Overview of NASA HAQAST

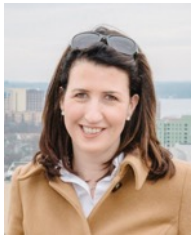
The NASA Health and Air Quality Applied Sciences Team

3rd Generation; 2021-2025

Tracey Holloway and Jenny Bratburd, University of Wisconsin—Madison

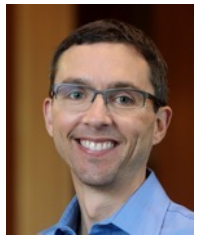
What is “hay-kast”?

- 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

HAQAST

HAQAST1:
2011-2016

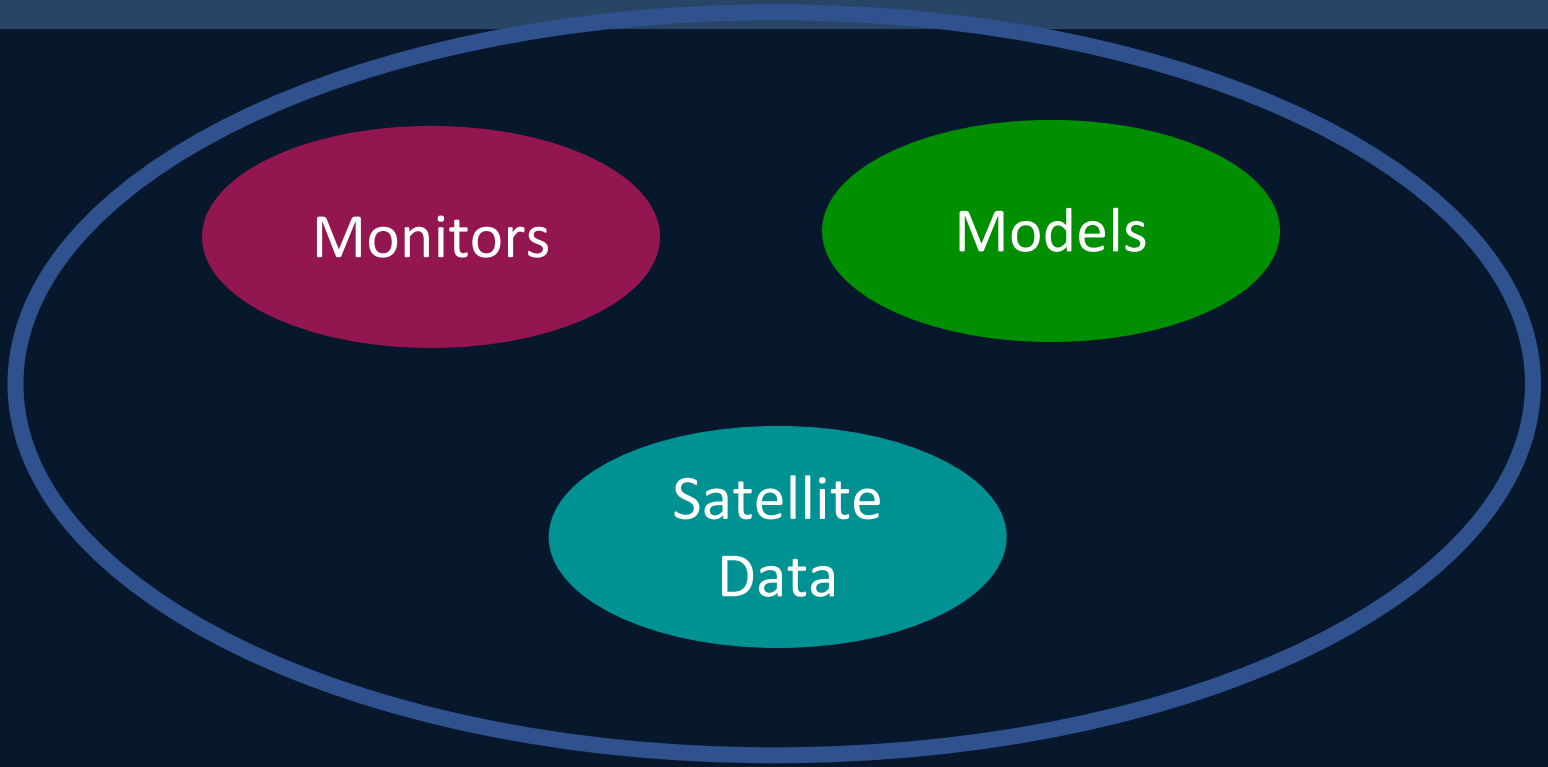
HAQAST2: *2016-2020*
HAQAST3: *2021-2025*

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

https://aura.gsfc.nasa.gov/outreach/images/A-Train_Web.jpg

Data Resources for Air Quality



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.

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

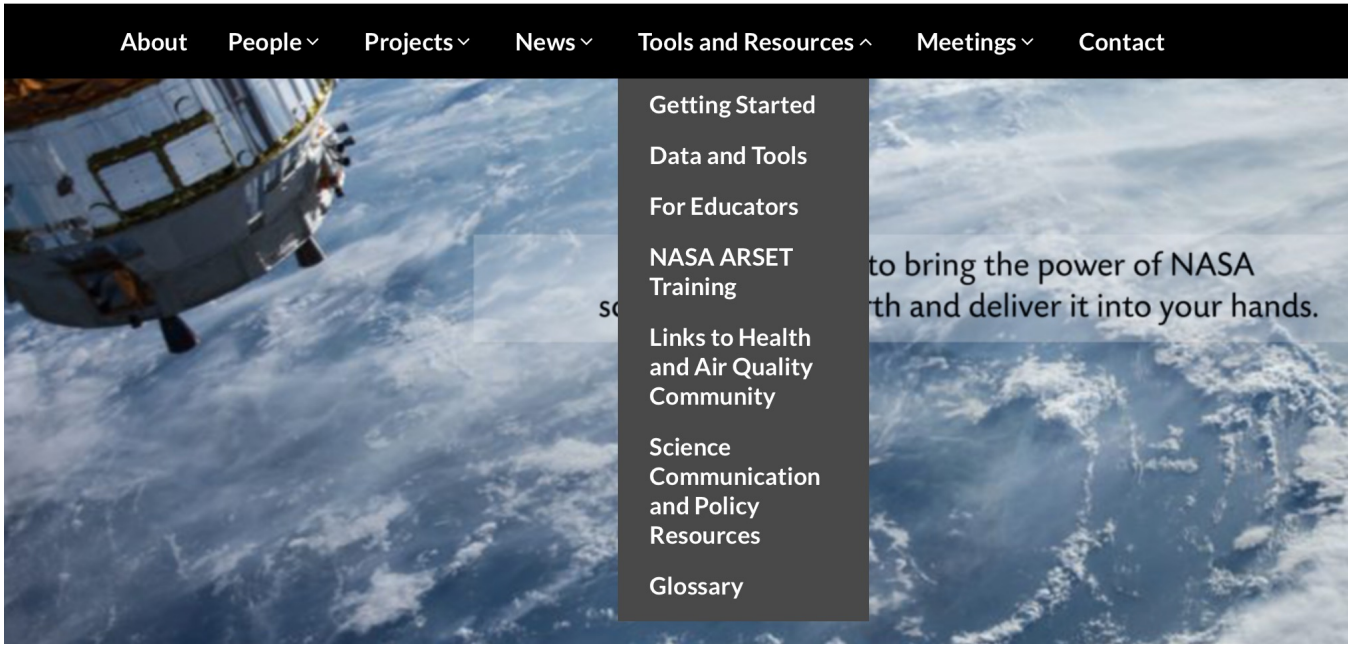
by Tracey Holloway and Jennifer Bratburd

Getting Started Is Easy

HAQAST

NASA HEALTH AND AIR QUALITY APPLIED SCIENCES TEAM

Connecting NASA Data and Tools with Health and Air Quality Stakeholders



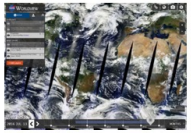
Data and Tools

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 toolsets
- Tutorials to get you started

For more general resources that may be of interest, please visit our links page.

And if you are brand-new to working with satellite data, please visit our Getting Started page, which will orient you to the uses, as well as the limits of satellite data.



NASA Worldview

Jump To

GETTING STARTED | TOOLS | DOWNLOAD DATA | TUTORIALS

NASA Health and Air Quality Tools

NASA has developed and maintains an incredibly wide array of free data and tools, many of which will be useful to the health and air quality communities. We've gathered below brief descriptions, links, and, in some cases, tutorials for the ones that we think will be of most interest to the HAQAST community. This page is intended to help you get started. For more advanced training, consider attending NASA's Applied Remote Sensing Training program.

We've grouped the tools below by their ease of use (basic and advanced). We've also ranked their functionality, from focused to flexible. In general, the more flexible a tool the more complex it is, and vice versa.

Basic Tools

NASA Worldview

Click to watch a video tutorial on how to use NASA Worldview

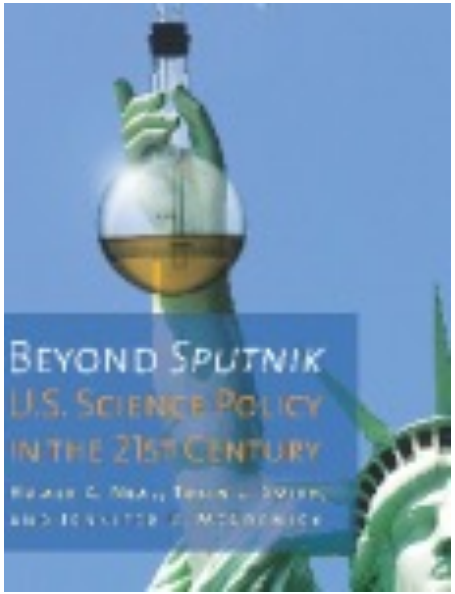
NASA Worldview is the best starting point for users new to satellite data and is freely available online. Worldview provides the capability to interactively browse global, full-resolution satellite imagery and then download the underlying data. Most of the 400+ available products are updated within three hours of observation, essentially showing the entire Earth as it looks "right now." This supports time-critical application areas such as wildfire management, air quality measurements, and flood monitoring.

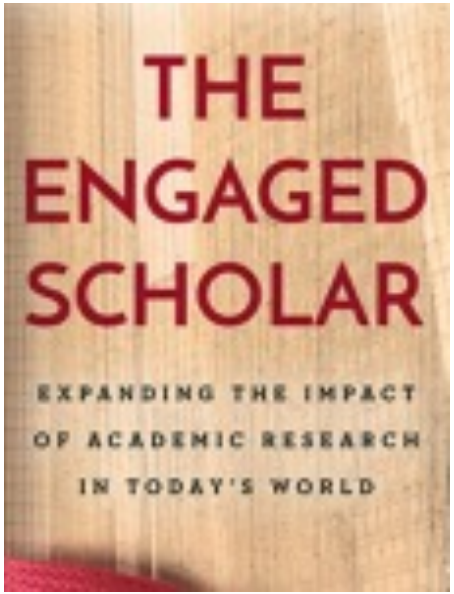
View current natural hazards and events using the Events tab which reveals a list of natural events, including wildfires, tropical storms, and volcanic eruptions. Animate the imagery over time. Arctic and Antarctic views of several products are also available for a "full globe" perspective. Worldview and Giovanni together will answer the basic needs for most HAQAST applications.

You can view a NASA webinar here, and a short video tutorial here, created by the HAQAST Communications Team.

And here's a written tutorial (you can find a downloadable pdf here).

Science Policy and Communication Resources





ehp Environmental Health Perspectives

Vol. 127, No. 7 | Commentary

Making Open Science Work for Science and Society

Kevin C. Elliott and David B. Resnik

Published: 29 July 2019 | CID: 075002

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

1. **Satellite data for environmental justice (SD4EJ)**

Team Lead: HAQAST investigators Susan Anenberg and Qian Xiao

Partners: Centers for Disease Control and Prevention (CDC), Texas Department of State Health Services, Environmental Defense Fund (EDF), White House Council on Environmental Quality, University of Maryland, Baltimore County, Consortium for the Valuation of Applications Benefits Linked with Earth Science (VALUABLES), National Oceanic and Atmospheric Administration (NOAA), Center for Applied Environmental Law and Policy (CAELP), DC Department of Energy & Environment, United States Environmental Protection Agency (EPA) Office of Environmental Justice

HAQAST Members and Collaborators: Gaige Kerr, Cici Bauer, Bryan Duncan, Mariana Figueiro, Arlene Fiore, Emily Fischer, Emily Gargulinski, Dan Goldberg, Pawan Gupta, Tracey Holloway, Yang Liu, Jeff Pierce, Ted Russell, Amber Soja, Christopher Uejio, Daniel Tong, Jun Wang, and Randall Martin also contribute to this team.

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.*

2. Enabling Stakeholder Access and Utilization of Data Products for Health and AQ Applications (First Steps)

Team Lead: HAQAST co-investigator Kevin Cromar

Partners: United Nations Environment Programme (UNEP), World Bank, World Health Organization (WHO), United Nations United Children's Emergency Fund (UNICEF), CDC, United States Department of Agriculture (USDA), NASA Socioeconomic Data and Applications Center (SEDAC), California Department of Public Health, Georgia Environmental Protection Division, University of British Columbia, Health Effects Institute (HEI), American Thoracic Society

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.

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.***

3. **Communicating the uncertainties of satellite-based NOx emissions for urban planning**

Team Lead: HAQAST co-investigator Dan Goldberg

Partners: United States Environmental Protection Agency (EPA), Health Effects Institute (HEI), Ramboll, NASA Applied Remote Sensing Training Program (ARSET), Ramboll, Pacific Northwest National Laboratory (PNNL), Institute for Health Metrics and Evaluation (IHME), Lake Michigan Air Directors Consortium, International Council on Clean Transportation

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

[W]e 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****.*

4. **Enabling USEPA to ingest high-frequency satellite air quality data into the AirNow system**

Team Lead: HAQAST investigator Pawan Gupta

Partners: Phil Dickerson and Barron Henderson with the US Environmental Protection Agency (EPA), and Shobha Kondragunta with the National Oceanic and Atmospheric Administration (NOAA)

HAQAST Members and Collaborators: Jianqiu Mao, Yang Liu, Kel Markert, Robert Levy, Randall Martin, Amber J. Soja, Martin Stuefer, Jenny Bratburd, Emily Gargulinksi, Yanshun Li, and Daniel Tong also contribute to this team.

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.***

5. **Fused earth observations to quantify health impacts from agricultural fires**

Team Lead: HAQAST investigators Sheryl Magzamen and Amber Soja

Partners: Sierra Club Kansas, ProPublica/Palm Beach Post, CDC, Center for Health, Work and Environment and Mountain and Plains Educational Research Center, High Plains Intermountain Center for Agricultural Health and Safety

HAQAST Members and Collaborators: Kellin Slater, Jeff Pierce, Emily Fischer, Bonne Ford, Jun Wang, Christopher Uejio, Emily Gargulinski, Susana Adamo, Randall Martin, Susan Anenberg, Pawan Gupta, Arlene Fiore, Jingqiu Mao also contribute to this team.

*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.*

ehp Environmental Health Perspectives

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Vol. 129, No. 8 | Research Letter

The Association between Outdoor Artificial Light at Night and Breast Cancer Risk in Black and White Women in the Southern Community Cohort Study

Qian Xiao, Gretchen L. Gierach, Cici Bauer, William J. Blot, Peter James, and Rena R. Jones

Published: 11 August 2021 | CID: 087701 | https://doi.org/10.1289/EHP9381

Image: NASA Earth Observatory

*"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."*

Image: USGS

Smoke from 900 miles away can still be harmful to human health

9NEWS

Air quality in Philly reaches unhealthy levels thanks to wildfires out west

WHYY PBS npr

GeoHealth

Research Article | Open Access

Differential Cardiopulmonary Health Impacts of Local and Long-Range Transport of Wildfire Smoke

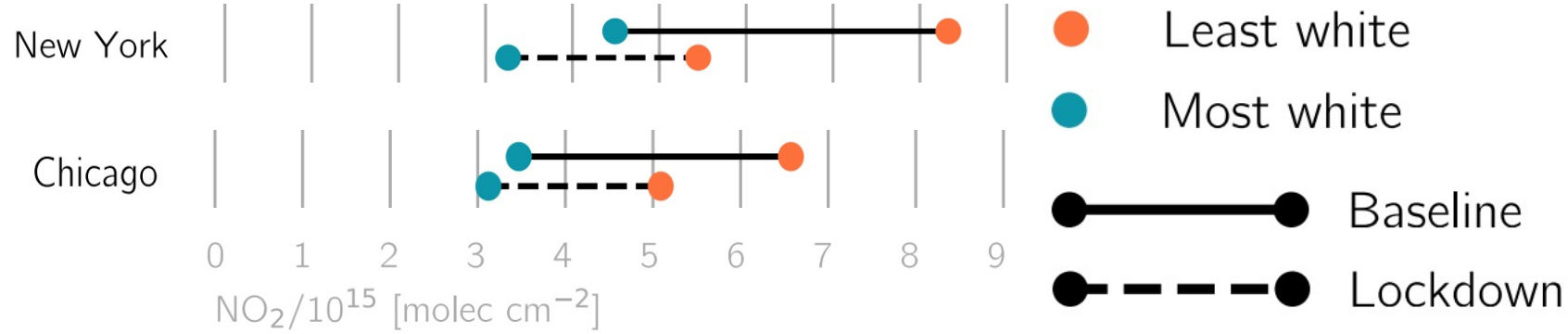
Sheryl Magzamen, Ryan W. Gan, Jingyang Liu, Katelyn O'Dell, Bonne Ford, Kevin Berg, Kirk Bol, Ander Wilson, Emily V. Fischer, Jeffrey R. Pierce

Research Article | Open Access

Associations Between Wildfire-Related $PM_{2.5}$ and Intensive Care Unit Admissions in the United States, 2006–2015

Cecilia Sorensen, John A. House, Katelyn O'Dell, Steven J. Brey, Bonne Ford, Jeffrey R. Pierce, Emily V. Fischer, Jay Lemery, James L. Crooks

"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."***



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RESEARCH ARTICLE

COVID-19 pandemic reveals persistent disparities in nitrogen dioxide pollution

Gaige Hunter Kerr, Daniel L. Goldberg, and Susan C. Anenberg
+ See all authors and affiliations

"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

HAQAST

NASA HEALTH AND AIR QUALITY APPLIED SCIENCES TEAM

Connecting NASA Data and Tools with Health and Air Quality Stakeholders