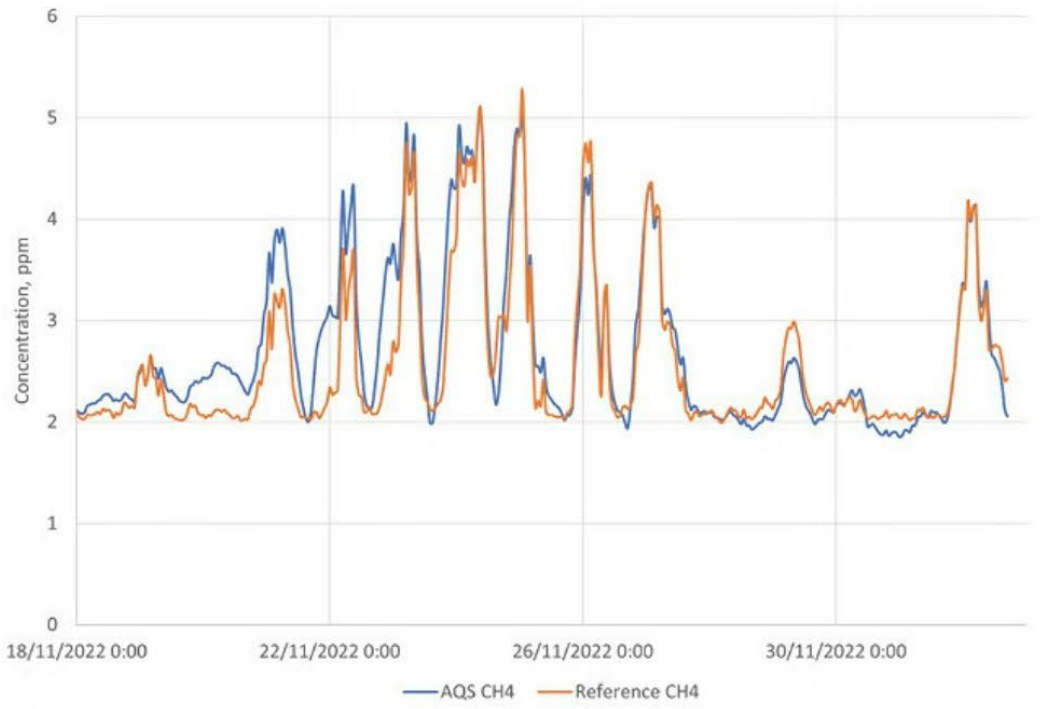


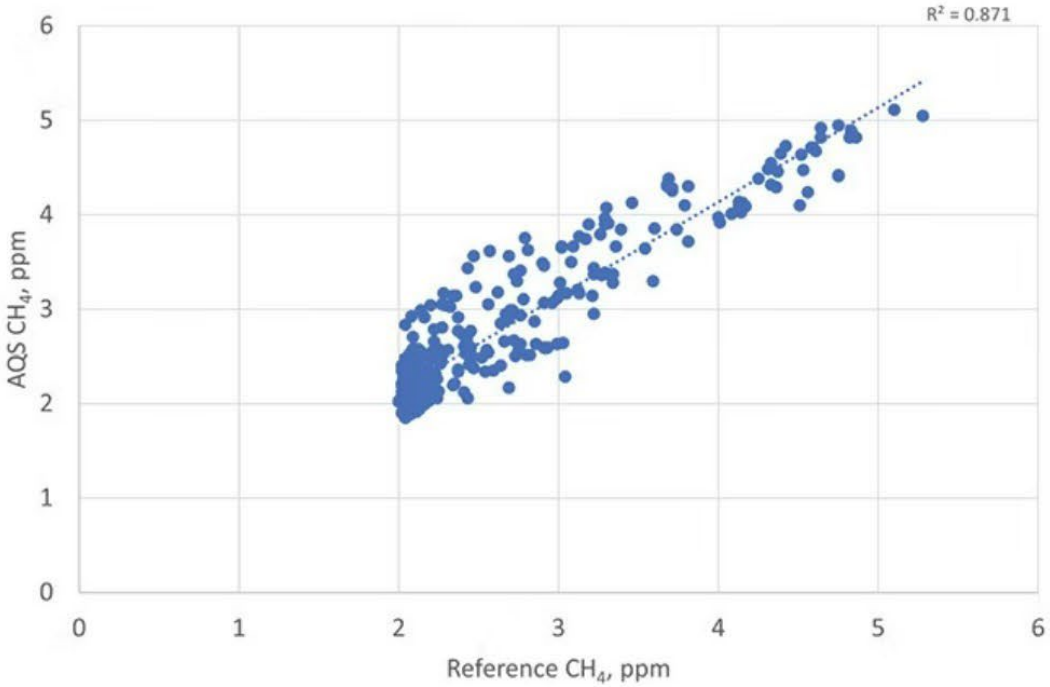
Methane module specifications and performance

	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 senor 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

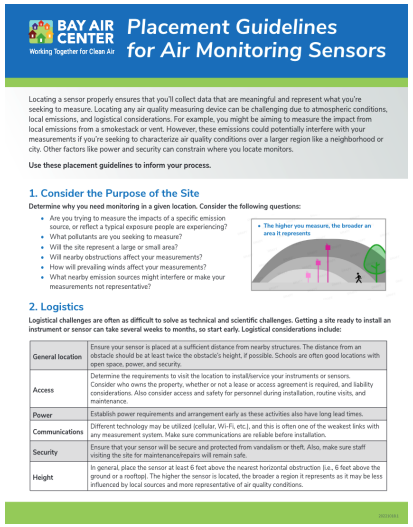
TDEnviro

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

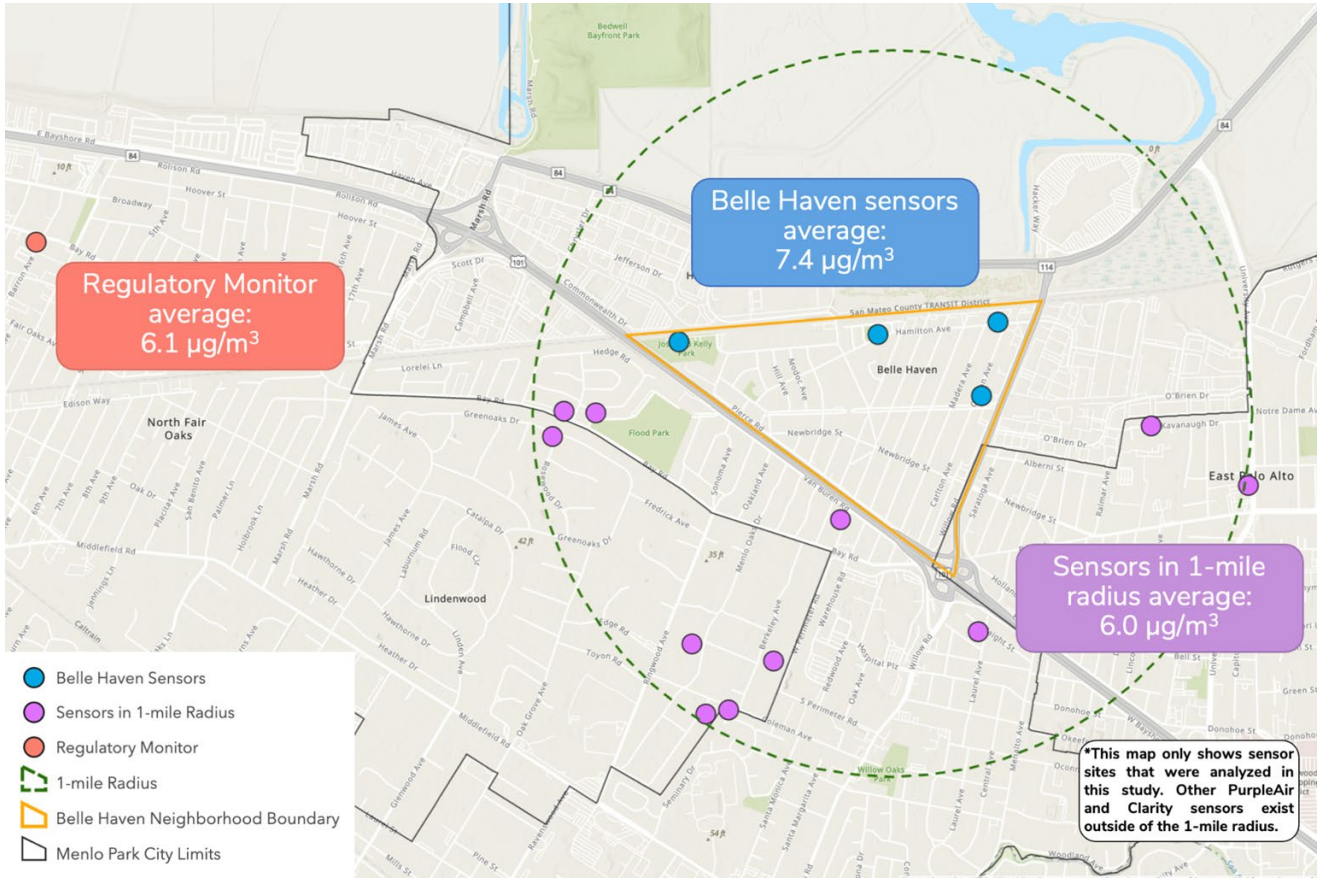
- Bay Area Air Quality Management District-sponsored community resource
- Provides AQ technical guidance, materials, and training to Bay Area community members and organizations, free of charge
- Supports efforts to understand and improve air quality

BAY AIR CENTER
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



BAY AIR CENTER
Working Together for Clean Air

BAY AREA AIR QUALITY MANAGEMENT DISTRICT

Let’s Talk

Trusted by Community

Understand Government

Independent

Technically Rigorous

Creative

TDEnviro.com

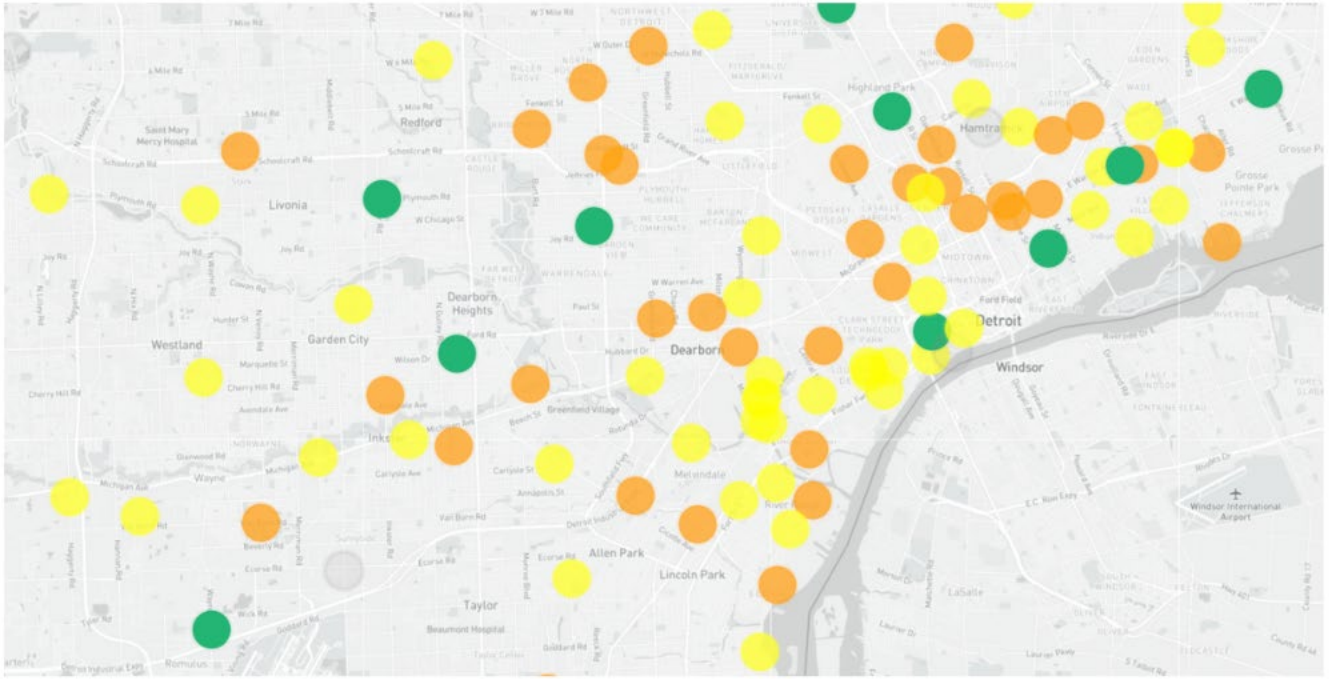
TDEnviro

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?



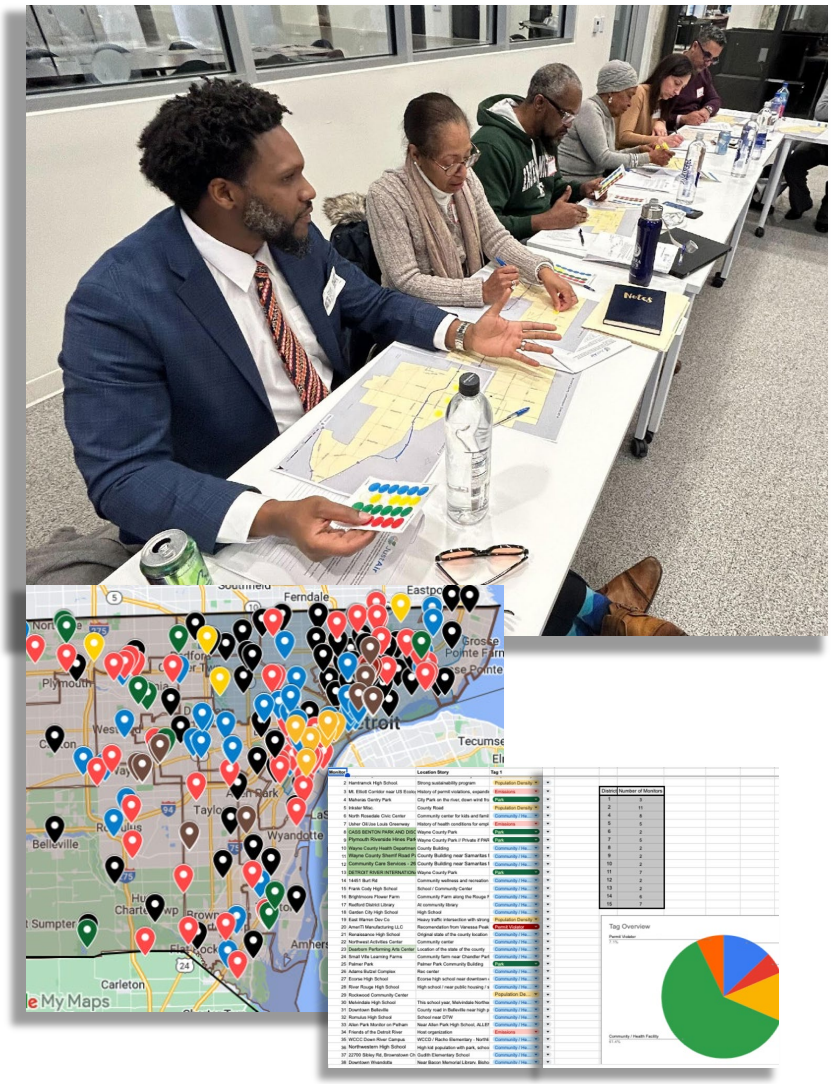
JustAir

WAYNE COUNTY MICHIGAN
EXECUTIVE
WARREN C. EVANS
SERVING 43 COMMUNITIES

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

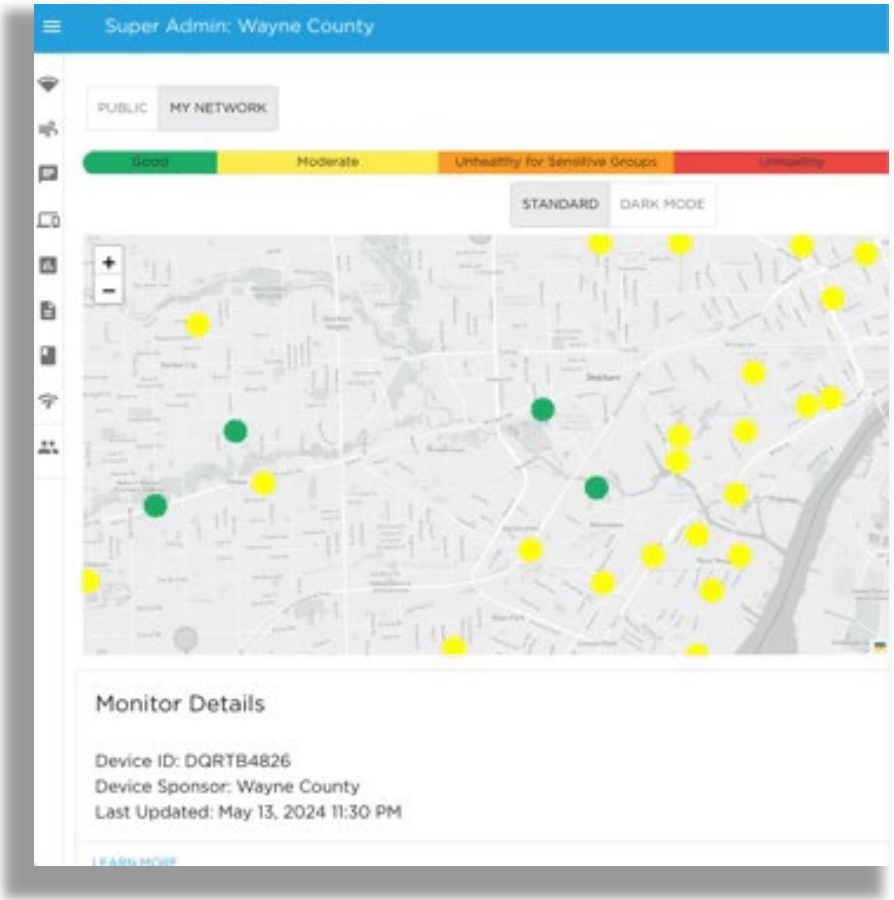
JustAir

Planning



Deployment

Management

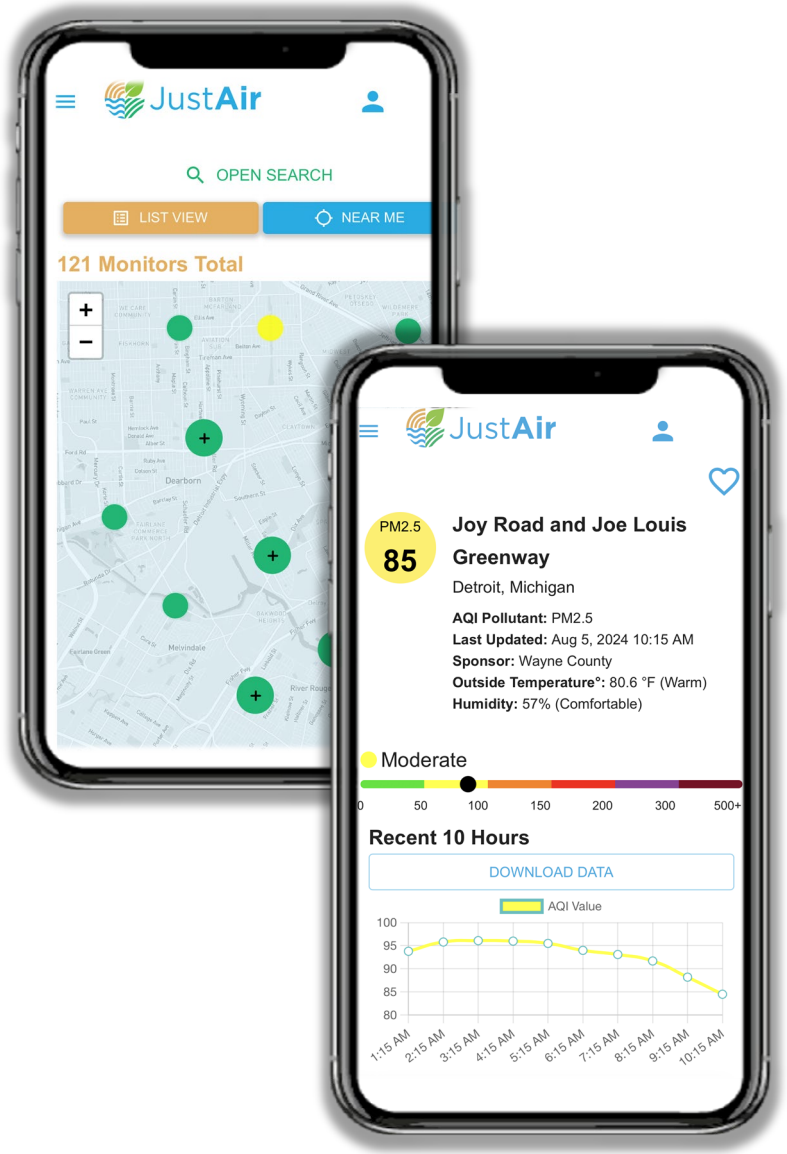


MyJustAir

Follow Monitors Near Where You Live, Work and Play

Receive text Alerts When Air Quality is Poor

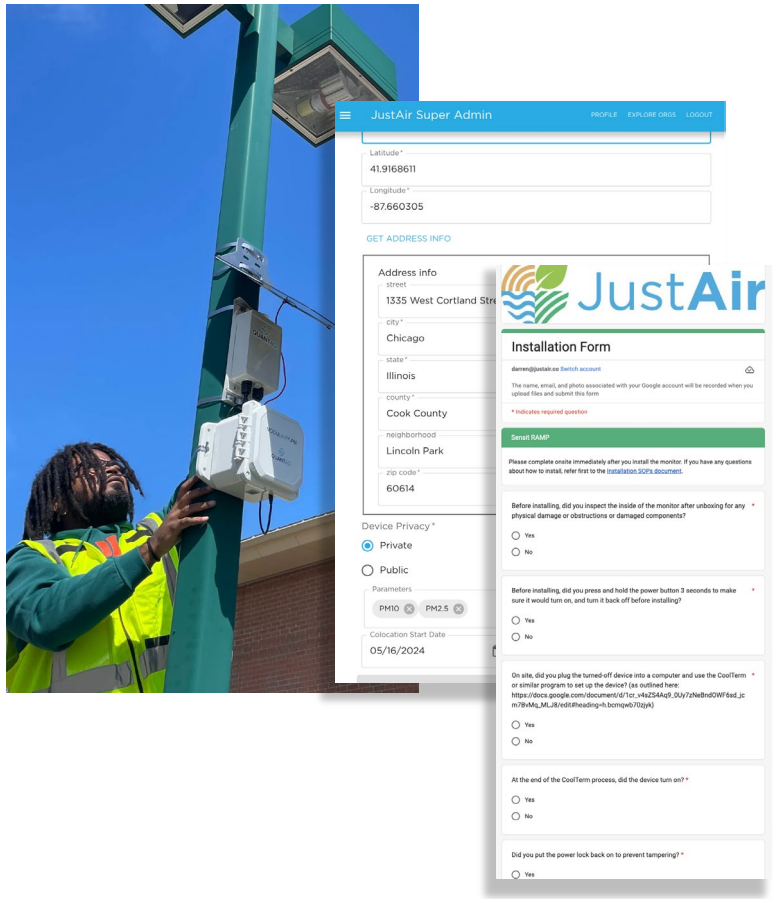
Make More Informed Health and Safety Decisions



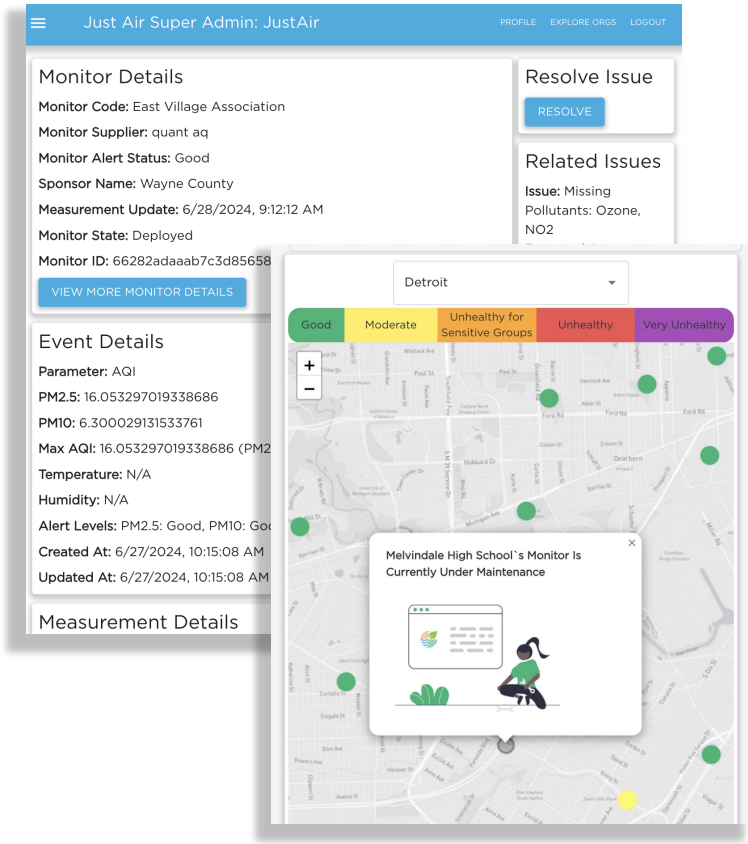
Sign up at JustAir.app

JustAir
QA Services

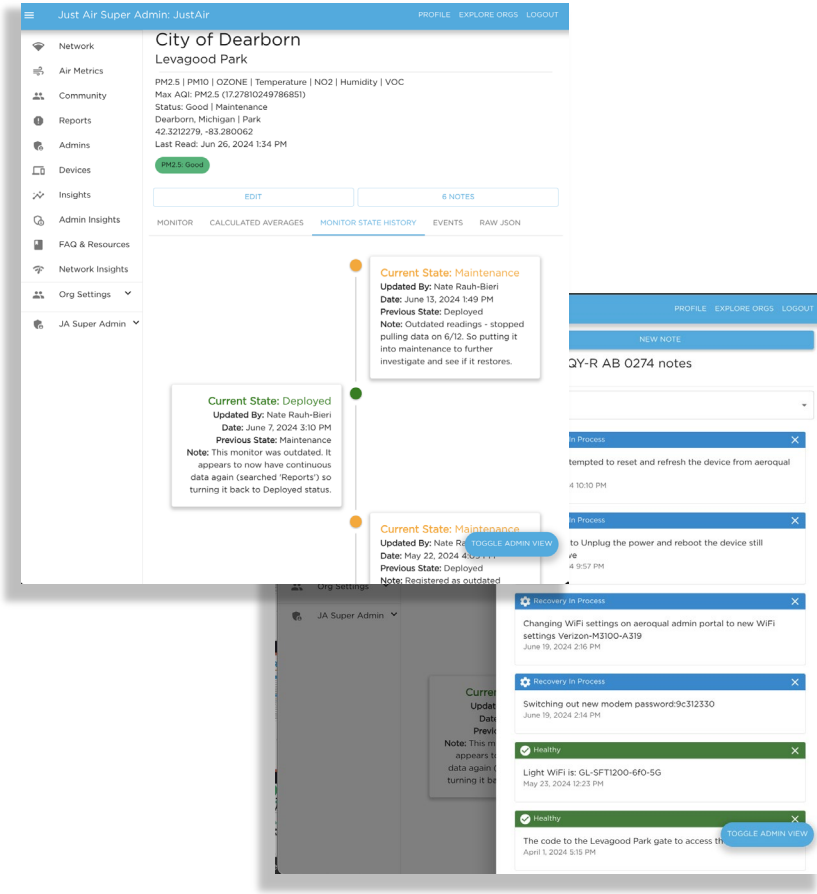
Quality Control



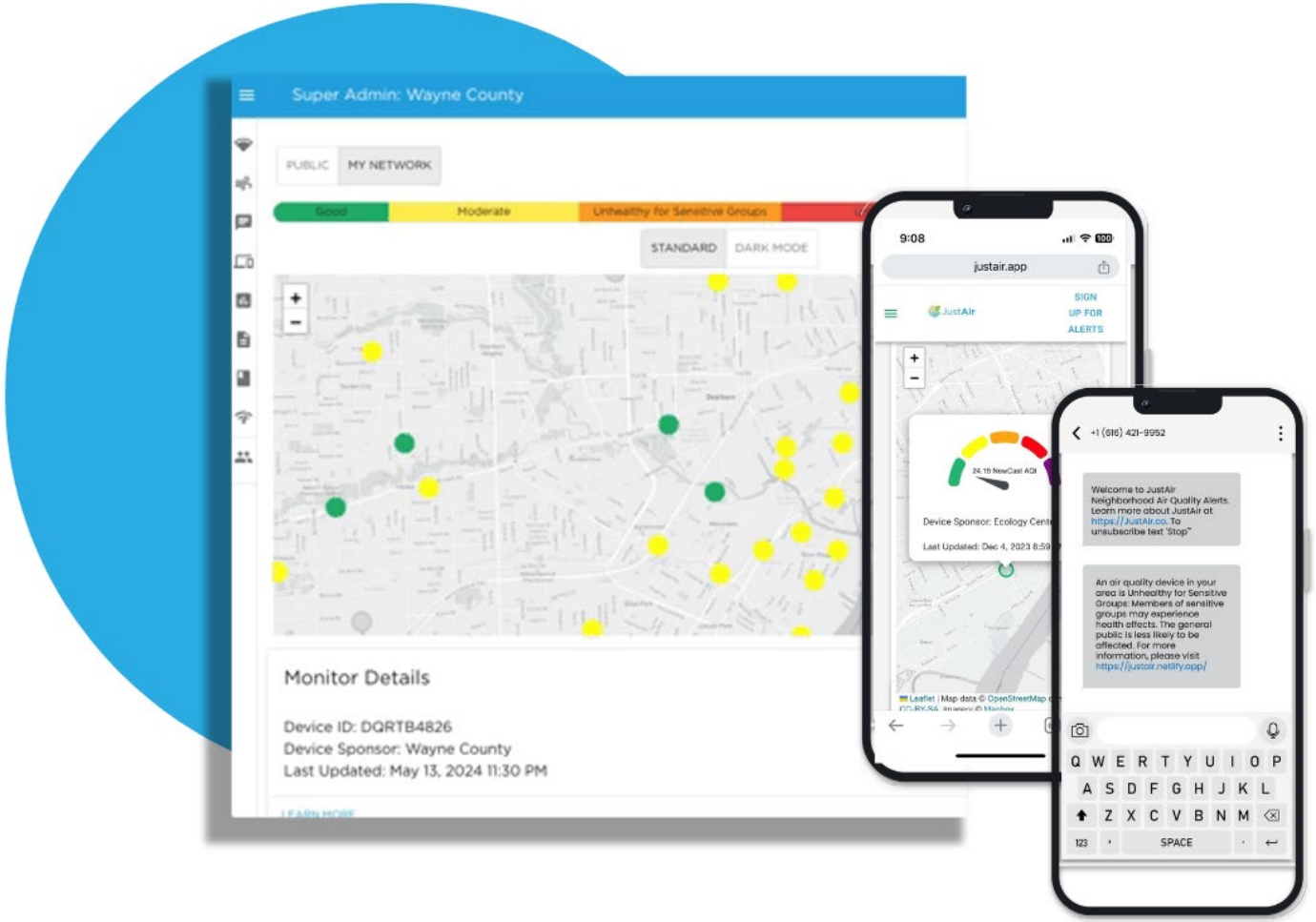
Incident and Anomaly Detection



Recovery and Reporting

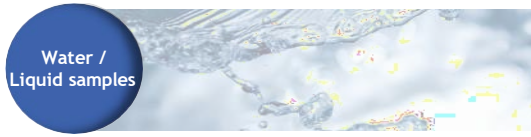


Building the Future on Trust



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®

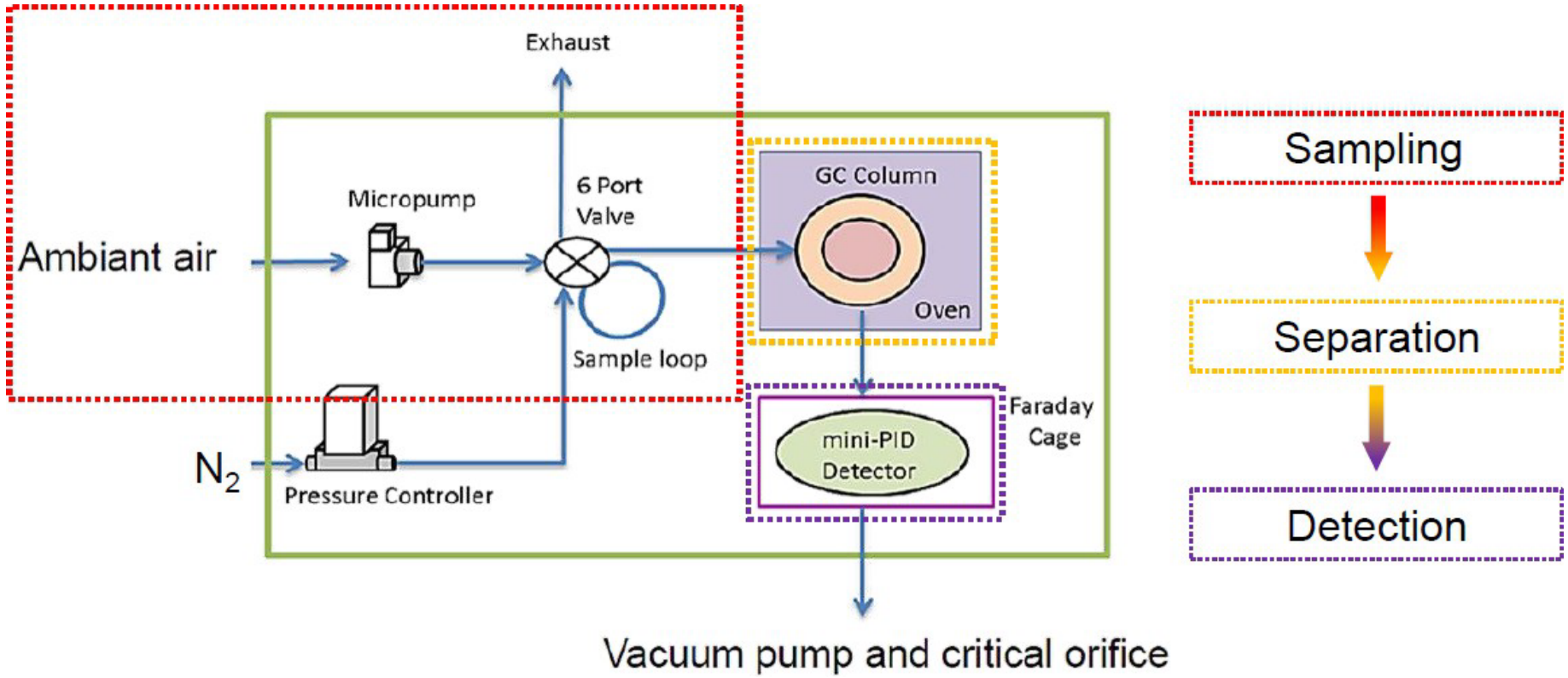
Jean-Philippe AMIET – 2024/08/12

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 µL (tunable)
Carrier gas	Nitrogen (3mL/**min**)
Detection type	miniPID 10.6 Ev
Sample flow	17 ml/min
Cycle time	10 min

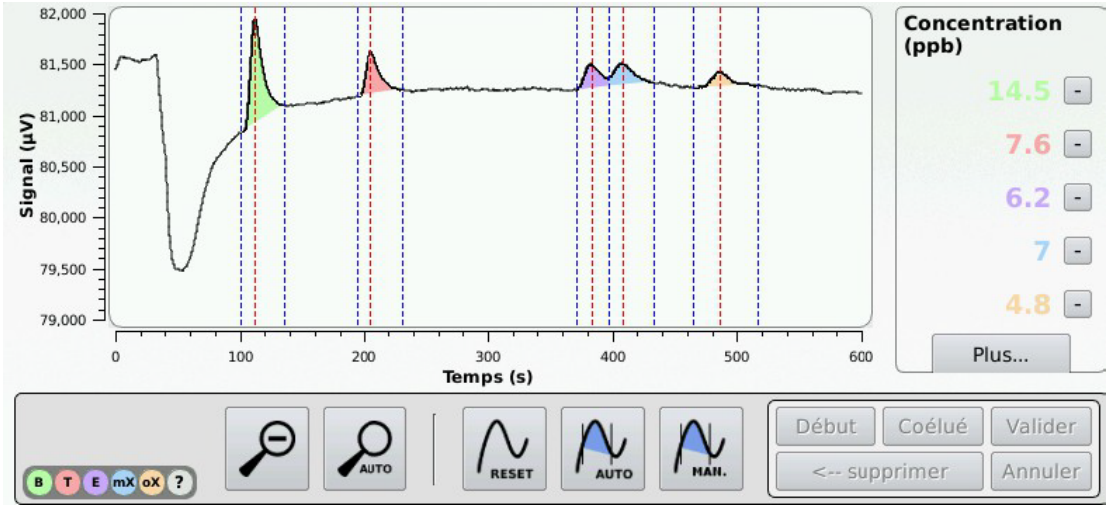
Developed in collaboration with CNRS Strasbourg

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

Résultats détaillés

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

Indoor air (painting, coatings) and clean rooms

Industrial Fence line monitoring

Transportable version for on-site BTEX and VOCs monitoring

Chemical, pharmaceutical

Chambre test studies

Field campaign

Industrial hygiene measurement

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

CHROMATOTEC®

Thanks for your attention

Break

9:35 – 9:50 AM