Overview of NASA HAQAST

The NASA Health and Air Quality Applied Sciences Team

3rd Generation; 2021-2025

Tracey Holloway and Jenny Bratburd, University of Wisconsin—Madison
What is “hay-kast”?

- Health and Air Quality Applied Sciences Team
- NASA-funded Applied Sciences Team
- 4 year initiative through 2025
- 14 Members and 70+ co-investigators
- Mission: Connect NASA science with air quality and health applications
- ~ $12+ Million Total Cost
- Three types of work:
  - Member projects
  - Tiger team projects (collaborative)
  - Outreach, engagement, rapid response
14 NASA Health and Air Quality 
Applied Sciences Team Members (HAQAST)

Tracey Holloway (Team Lead, UW-Madison)
Susan Anenberg (George Washington University)
Bryan Duncan (NASA GSFC)
Arlene Fiore (Columbia University)
Pawan Gupta (Universities Space Research Association)
Yang Liu (Emory University)
Jingqiu Mao (University of Alaska, Fairbanks)
Randall Martin (Washington University)
Ted Russell (Georgia Tech)
Jeffrey Pierce (Colorado State University)
Amber Soja (National Institute of Aerospace)
Daniel Tong (George Mason University)
Christopher Uejio (Florida State University)
Qian Xiao (University of Texas Health Science Center at Houston)

haqast.org
The team structure fundamentally changes outcomes.

- Increased visibility of work and resources to end-users
- Culture to support and promote collaborations and synergies
- Growth of two-way dialogue
- Increased collaborations to meet stakeholder needs
- Rapid spin-up of high-value activities
Data Resources for Air Quality

Monitors

Models

Satellite Data

Data fusion methods to leverage strengths
Smoke replaces ice at Lake Winnipeg.

True color image Moderate Resolution Imaging Spectroradiometer (MODIS) on NASA’s Aqua satellite, from the NASA Earth Observatory, May 2021 over Winnipeg, Canada.

Source: https://earthobservatory.nasa.gov/images/148340/smoke-replaces-ice-at-lake-winnipeg

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The Four Things to Know about Satellite Data for Air Quality Management

by Tracey Holloway and Jennifer Bratburl
Getting Started Is Easy

NASA HEALTH AND AIR QUALITY
APPLIED SCIENCES TEAM
Connecting NASA Data and Tools with Health and Air Quality Stakeholders
Data and Tools

NASA's data and tools are free to the public. On this page, you can find:

- Links to available NASA data and tools
- Other free data and tools
- Tutorials to get you started

For more general resources that may be of interest, visit the [NASA Earth Data Store](https://www.nasa.gov/earthdata).

And if you are interested in working with satellite data, please visit our [NASA Earth Observing System Data Gateway](https://data.gesdis.nasa.gov/).

### NASA Health and Air Quality Tools

NASA has developed tools to help schools and others visualize and understand air quality and health data. The tools are freely available, and they provide a powerful way to explore air quality and health data. They are designed to help users understand how air quality can affect their health and how they can use this information to make informed decisions.

We've grouped the tools below by their use of one or more tools. We've also included their functionality, from basic to advanced.

#### Basic Tools

- **NASA Earthdata**

  *Provides access to NASA's Earth observation data and tools for environmental monitoring.*

- **AirNow**

  *Provides real-time air quality data for the United States.*

- **AirTrends**

  *Displays air quality trends over time.*

- **AirNow Interactive Map**

  *Interactive map showing current and historical air quality data.*

- **GEMS**

  *A model for predicting the impact of air pollution on human health.*

- **AirNow Health Effects**

  *Tool for estimating the health effects of air pollution.*

- **AirNow Decision Support System**

  *A tool for decision support in air quality management.*

- **AirNow PM2.5 Monitoring**

  *Monitors particulate matter concentration.*

- **AirNow Visibility**

  *Monitors visibility due to air pollution.*

- **AirNow Air Quality Index**

  *Visualizes air quality index data.*

- **AirNow Air Quality Reporting**

  *Reports air quality data.*

- **AirNow Air Quality Assessment**

  *Assesses air quality data.*

- **AirNow Air Quality Forecasting**

  *Forecasts air quality data.*

- **AirNow Air Quality Monitoring**

  *Monitors air quality data.*

- **AirNow Air Quality Assessment and Forecasting**

  *A tool for assessing and forecasting air quality.*

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  *A tool for assessing and forecasting air quality.*

- **AirNow Air Quality Monitoring and Forecasting System and Tool**

  *A tool for monitoring and forecasting air quality.*
Science Policy and Communication Resources
The open science movement encompasses a number of initiatives [including to] promote successful communication between experts and decision makers so they can make effective use of scientific information (Holloway et al. 2018; Royal Society 2012).

Government agencies have also been involved in innovative efforts to help decision makers make more effective use of data and influence research projects to make them as socially relevant as possible…. NASA has supported a Health and Air Quality Applied Sciences Team (HAQAST), which helps stakeholders make use of NASA data to answer stakeholders’ environmental health questions (Holloway et al. 2018).
HAQAST Supports Two Types of Projects: Individual & Tiger Team

- **March. 2021**
- **2022**
- **2024**
- **2024**
- **2025**

**14 HAQAST Members’ Proposed Initiatives with stakeholders & Co-I collaborators**

**Year 1 “Tiger Teams”**
- Larger collaborations
- Focused, stakeholder-based, short-term

**Year 2 “Tiger Teams”**

TBD
As environmental injustice extends across multiple environmental risk factors ... this project brings together a broad set of HAQAST teams with complementary expertise using many satellite products.
This project will deliver:

1) thorough documentation of products (e.g., how it was derived, strengths and weaknesses for various applications),
2) case studies to highlight data for health and AQ applications, and
3) a “homepage” … one-stop shop for all these resources.

Team Lead: HAQAST co-investigator Kevin Cromar


HAQAST Members and Collaborators: Bryan Duncan, Ana Prados, C. Keller, Pawan Gupta, Qian Xiao, Christopher Ueijo, Susan Anenberg, Dan Goldberg, Randall Martin, Daniel Tong, Tracey Holloway also contribute to this team.
3. **Communicating the uncertainties of satellite-based NOx emissions for urban planning**

**Team Lead:** HAQAST co-investigator Dan Goldberg


**HAQAST Members and Collaborators:** Susan Anenberg, Arlene Fiore, Tracey Holloway, Ted Russell, and Daniel Tong also contribute to this team.

*We will quantify uncertainties using sensitivity analyses [and] engage stakeholders to help researchers prioritize aspects of estimating NOx emissions that are the most impactful for decision-making.*
This project …[will] develop a value added hourly and daily PM$_{2.5}$ dataset covering [the continental U.S.] region and integrate it into the AirNow system.
This project will serve as a best practice for conducting exposure assessment using a fusion approach for other agricultural burning practices across the United States.
“Our findings extend prior work [attributing breast cancer risk to light at night] by characterizing this relationship among both Blacks and Whites in a large cohort of women recruited from disadvantaged communities.”
“To our knowledge, this is the first paper to investigate health effects of both long-range transport and local [wildfire smoke], as well as the first to demonstrate a [wildfire smoke]-related mortality effect in the U.S.”
marginalized communities continued to face higher levels of NO$_2$ during the lockdowns than nonmarginalized communities experienced prior to the pandemic
HAQAST Houston

- January 20-21, 2022
- Public, hybrid meeting
- Dialogue with stakeholders & scientists
Our mission is to bring the power of NASA science down to earth and deliver it into your hands.