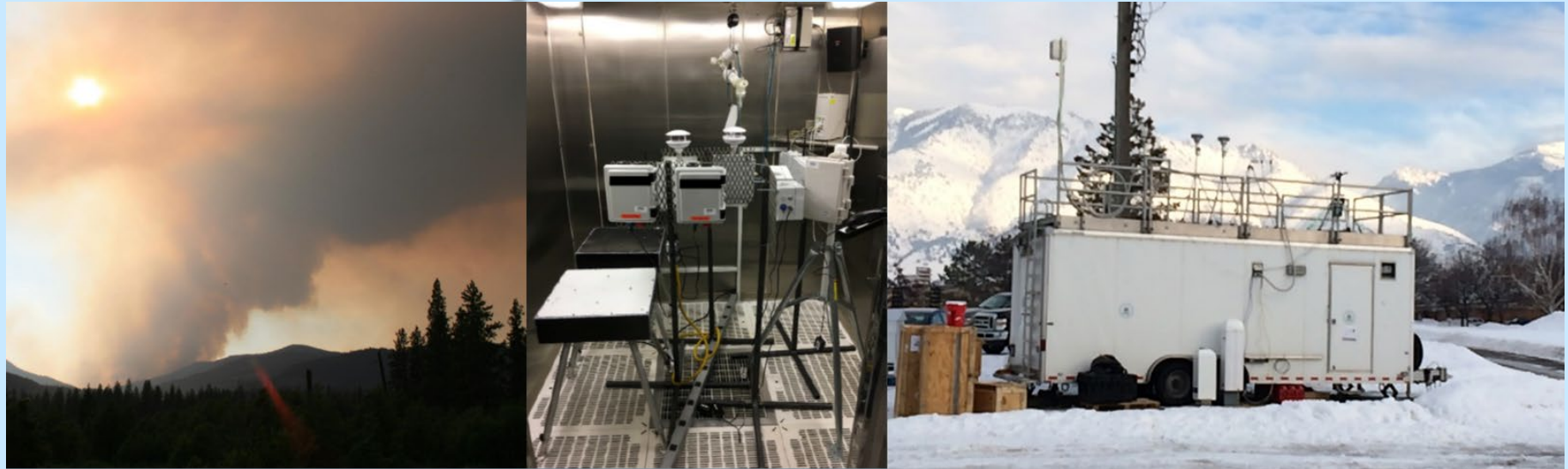*2024 National Ambient Air Monitoring Conference*

Update from EPA's Office of Research and Development

Gayle Hagler, Associate Director (with contributions by many!)

Center for Environmental Measurement and Modeling

Office of Research and Development

To cover today

- Air research at EPA

- Current in-house research portfolio related to air measurements, including:
  - FRM/FEM: Methods designation; development and evaluation
  - Sensors and data use
  - Air toxics and emerging contaminants: EtO, PFAS, 6PPD-q
  - Air monitoring platforms and remote sensing

- Grantee research

Look for this type of box for related EPA NAAMC presentations

ORD's air research focus

EPA/600/R-22/234 | October 2022

Air, Climate, and Energy
Strategic Research Action Plan
Fiscal Years 2023-2026

Office of Research and Development
Immediate Office of the Assistant Administrator
Air, Climate, and Energy Research Program

Research planned and continually coordinated to meet key stakeholder needs: *"ACE will continue to engage with EPA and external partners to identify specific deliverables and, through this collaborative approach, we will ensure that the **innovative work of our scientists and engineers informs the needs of the Agency, states, and Tribes."** (from the Executive Summary)*

Link: https://www.epa.gov/research/strategic-research-action-plans-fiscal-years-2023-2026#ACE
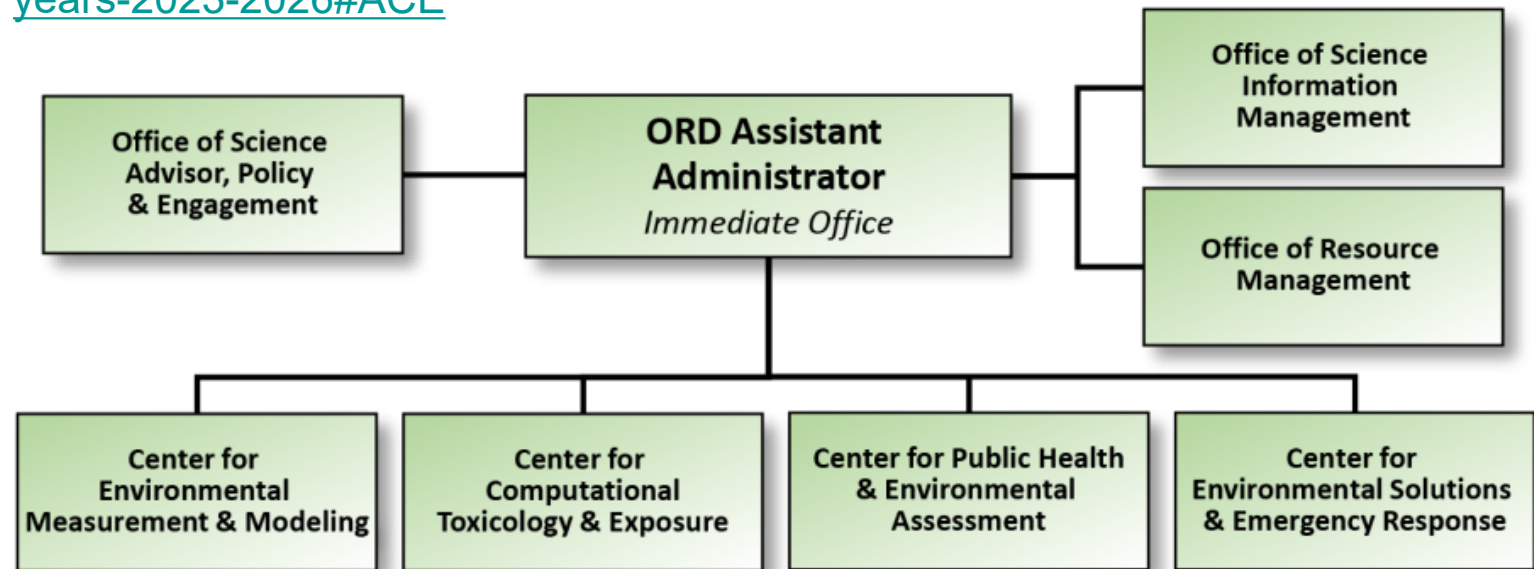
ORD continues to lead Federal Refence Method (FRM) and Federal Equivalent Method (FEM) designation

- Title 40, Part 53 of the Code of Federal Regulations (40 CFR Part 53)
  - Includes "General requirements" for reference and equivalent methods.
  - Specifies EPA ORD as the receiver of FRM/FEM candidate technology applications, lays out application requirements, and gives details of the designation process.

- FRM / FEM new designations and modifications to existing designations are posted to the Air Monitoring Technology Information Center

Related: Tues presentation by Tim Hanley (PM session)

List of Designated Reference and Equivalent Methods, June 15, 2024   Page 1

EPA
United States
Environmental Protection
Agency

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
CENTER FOR ENVIRONMENTAL MEASUREMENTS & MODELING
AIR METHODS & CHARACTERIZATION DIVISION (MD-D205-03)
Research Triangle Park, NC 27711
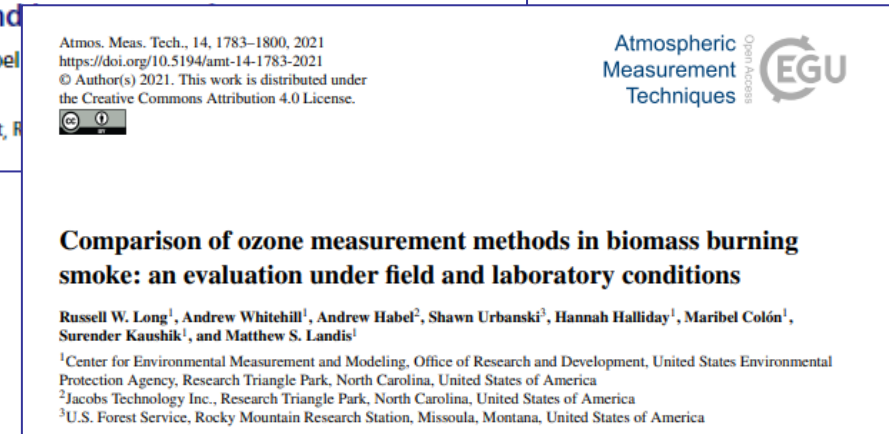
Office of
Research and Development

LIST OF DESIGNATED REFERENCE AND EQUIVALENT METHODS

Issue Date: June 15, 2024
(www.epa.gov/ttn/amtic/criteria.html)

Most Recent Modifications of Existing Designations

Designation Number	Applicant	Instrument Series	Summary of Modification	Effective Date
EQOA-0809-187	Acoem Australia	Ecotech Serinus 10 FEM O_3 Analyzer	Expanding operating temperature range of the instrument from 20-30 °C to 0-40 °C	February, 2024
EQPM-1013-209	MetOne	BAM-1022 FEM $PM_{2.5}$ Monitor	Modification request to add the BAM-1022-PLUS monitor	February, 2024
EQOA-0719-253	FPI	AQMS-300 FEM O_3 Analyzer	Modification request, Addition of the AQMS-300M to designation description and include voltage range to 110VAC.	May, 2024
EQSA-0809-188	Acoem Australia	Ecotech Serinus 50 FEM SO_2 Analyzer	Expanding operating temperature range of the instrument from 20-30 °C to 0-40 °C	June, 2024
RFCA-0509-174	Acoem Australia	Ecotech Serinus 30 FRM CO Analyzer	Expanding the concentration range of the trace version of the analyzer from 0 – 40 ppm to 0 – 50 ppm as well as operating temperature range of the instrument from 20-30 °C to 0-40 °C	June, 2024
RFPS-0498-116, EQPM-1013-211, RFPS-0315-221, RFPS-0717-245, EQPM-0812-203, EQPM-0202-144,	Multiple manufacturers	$PM_{2.5}$ FRMs and FEMs	Revised existing $PM_{2.5}$ designations to include the Tisch TE-PM2.5C cyclone as an approved component of $PM_{2.5}$ samplers and monitors per recent revisions to 40 CFR Part 50 Appendix L	June 2024

FEM / FRM research: understanding wildland fire smoke influence on instruments

- **Why is this needed**?
  - Smoke from wildfires affects many areas of the United States each year, including areas far from wildfires due to long-distance transport.
  - Measuring in smoke presents unique measurement challenges.

- Monitoring research is in progress, **testing ozone and PM$_{2.5}$ instrumentation in laboratory experiments and field locations** prone to wildfire smoke events.

Check for updates

Summary of PM$_{2.5}$ measurement artifacts associated with the Teledyne T640 PM Mass Monitor under controlled chamber experimental conditions using polydisperse ammonium sulfate aerosols and

Russell W. Long[a], Shawn P. Urbanski[b], Emily Lincoln[b], Maribel Robert W. Vanderpool[a], and Matthew S. Landis[a]

[a]U.S. Environmental Protection Agency, Office of Research and Development, R Mountain Research Station, Missoula, MT, USA

Comparison of ozone measurement methods in biomass burning smoke: an evaluation under field and laboratory conditions

Russell W. Long[1], Andrew Whitehill[1], Andrew Habel[2], Shawn Urbanski[3], Hannah Halliday[1], Maribel Colón[1], Surender Kaushik[1], and Matthew S. Landis[1]

[1]Center for Environmental Measurement and Modeling, Office of Research and Development, United States Environmental Protection Agency, Research Triangle Park, North Carolina, United States of America
[2]Jacobs Technology Inc., Research Triangle Park, North Carolina, United States of America
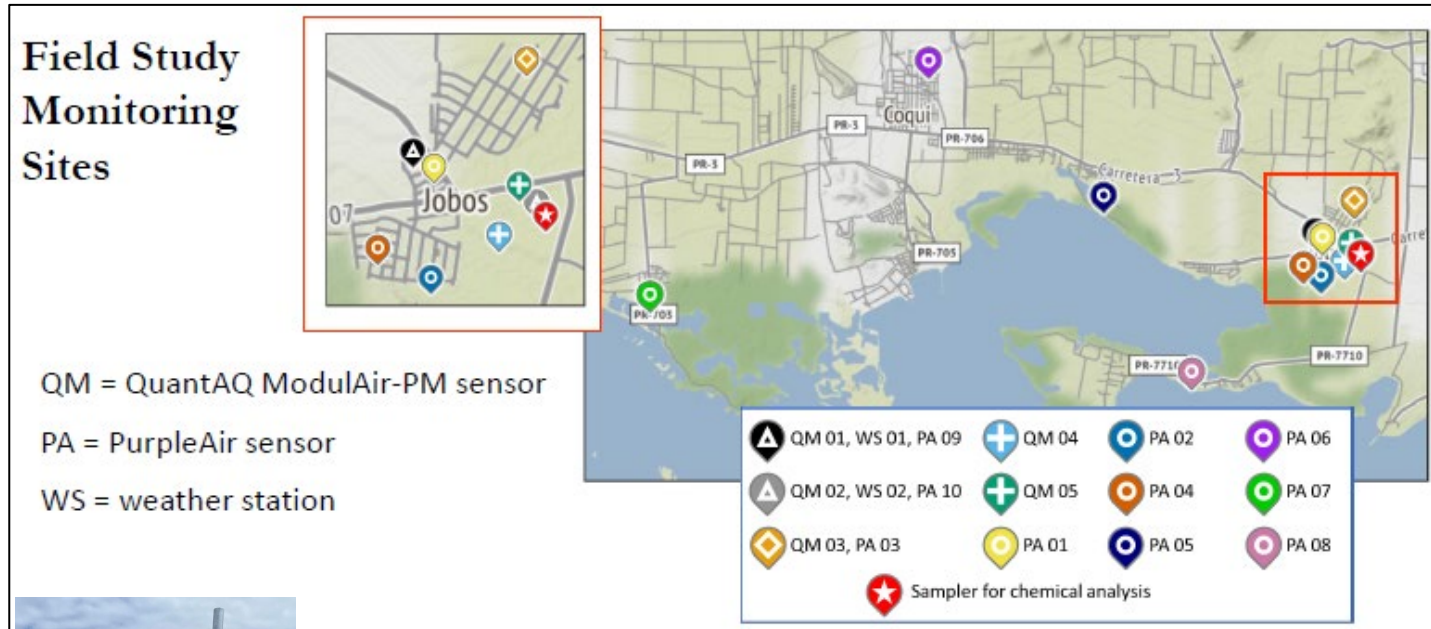[3]U.S. Forest Service, Rocky Mountain Research Station, Missoula, Montana, United States of America

Example finding: "The study found that the new ozone NO-chemiluminescence method, designated as an FRM in 2015, did not have operational problems when used in the smoke plumes. However, the ozone UV-photometric method showed varying degrees of smoke interference and did not provide accurate results." - https://www.epa.gov/sciencematters/study-provides-new-insights-impacts-wildland-fires-ozone-monitoring-equipment

Puerto Rico Community PM study

- Field study co-led by EPA Region 2 and ORD to measure the spatiotemporal variation and composition of PM in a community concerned about fugitive dust from coal combustion residuals (CCR).

- Measurements, with siting informed through community engagement:
  - PM_{10} filter sampler with mass and composition analysis (black carbon, trace metals)
  - Sensor network using two types of PM sensors, weather station

- April 2023 – Mar 2024 study including before/after collocation, with siting support from community members and collocation and sampler operation support from PR Department of Natural and Environmental Resources (PRDNER)

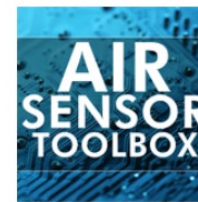- Monthly newsletters during field study shared with stakeholders, in Spanish and English

Related: Poster presentation by Sarah Pender (EPA R2)

Field Study Monitoring Sites

QM = QuantAQ ModulAir-PM sensor
PA = PurpleAir sensor
WS = weather station

QM 01, WS 01, PA 09 | QM 04 | PA 02 | PA 06
QM 02, WS 02, PA 10 | QM 05 | PA 04 | PA 07
QM 03, PA 03 | PA 01 | PA 05 | PA 08
Sampler for chemical analysis

~1 mile to CCR source

Sensor/sampler post-study collocation on a school building roof
photo credits: Sarah Pender (left), Amara Holder (above)

R&D on air sensors

- United States, and worldwide, has seen significant technological and use growth for air sensors used for non-regulatory supplemental and informational monitoring (NSIM) purposes.

- EPA research has included:
  - Testing sensors in field and laboratory settings
  - Loans and direct use of sensor technology in field studies
  - Development of strategies to quality assure and correct large networks of public sensor data
  - Developing performance targets and test protocols for sensors used in NSIM applications
  - Significant engagement with sensor developers and practitioners
  - Development of tools and materials:
    - Enhanced Air Sensor Guidebook
    - Python package for air sensor data analysis (Sensortoolkit)
    - Coming soon: Air Sensor Network Analysis Tools

Related: Poster presentation by Ryan Brown (EPA Region 4)

R&D on air sensors

The AirNow Fire and Smoke Map (fire.airnow.gov) integrates the official monitoring sites, temporary smoke monitors, and sensor data.

ORD research continues to inform sensor data inclusion, quality checks and corrections applied to sensor data in the widely used map.

Atmospheric Measurement Techniques — Open Access — EGU

Development and application of a United States-wide correction for PM₂.₅ data collected with the PurpleAir sensor

Karoline K. Barkjohn[1], Brett Gantt[2], and Andrea L. Clements[1]

[1]Office of Research and Development, US Environmental Protection Age...
Research Triangle Park, NC 27711, USA
[2]Office of Air Quality Planning and Standards, US Environmental Protec...
Research Triangle Park, NC 27711, USA

Correspondence: Karoline K. Barkjohn (barkjohn.karoline@epa.gov)

sensors — MDPI

Article

Correction and Accuracy of PurpleAir PM₂.₅ Measurements for Extreme Wildfire Smoke

Karoline K. Barkjohn [1,*], Amara L. Holder [1], Samuel G. Frederick [2,3] and Andrea L. Clements [1]

[1] US Environmental Protection Agency Office of Research and Development, Research Triangle Park, Durham, NC 27711, USA
[2] Former ORAU Student Services Contractor, US Environmental Protection Agency Office of Research and Development, Research Triangle Park, Durham, NC 27711, USA
[3] Currently Department of Atmospheric Sciences, University of Illinois Urbana-Champaign, Urbana, IL 61801, USA
* Correspondence: barkjohn.karoline@epa.gov

Related: Weds presentation by Ron Evans (Sensors session)

Example: new v4 Fire and Smoke Map with PM₂.₅ sensor layer turned on and off (8/1/2024, Colorado front range area)
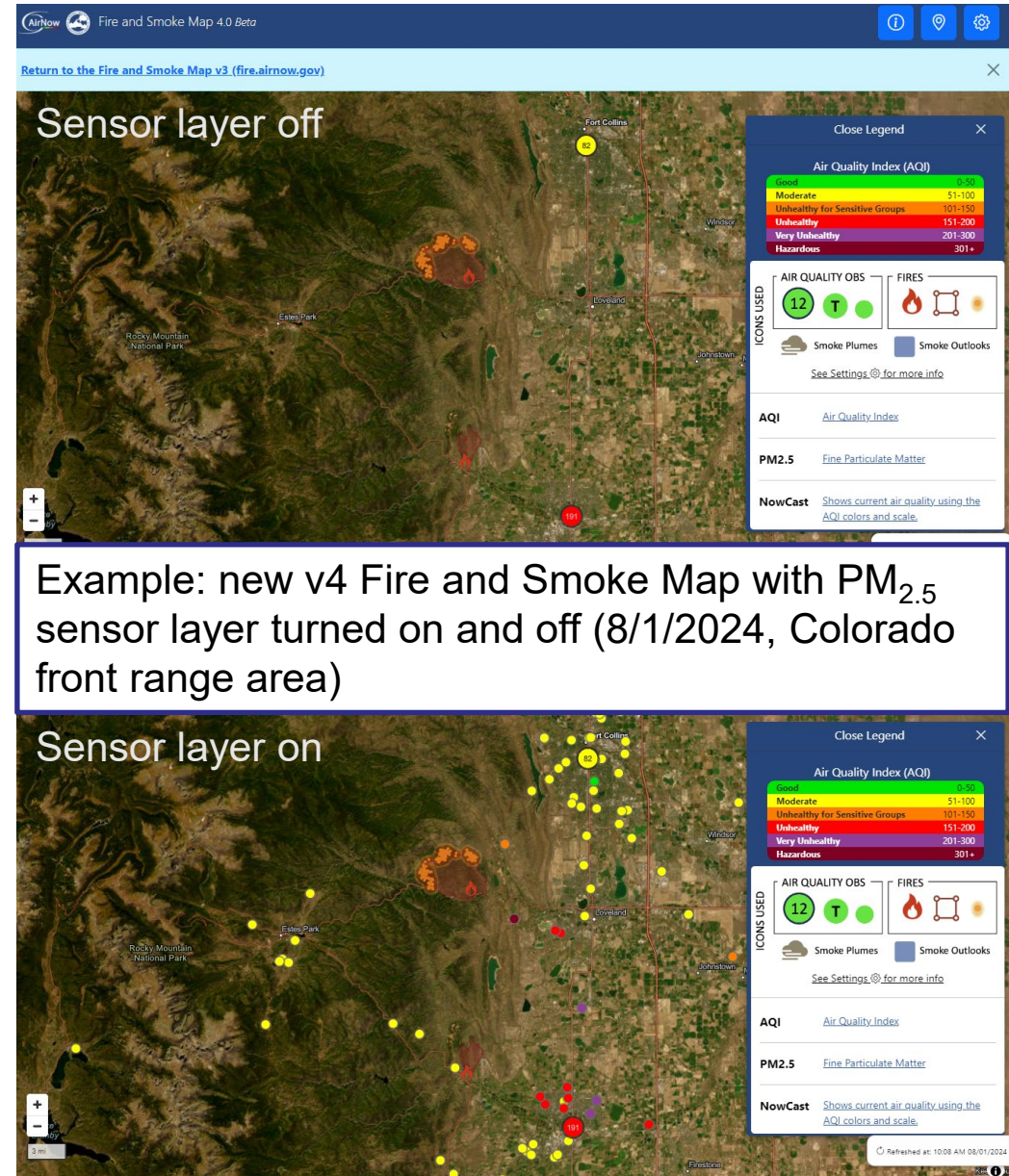
R&D on methods to support wildfire smoke response

Wildfire Smoke Air Monitoring Response Technology (WSMART)

- WSMART initiated in 2021 to support White House and EPA Administrator goals; continuing as an Air, Climate and Energy (ACE) Product

- Air monitor loan program to supplement existing State, Local, Tribal, and Air Resource Advisor (ARA) capabilities:
  - Stationary sensors ($PM_{2.5}$, volatile organic compounds + CO sensors)
  - Vehicle Add-on Mobile Monitoring (VAMMS)

60+ loan recipients since 2021, including **Tribal, State/Local** agencies and **Air Resource Advisors**
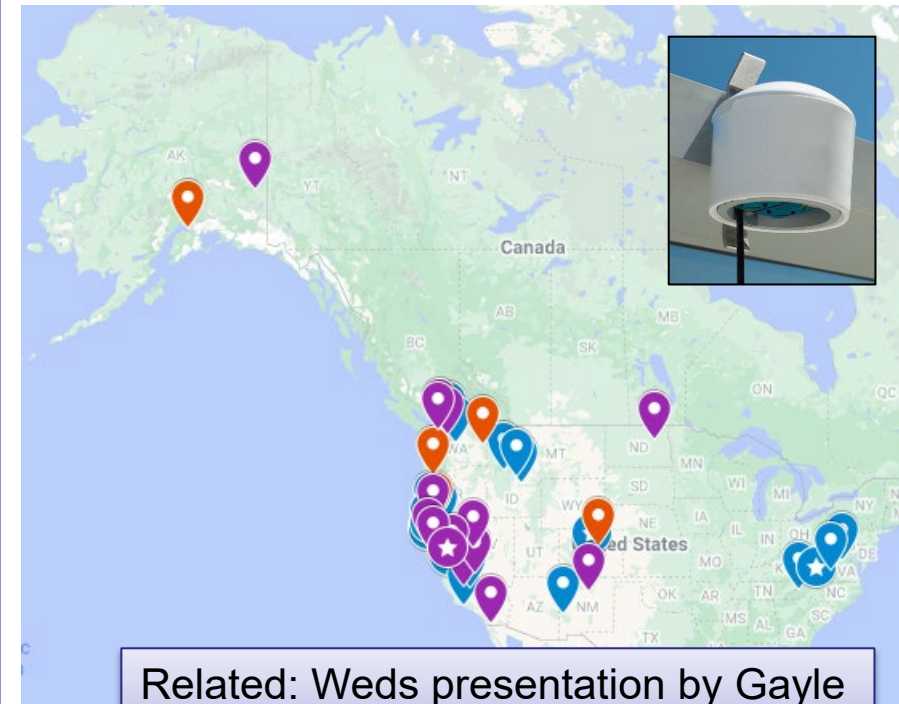
Related: Weds presentation by Gayle Hagler (Mobile monitoring session)

R&D related to air toxics - Integrated Risk Information System (IRIS)

– Program within ORD's Center for Public Health and Environmental Assessment (CPHEA)

– Database of assessments on hundreds of environmental pollutants; comprised of *Hazard Identification* and *Dose-Response Assessment* steps of Risk Assessment

– Top tier human health toxicity assessment for subchronic and chronic exposure to environmental substances
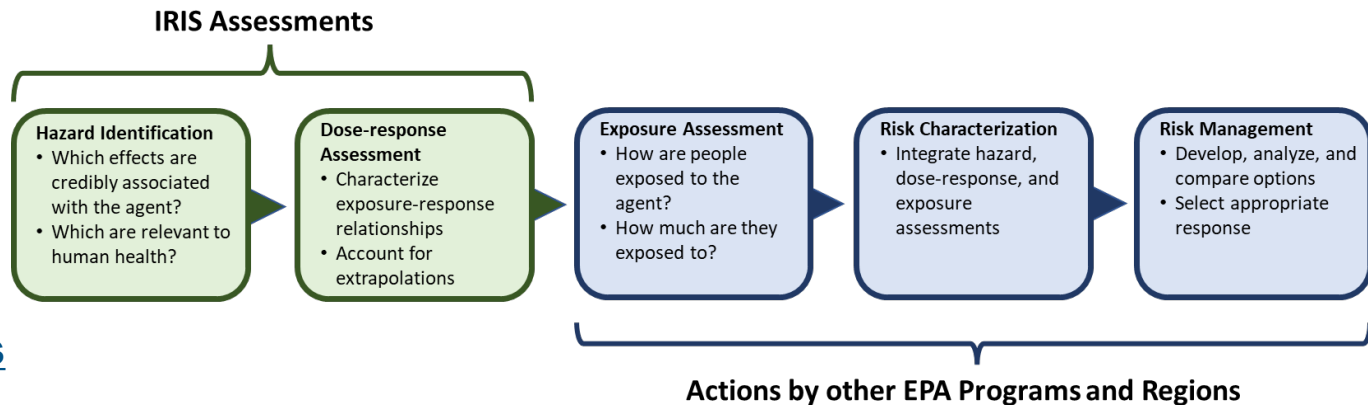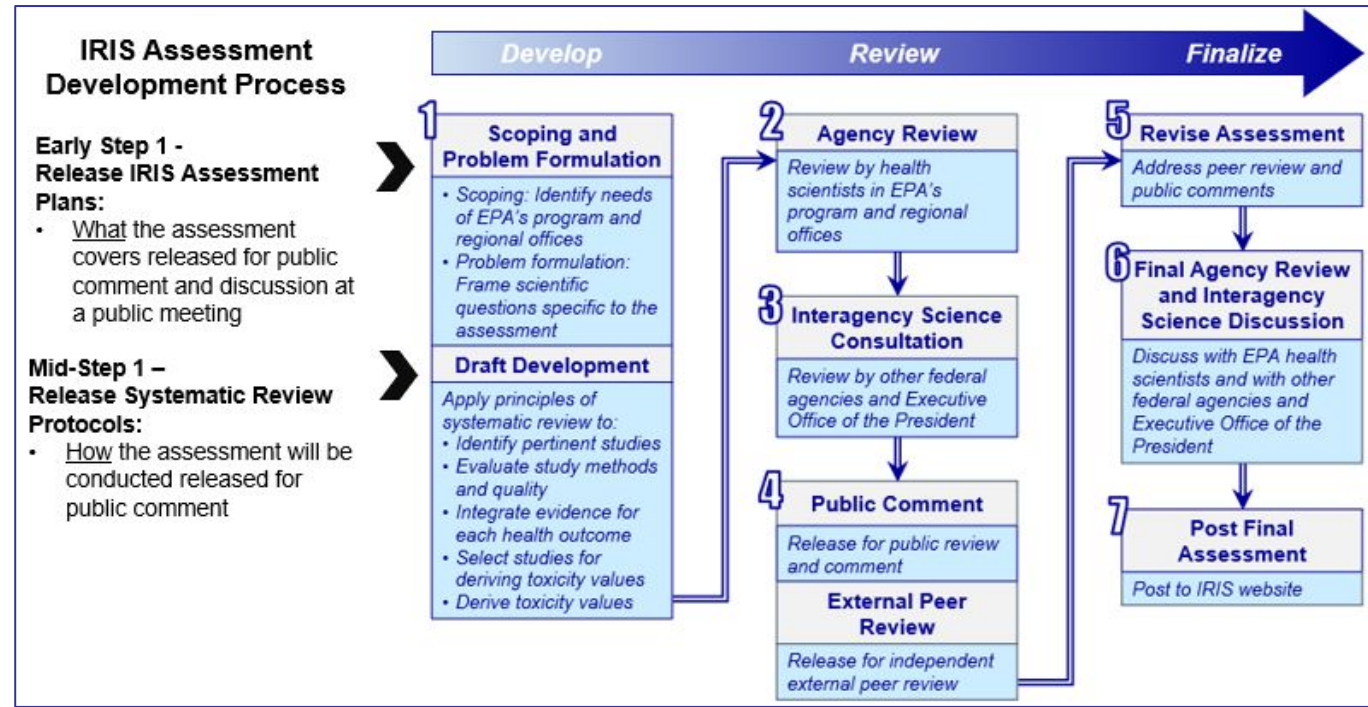
– Derives toxicity values for oral and inhalation exposures
  - Noncancer: Reference Doses (RfDs) and Reference Concentrations (RfCs).
  - Cancer: Oral Slope Factors (OSFs) and Inhalation Unit Risks (IURs).

– Contribute to risk assessments and Agency decisions under CAA, SDWA, CERCLA, TSCA, etc

https://www.epa.gov/iris

IRIS Assessment Development Process

Develop — Review — Finalize

Early Step 1 – Release IRIS Assessment Plans:
- What the assessment covers released for public comment and discussion at a public meeting

Mid-Step 1 – Release Systematic Review Protocols:
- How the assessment will be conducted released for public comment

1 **Scoping and Problem Formulation**
- Scoping: Identify needs of EPA's program and regional offices
- Problem formulation: Frame scientific questions specific to the assessment

Draft Development
Apply principles of systematic review to:
- Identify pertinent studies
- Evaluate study methods and quality
- Integrate evidence for each health outcome
- Select studies for deriving toxicity values
- Derive toxicity values

2 **Agency Review**
Review by health scientists in EPA's program and regional offices

3 **Interagency Science Consultation**
Review by other federal agencies and Executive Office of the President

4 **Public Comment**
Release for public review and comment

External Peer Review
Release for independent external peer review

5 **Revise Assessment**
Address peer review and public comments

6 **Final Agency Review and Interagency Science Discussion**
Discuss with EPA health scientists and with other federal agencies and Executive Office of the President

7 **Post Final Assessment**
Post to IRIS website

IRIS Assessments

Hazard Identification
- Which effects are credibly associated with the agent?
- Which are relevant to human health?

Dose-response Assessment
- Characterize exposure-response relationships
- Account for extrapolations

Exposure Assessment
- How are people exposed to the agent?
- How much are they exposed to?

Risk Characterization
- Integrate hazard, dose-response, and exposure assessments

Risk Management
- Develop, analyze, and compare options
- Select appropriate response

Actions by other EPA Programs and Regions

R&D related to air toxics - Integrated Risk Information System (IRIS)

	Chemical Name	CASRN	IRIS Progress Step
1	Arsenic, Inorganic (iA)	7440-38-2	Step 4
2	Chloroform	67-66-3	Step 3
3	Chromium VI (CrVI)	18540-29-9	Step 6
4	Cobalt and Cobalt Compounds	1307-96-6	Step 1
5	Ethylbenzene	100-41-4	Step 1
6	Formaldehyde (Inhalation)	50-00-0	Step 6
7	Mercury Salts, Inorganic	Various	Step 1
8	Methylmercury (MeHg)	22967-92-6	Step 1
9	Naphthalene	91-20-3	Step 1
10	Nitrate	14797-55-8	Step 1
11	Nitrite	14797-65-0	Step 1
12	Perfluorodecanoic Acid (PFDA)	335-76-2	Step 6
13	Perfluorohexanesulfonic Acid (PFHxS)	355-46-4	Step 4
14	Perfluorononanoic Acid (PFNA)	375-95-1	Step 4
15	Polychlorinated Biphenyls (PCBs)	1336-36-3	Step 1
16	Uranium, natural	7440-61-1	Step 1
17	Vanadium and Compounds (Oral)	Various	Step 1
18	Vanadium and Compounds (Inhalation)	Various	Step 1

- 18 ongoing assessments
- Recent release of final assessment for PFDA (#12 in table)
- Upcoming releases of final assessments for hexavalent chromium (#3 in table) and formaldehyde (#6 in table)
- Agency-wide input solicited every two years regarding which chemicals are priorities for future IRIS assessment

- Keep up with IRIS assessments by going to EPA's webpages at www.epa.gov/iris; and by checking the IRIS Program Outlook which lists assessments in development and projected public milestone dates
- The Outlook is updated at least 3 times per year (Feb, June, Oct) and can be found at https://www.epa.gov/iris/iris-program-outlook

R&D on air toxics: EtO

Ethylene oxide (EtO) measurement is an area of active research, including:

- Multiple environments: Ambient monitoring, near-source and fenceline-monitoring
- Multiple measurement approaches

Fenceline Monitoring

Ambient Monitoring

ATMOSPHERIC ENVIRONMENT: X 18 (2023) 100214

Contents lists available at ScienceDirect

Atmospheric Environment: X

journal homepage: www.journals.elsevier.com/atmospheric-environment-x

ELSEVIER

Assessment of chemical facility ethylene oxide emissions using mobile and multipoint monitoring

Eben D. Thoma [a,*], Ali Gitipour [a], Ingrid George [a], Peter Kariher [a], Megan MacDonald [a,1], Gustavo Queiroz [b,2], Parikshit Deshmukh [c,3], Josh Childers [d], Tim Rodak [d], Volker Schmid [d]

[a] U.S. Environmental Protection Agency, Office of Research and Development, Center for Environmental Measurement and Modeling, 109 TW Alexander Dr., RTP, NC, 27711, USA
[b] U.S. Environmental Protection Agency, Region 7, U.S. EPA Region 7, 11201 Renner Blvd, Lenexa, KS, 66219, USA
[c] Jacobs Technology Inc., 109 TW Alexander Dr., RTP, NC, 27711, USA
[d] CleanAir Engineering Inc., 110 Technology Drive, Pittsburgh, PA, 15275, USA

Fast, real-time EtO measurements for fugitive emissions detection and fenceline monitoring

Sensitive EtO methods (<10 pptv) for ambient air monitoring; TO-15A

ACS ES&T Air

pubs.acs.org/estair

This article is licensed under CC-BY-NC-ND 4.0

Perspective

Ethylene Oxide: An Air Contaminant of Concern

Tiffany L. B. Yelverton,* Michael D. Hays, and Joann Rice

Cite This: https://doi.org/10.1021/acsestair.4c00053

Read Online

R&D on air toxics: EtO – TO-15A

- Research challenge: develop optimized analytical method to measure EtO at ultra-trace concentrations (target: EtO MDLs below 10 pptv) in ambient air, building on Method TO-15A

- Research conducted:
  - Analytical method development
  - Canisters
    - Canister validation
    - Cleaning evaluation – ongoing research

- Coming soon:
  - ORD-developed Guidance Document provided to EPA OAQPS, who will facilitate external review and posting.

Related: Weds presentation by Tamira Cousett (EtO session)

Photos from research team: Tamira Cousett (EPA), Karen Oliver (EPA), Carlton Witherspoon (Jacobs), Andrew Whitehill (EPA)

R&D on air toxics: EtO – recent field studies

Region 5 ROAR (Blaine, MN): background and near-airport, stationary monitoring (2023)

Harcros chemical facility (Kansas City, KS): community downwind of Harcros chemical facility (2021; 2023 – ROAR project)

Verona EtO Project: multiple sites near BCP Ingredients Inc. Facility, stationary monitoring (Phase 1: 2022-2023; Phase 2: 2023-present)

Region 6 / NEIC Journey to Justice: mobile monitoring study; tech transfer from ORD to NEIC (2022)

Dow Chemical post-explosion study: mobile monitoring (2023)

Field Ambient Method Evaluation (FAME): near-road, stationary monitoring (2021-2022)
Laboratory performance tests: 2020-2021

Region 2 ROAR (Fajardo, PR): Mobile and stationary monitoring study near facility (2024 – present)

Related: Weds presentation by Ingrid George (EtO session)

ROAR: Region-ORD Applied Research program
NEIC: National Enforcement Investigations Center

ORD research studying per- and polyfluoroalkyl substances (PFAS) – wet deposition

- Bigger picture:
  - ORD has a large research program studying PFAS
  - EPA recently issued a drinking water standards and is proposing two regulations under the Resource Conservation and Recovery Act (see https://www.epa.gov/pfas)
  - Research measuring PFAS presence in wet deposition informs the fate and transport of PFAS in the environment
- Wet deposition research approach:
  - Samples collected as an extension of National Atmospheric Deposition Program (NADP) National Trends Network (NTN) sampling protocols
  - Targeted PFAS analysis by Wisconsin State Laboratory of Hygiene using modified ISO 21675 non-potable water method
  - Two peer-reviewed journal articles summarizing wet deposition research results are anticipated to be published in late 2024 and early 2025.

EPA United States Environmental Protection Agency

EPA's PFAS Strategic Roadmap: Second Annual Progress Report

December 2023

RESEARCH

Investing in research, development, and innovation to increase understanding of PFAS methods, human health and environmental risks, and technologies.

Related: Poster presentation by David Gay (WSLH, NADP coordinator)

ORD research studying per- and polyfluoroalkyl substances (PFAS) – chemical ionization mass spectrometry

- Recent publication describing a short-term outdoor field study testing the use of chemical ionization mass spectrometry for time-resolved measurement of PFAS in air. (Mattila and Offenberg, 2024, https://doi.org/10.1080/10962247.2024.2366491)

- From the abstract: "The CIMS was calibrated for C2–C6 perfluorinated carboxylic acids, and 4:2 and 6:2 fluorotelomer alcohols. Of these, only trifluoroacetic acid (TFA) was detected in ambient air above instrumental detection limits."

- CIMS is being applied in ORD air emissions studies to measure PFAS
  - see Mattila et al., 2024, https://pubs.acs.org/doi/full/10.1021/acs.est.3c09255

Measuring short-chain per- and polyfluoroalkyl substances in Central New Jersey air using chemical ionization mass spectrometry

James M. Mattila [a,b] and John H. Offenberg[c]

[a]Oak Ridge Institute for Science and Education, Office of Research and Development, U.S. Environmental Protection Agency, Durham, NC, USA; [b]Office of Air Quality Planning and Standards, Office of Air and Radiation, U.S. Environmental Protection Agency, Durham, NC, USA; [c]Center for Environmental Measurement and Modeling, Office of Research and Development, U.S. Environmental Protection Agency, Durham, NC, USA
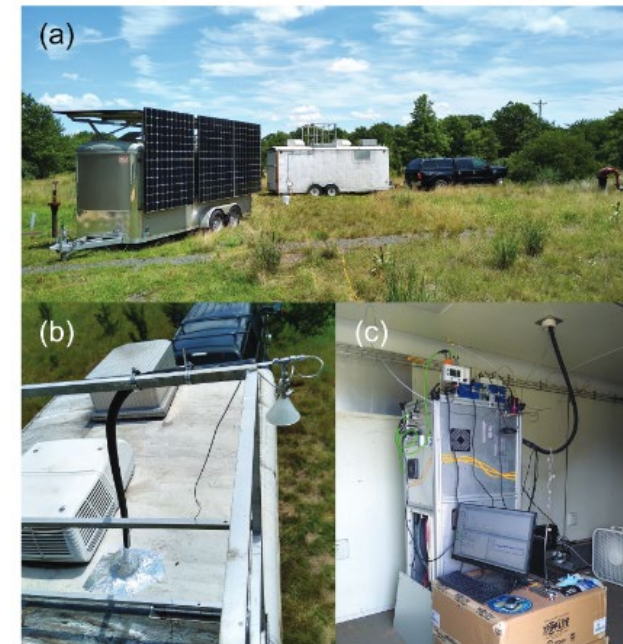
Figure 1. Photos from the field site. (a) The instrument trailer located on a grassy field at the EPA/ORD/CESER facility in Edison, NJ. (b) A view of the air sampling inlet extending from the ceiling of the trailer. (c) A view of the inlet delivering sampled ambient air to the iodide CIMS instrument inside the trailer.

Emerging contaminant: 6PPD-quinone

- Researchers discovered that 6PPD-quinone in stormwater was lethal to coho salmon (Tian et al., 2021) and may also impact other fish species (Brinkman et al., 2022)

- 6PPD has been widely used in vehicle tires to protect against breakdown; oxidizes to form 6PPD-quinone.

- EPA has initiated a number of research and programmatic activities to understand and address 6PPD-quinone; with publications and activities shared here:
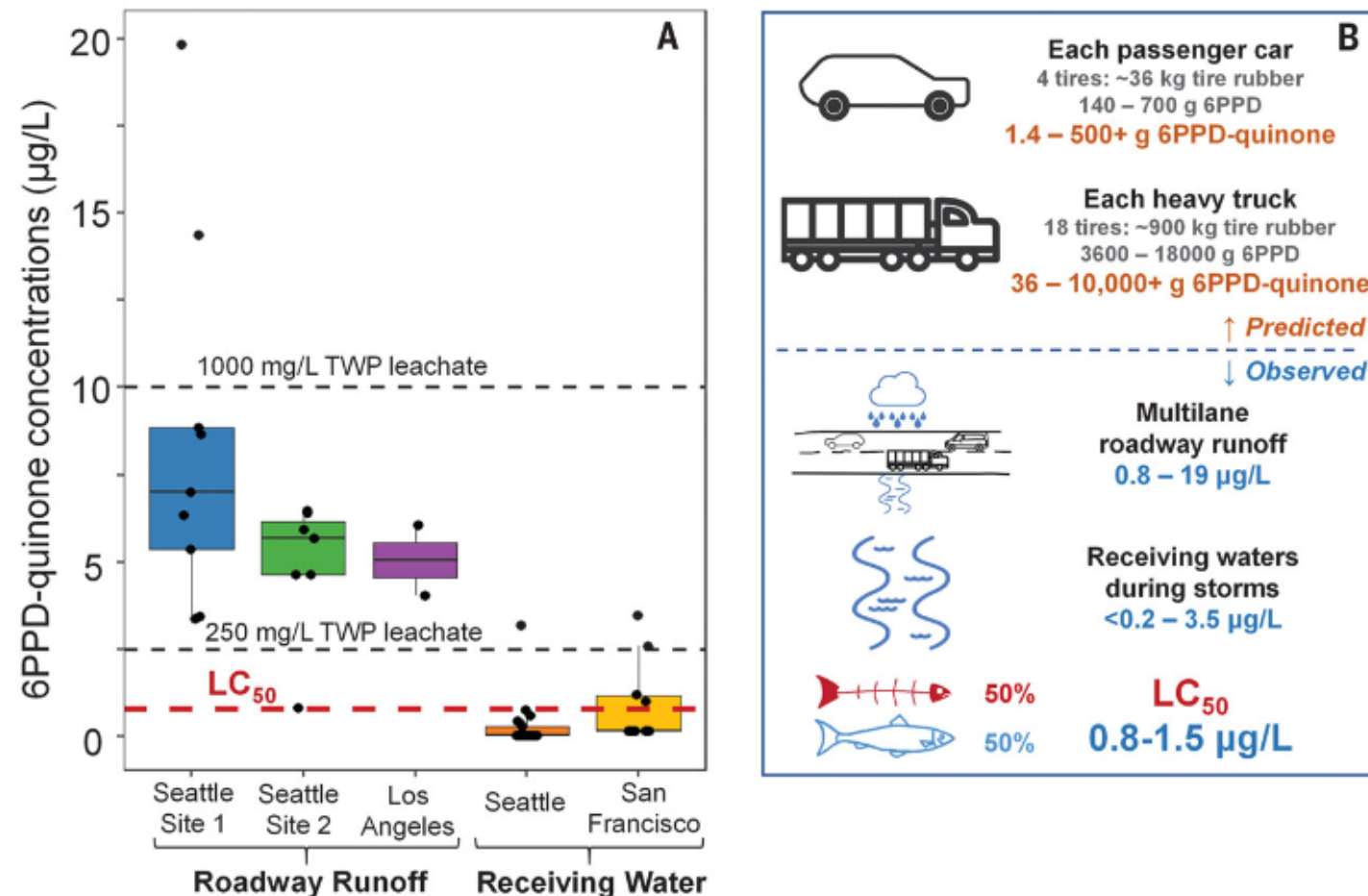 https://www.epa.gov/chemical-research/6ppd-quinone

Figure 4 in Zhenyu Tian et al., A ubiquitous tire rubber–derived chemical induces acute mortality in coho salmon. Science 371,185-189(2021). DOI:10.1126/science.abd6951

ORD air research: 6PPD-quinone

- Ongoing analytical chemistry research at EPA's Research Triangle Park lab to detect and quantify 6PPD and 6PPD-quinone in airborne particulate.

  - Extraction via thermal desorption, GC/MS

- Collaborating with DC DOEE and VDEQ to measure roadside PM concentrations of 6PPD and 6PPD-quinone.

  - High-volume sampling of TSP, PM_{10}, and $PM_{2.5}$ particle sizes

  - Characterization of multiple pollutant concentrations including 6PPD/6PPD-quinone, microplastics, PAHs, and metals

- Research will be valuable to provide insights into roadway emissions of PM-phase 6PPD and 6PPD-quinone, and fate and transport in the environment.
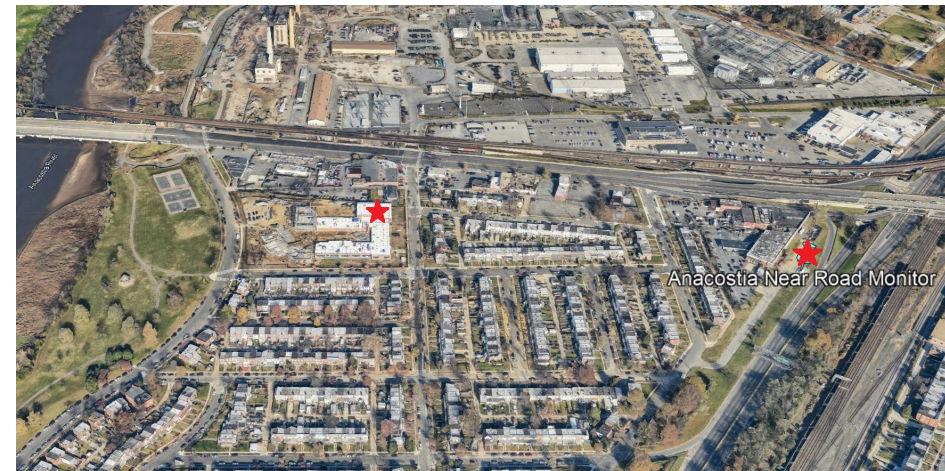
DC DOEE Anacostia and River Terrace sites
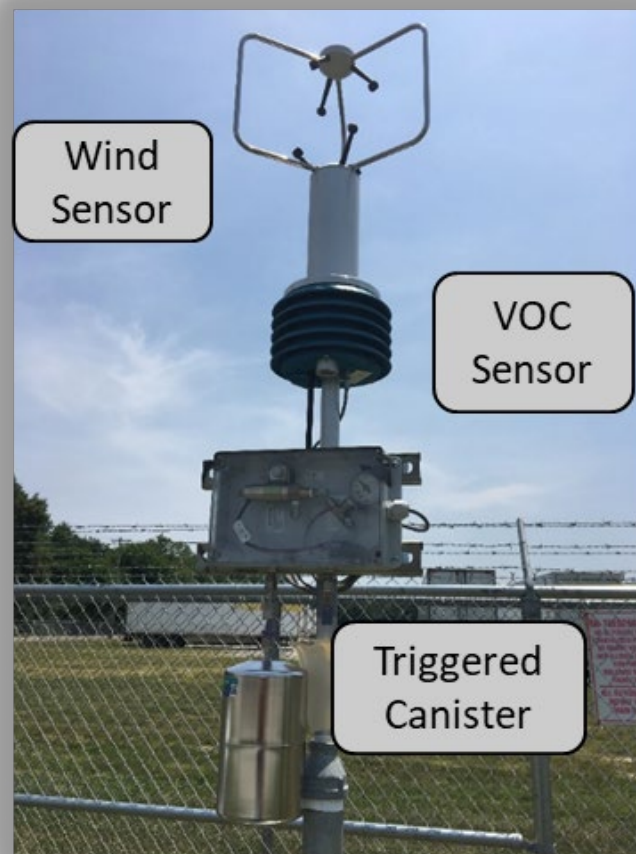

DC DOEE Anacostia site

VDEQ Springfield, VA site

R&D related to air monitoring platforms

…and, related data visualization and analytics

Aerial monitoring with ORD's "Kolibri" Sensor/Sampler

Sampling emissions from an oil spill burn on icy waters.

Wind Sensor

VOC Sensor

Triggered Canister

SPod system

Solar-powered, wireless sensor systems
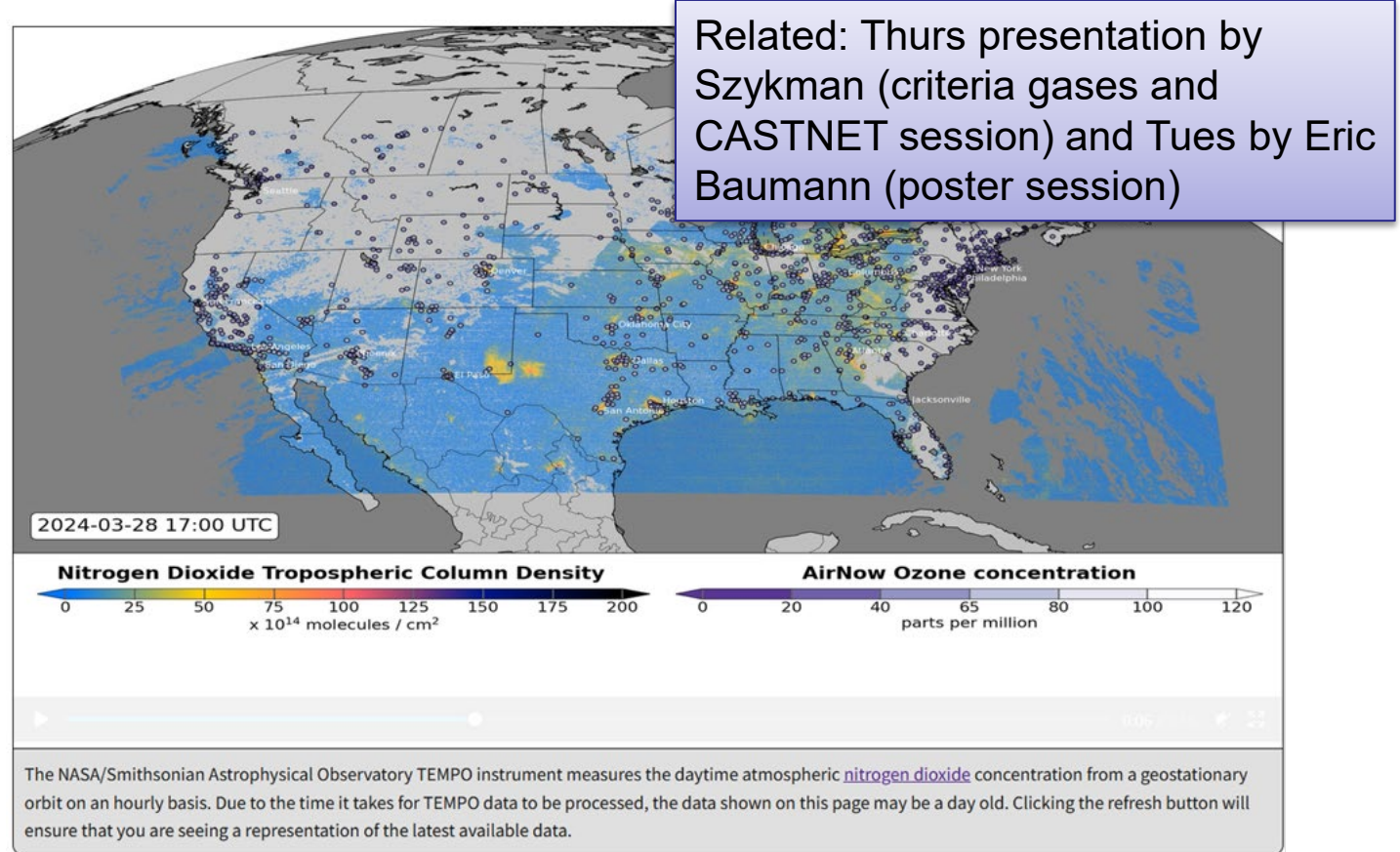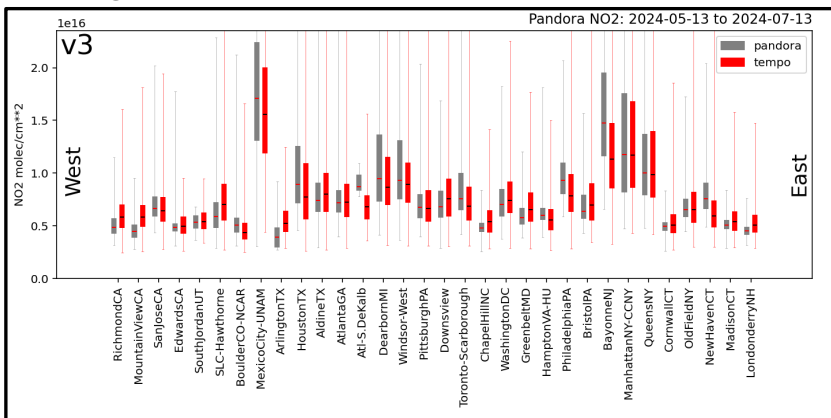

GMAP – Electric Vehicle

Mobile monitoring platform with real-time instruments

Remote sensing R&D (satellite and ground-based)

ORD research collaborations with State and Local Agencies, NASA, and European Space Agency on the Pandora Ground-Based Spectrometers through the Pandonia Global Network is providing for routine and systematic validation of the TEMPO data products and guide data quality decisions.

Bias assessment of TEMPO NO$_2$ data using Pandora Spectrometers

Related: Thurs presentation by Szykman (criteria gases and CASTNET session) and Tues by Eric Baumann (poster session)

2024-03-28 17:00 UTC

Nitrogen Dioxide Tropospheric Column Density | **AirNow Ozone concentration**

x 10^{14} molecules / cm^2 | parts per million

The NASA/Smithsonian Astrophysical Observatory TEMPO instrument measures the daytime atmospheric nitrogen dioxide concentration from a geostationary orbit on an hourly basis. Due to the time it takes for TEMPO data to be processed, the data shown on this page may be a day old. Clicking the refresh button will ensure that you are seeing a representation of the latest available data.

ORD research is working to increase user access to TEMPO data through the Remote Sensing Information Gateway and adding daily visualizations.

Remote sensing R&D (satellite and ground-based)

ORD research collaborations with HBCU Hampton University, NASA, NOAA, the Photochemical Assessment Monitoring Station Program and other academic institutions are helping to develop the Unified Ceilometer Network. The UCN will be the first operational ceilometer profiling network for aerosol profiles and characterization of the Planetary Boundary Layer with a focus on data products for model evaluation.

ORD research continues to inform Boundary Layer Research through the use of profile measurements, including ceilometers.

OCTOBER 2020   CAICEDO ET AL.   1847

An Automated Common Algorithm for Planetary Boundary Layer Retrievals Using Aerosol Lidars in Support of the U.S. EPA Photochemical Assessment Monitoring Stations Program

VANESSA CAICEDO,[a,b] RUBEN DELGADO,[a,b] RICARDO SAKAI,[c] TRAVIS KNEPP,[d,e] DAVID WILLIAMS,[f] KEVIN CAVENDER,[g] BARRY LEFER,[h] AND JAMES SZYKMAN[e,f]

[a] Joint Center of Earth Systems Technology, Baltimore, Maryland; [b] University of Maryland, Baltimore County, Baltimore, Maryland; [c] Howard University, Washington, D.C.; [d] Science Systems and Applications, Inc., Hampton, Virginia; [e] National Aeronautics and Space Administration Langley Research Center, Hampton, Virginia; [f] Office of Research and Development, U.S. Environmental Protection Agency, Research Triangle Park, North Carolina; [g] Office of Air Quality Planning and Standards, U.S. Environmental Protection Agency, Research Triangle Park, North Carolina; [h] National Aeronautics and Space Administration Headquarters, Washington, D.C.

(Manuscript received 10 April 2020, in final form 4 August 2020)

...etrieval algorithm is proposed as a common cross-
... for implementation under the redesigned U.S.
...oring Stations program. This algorithm addresses
... before the implementation of the retrieval method

Related: Weds presentation by Jim Szykman (PAMS session)
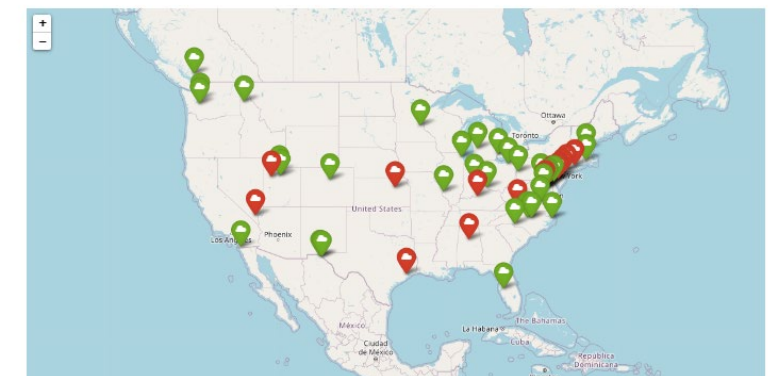

UNIFIED CEILOMETER NETWORK

Science to Achieve Results (STAR) Program

Recent Funding Opportunity

Air Quality Information: Making Sense of Air Pollution Data to Inform Decisions in Underserved Communities Overburdened by Air Pollution Exposures

Overarching goal: *Provide underserved communities science-based information, tools and approaches to utilize air and related environmental data to engage with decision-makers and take actions to address community-identified air pollution concerns*

Research Areas:

❖ Methods and tools for data integration and analysis to characterize community exposures to air pollution in underserved communities

❖ Effective communication of air quality information to communities and decision makers to support actions to address air pollution concerns in underserved communities

Supporting partnerships with minority serving institutions (MSIs):

EPA intends to use up to 50% of the total funding amount available under this announcement for institutions that include MSI partnerships as part of the application.

STAR program

Measurement and Monitoring Methods for Air Toxics and Contaminants of Emerging Concern in the Atmosphere Grants

Recent awardees:
- **Open-source reference method for open-path optical remote sensing (OP-ORS) of air toxics**
PI: Jochen Stutz, University of California Los Angeles

- **Methods for real-time measurements of air toxics using an array of lower-cost sensors**
PI: Gabriel Isaacman-VanWertz, Virginia Tech

- **Portable GC/MS system for air toxics**
PI: Tony Wexler, University of California Davis

- **Mapping urban emissions of sub-10 nm particles using a mobile platform**
PI: Markus Petters, University of California Riverside

- **High-resolution chemical ionization mass spectrometry methods for real-time measurement of PFAS**
PI: Jason Surratt, University of North Carolina Chapel Hill

- **Analysis of aerosol-phase plastic additives in a coastal environment**
PI: Nate Slade, University of California San Diego

https://www.epa.gov/research-grants/measurement-and-monitoring-methods-air-toxics-and-contaminants-emerging-concern-2

Air monitoring and other research at EPA: ways to stay informed

https://www.epa.gov/research-states/epa-tools-and-resources-webinar-series

https://www.epa.gov/air-research/air-climate-energy-research-webinar-series

2024 Schedule

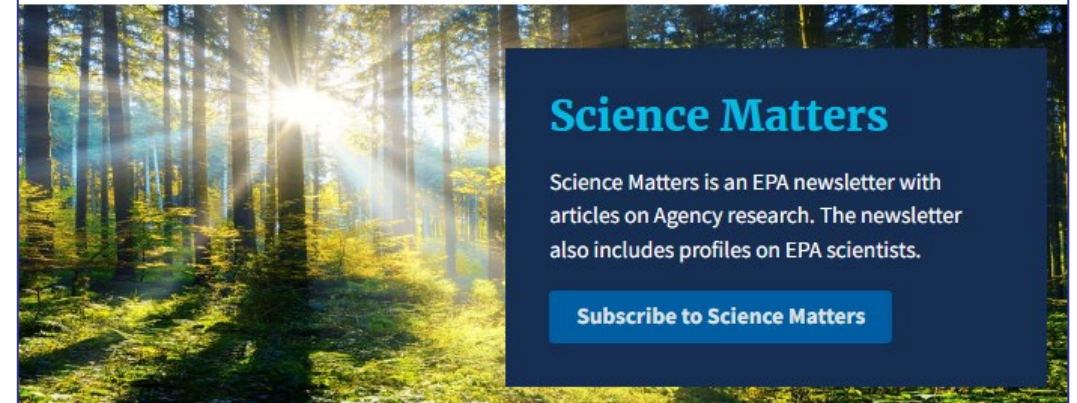| Date	Topic and Presenter(s)
April 17, 2024	Tire Crumb Research *Kent Thomas, Jose Zambrana, and Annette Guiseppi-Elie, EPA ORD*
May 15, 2024	Wildfires *Bob McKane, EPA ORD*
June 5, 2024	RETIGO Data Visualization Tool *Andrea Clements, EPA ORD*
July 17, 2024	Temperature, Precipitation, and Beyond: Introducing Datasets Suitable for Comprehensive Analysis of Local Climate Change Impacts *Megan Mallard, Jeff Willison, and Tanya Spero, EPA ORD*
August 21, 2024	New Approach Methods (NAMs) *Alison Harrill, EPA ORD*
September 18, 2024	Assessing Community Vulnerabilities to Potential Contaminant Releases from Extreme Events *Meridith Fry and Lauren Oliver, EPA ORD*
October 16, 2024	Participatory Science *Heather Drumm and Julie Vastine, EPA ORD*
November 20, 2024	Fifth National Climate Assessment: Resources and Interactive Atlas *Rebecca Dodder, EPA ORD*
December 11, 2024	PFAS *Susan Burden and Tom Speth, EPA ORD*

Air, Climate, & Energy Research Webinar Series

Tuesday, August 20th from 3-4 PM EST

Health Impacts of Air Pollutants Beyond Cardiovascular or Respiratory Effects

https://www.epa.gov/sciencematters

EPA Science Matters Newsletter

Science Matters

Science Matters is an EPA newsletter with articles on Agency research. The newsletter also includes profiles on EPA scientists.

Subscribe to Science Matters

Thank you!

Thanks to many EPA contributors for slide content and images shown here:
FEM/FRM: Robert Vanderpool, Cortina Johnson, Russell Long, Matt Landis
Puerto Rico study: Sarah Pender, Gavin Lau, Amara Holder, Matt Landis, Maribel Colón, Farnaz Nojvan
Sensors: Karoline Barkjohn, Amara Holder, Andrea Clements, Rachelle Duvall
WSMART: Amara Holder, Ashley Bittner, Lara Phelps, Bill Mitchell, Andrea Clements (RETIGO)
IRIS: Samantha Jones, Elizabeth Chan
EtO: Ingrid George, Karen Oliver, Tamira Cousett, Andrew Whitehill, Ali Gitipour, Tiffany Yelverton, Michael Hays, Eben Thoma
6PPD-q: Joe Martin, Rich Baldauf
PFAS wet deposition / ambient air: John Offenberg, James Mattila
Measurement platforms: Brian Gullett, Johanna Aurell, Amara Holder, Megan McDonald, Eben Thoma, Ingrid George, Ali Gitipour, Rachelle Duvall
Remote Sensing: Jim Szykman, Lukas Valin
STAR: Serena Chung

Contact: hagler.gayle@epa.gov

The views expressed in this presentation are those of the author(s) and do not necessarily represent the views or policies of the U.S. Environmental Protection Agency.