NASA HELPS NEW YORKERS COPE WITH SUMMER SWELTER

NASA Earth Science Division's Health and Air Quality Applications program and the New York State Department of Health (NYSDOH) developed a **collaborative project** to identify when high temperatures in New York State were detrimental to human health. **Tabassum Insaf (NYSDOH Bureau of Environmental and Occupational Epidemiology)** and team used NASA-sponsored NLDAS data to examine the spatial surface and temperature data and related health outcomes in local geographic areas. During Summer 2018, in coordination with the National Weather Service, the Heat Advisory threshold was reduced from 100°F to 95°F in efforts to prepare local citizens to prevent heat-related illnesses.

NASA Terra satellite image illustrates New York State on June 21, 2018. Photo credit: NASA

NASA-sponsored NLDAS data provides estimates of maximum air temperature across New York State. Photo credit: NYSDOH

CHOLERA FORECASTS HELP SAVE LIVES IN YEMEN

Using satellite data from the **Global Precipitation Measurement (GPM)** mission and **Moderate Resolution Imaging Spectroradiometer (MODIS)** instruments, **Antarpreet Jutla (West Virginia U.)**, **Rita Colwell (U. of Maryland, College Park)**, and **Anwar Huq (U. of Maryland, College Park)** developed a **forecasting tool** with 92% accuracy to predict high-risk geographic areas for *Vibrio cholerae* spread and distribution across Yemen in 2017. The World Health Organization reported this 2017 outbreak as the world's worst cholera outbreak. In early 2018, international organizations, such as U.K. Aid, U.K. Met Office, and United Nations Children's Fund (UNICEF), collaborated with these NASA-funded researchers and used the model to identify **predicted cholera risk** and inform decision-makers where to best allocate preparedness and support measures based on the model's predictions.
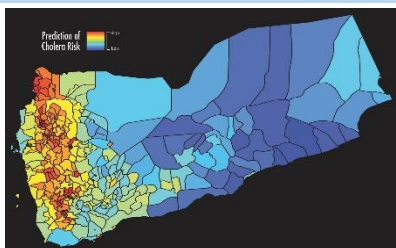
Predicted cholera risk (blue color as low risk, red color as high risk) based on analysis and satellite data in Yemen, June 2017. Photo credit: A. Jutla
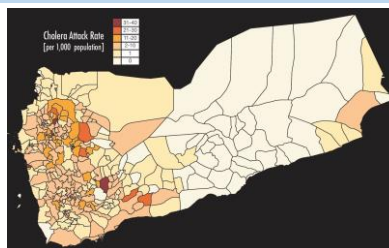
Actual number of cholera cases, June 2017. Red area represents reported cholera cases. Photo credit: A. Jutla

HEALTH AND AIR QUALITY APPLICATIONS
APPLIED SCIENCES PROGRAM

haQ

JOHN HAYNES
PROGRAM MANAGER
HEADQUARTERS

**SUE ESTES**
ASSOCIATE
U. of ALABAMA-HUNTSVILLE

ALI OMAR
ASSOCIATE
LANGLEY RESEARCH CENTER

**HELENA CHAPMAN**
AAAS S&T POLICY FELLOW
HEADQUARTERS

NASA DEVELOP CELEBRATES 20TH ANNIVERSARY

In August 2018, the **NASA DEVELOP Program** celebrated their 20th year anniversary and recognized the achievements of NASA DEVELOP staff, students, and partners. At the Annual Earth Science Application Showcase (AESAS 2018), held at NASA Headquarters, DEVELOP staff showcased the Summer 2018 accomplishments of 102 student participants, who completed 28 projects at 13 locations, with more than 60 project partners. Students presented their **projects** through poster presentations and shared experiences in group discussions with NASA Applied Sciences Program staff. Each NASA Applied Sciences Program Application area shared achievements at the AESAS 2018 poster session.
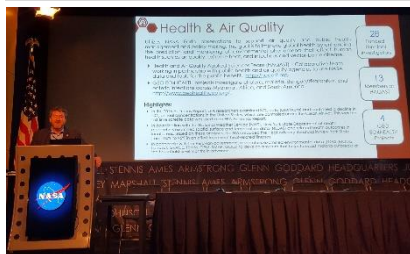
J. Haynes presents HAQ activity achievements. Photo credit: H. Chapman
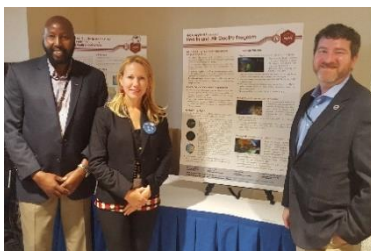
A. Omar, H. Chapman, and J. Haynes (Left to Right) at the AESAS 2018 poster session. Photo credit: DEVELOP

J. Haynes leads the HAQ group discussion. Photo credit: H. Chapman

ISES-ISEE 2018 JOINT ANNUAL MEETING IN OTTAWA

At the International Society of Exposure Science and the International Society for Environmental Epidemiology (ISES-ISEE) 2018 Joint Annual Meeting, held in Ottawa, Canada, the NASA HAQ Team coordinated the scientific session, *NASA Applications for Public Health and Air Quality Models and the Translation of Research into Policy and Other Decision Making*, moderated by **Sue Estes (U. of Alabama, Huntsville)**, to an audience of approximately 85 attendees. Presentation titles included *NASA Applications for Public Health and Air Quality Models and Decisions Using Earth Observation Systems* (**John Haynes, NASA**); *Searching Panacea for Cholera* (**Antarpreet Jutla, West Virginia U.**); *Advancing Extreme Heat Epidemiology Using Remotely Sensed Earth Observations: Generating a Long-Term Historical Time-Series of Daily Heat Metrics at the Community-Level* (**Ambarish Vaidyanathan, CDC**); and *An Operational System for Surveillance and Ecological Forecasting of West Nile Virus Outbreaks* (**Mike Wimberly, South Dakota State U.**).

S. Vaidyanathan, J. Haynes, M. Wimberly, A. Jutla, S. Estes, and H. Chapman (Left to Right). Photo credit: M. Shimamota

HAQ TEAM CONDUCTS 10TH ANNIVERSARY PROGRAM REVIEW

The NASA HAQ Team, led by **Sue Estes (U. of Alabama, Huntsville)**, coordinated the 10th annual HAQ Applications Program Review 2018 with approximately 40 attendees in Burlington, VT. Presentations were shared by NASA-funded researchers (ROSES, GEO EO4HEALTH), HAQAST, CDC partners, and Vermont Department of Health staff. Invited speakers presented on Communications, Prizes/Challenges, One Health, VALUABLES, and NASA Training and Capacity Building.

Attendees to the HAQ Applications Program Review 2018. Photo credit: Hotel Vermont

HAQAST 4 MEETING FEATURES TALKS ON AIR QUALITY AND PUBLIC HEALTH APPLICATIONS FROM INVESTIGATORS AND STAKEHOLDERS

At HAQAST4, held in Madison, WI, more than 150 persons attended in-person or virtually, as the largest HAQAST (or AQAST) meeting in history. Presenting stakeholders included LADCO, WESTAR/WRAP, American Lung Association, South Coast AQMD, USDA, CDC, TCEQ, and other state and local public health departments. The meeting provided a rich discussion of the synergy between air quality regulations and public health policies and decisions. **Tracey Holloway (U. Wisconsin, Madison)** announced the [HAQAST 2018 Tiger Team](#) selections. The evening poster session had 40 submissions, including the HAQ Team poster, *Using Satellite Data for Applications in Public Health Practice*. **Helena Chapman (NASA)** was invited to present, *From Fieldwork to Science Policy*, to nine graduate and post-graduate students of the UW-Madison [Catalysts for Science Policy](#) Group.
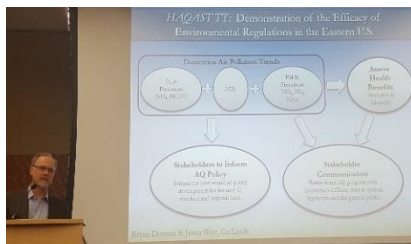

Presentation by T. Holloway.
Photo credit: HAQAST

J. West moderated the *Strategies for Linking NASA Data and User Applications* session.
Photo credit: HAQAST
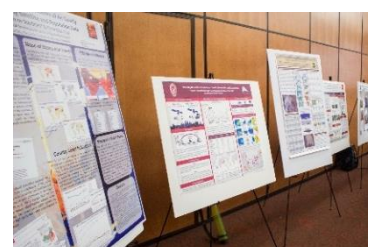
HAQAST poster session.
Photo credit: HAQAST

Presentation by B. Duncan.
Photo credit: H. Chapman

A. Omar, H. Chapman, S. Estes, and J. Haynes (Left to Right). Photo credit: HAQAST

H. Chapman with UW-Madison Catalysts for Science Policy members.
Photo credit: UW-Madison CasP

NASA INVESTIGATORS IN THE NEWS

Michael Wimberly (South Dakota State U.): [What to Know about West Nile Virus](#) and [Scientists Use Satellite, Climate Data to Forecast West Nile Risk in South Dakota](#), and [West Nile Virus Prediction Model Protects Human Health, Empowers Communities](#): Using MODIS and Landsat data, **M. Wimberly** and team created weekly risk assessment maps in efforts to forecast risk of West Nile virus in SD.

Jeff Pierce (Colorado State U.): [Rivers of Smoke' Carry Air Pollution East as California Burns](#) and [U.S. Wildfire Smoke Deaths Could Double by 2100](#): Using MODIS satellite data, EPA Air Quality System, and NOAA Hazard Mapping System, **J. Pierce** and team estimated the association between $PM_{2.5}$ and cardiopulmonary hospital admissions in WA.

Rajesh Kumar (National Center for Atmospheric Research): [Five Steps to Improve Air-quality Forecasts](#): **R. Kumar** and colleagues highlighted five strategies that can strengthen global air quality monitoring and modelling networks.

AWMA 2018 FEATURES HYPERWALL TALKS AND SESSION ON AIR QUALITY AND PUBLIC HEALTH APPLICATIONS FROM INVESTIGATORS

At the Air & Waste Management Association (AWMA) Annual Conference 2018, held in Hartford, CT, the NASA HAQ Team coordinated the scientific session, *NASA's Satellite and Sub-Orbital Measurements for Air Quality and Health Applications*, moderated by **Sue Estes (U. of Alabama, Huntsville)**, to an audience of approximately 30 attendees. Presentation titles included *Earth Observations Applied to a Changing World: NASA Health and Air Quality Applications* (**John Haynes, NASA**); *Smoke Exposure and Associated Health Effects across Several Fire Seasons and Locations in the Western U.S.* (**Jeff Pierce, Colorado State U.**); and *Satellite Remote Sensing of Fires & Surface PM$_{2.5}$ with Nightlights Measured from Space* (**Jun Wang, U. Iowa; Presented by Ali Omar, NASA**).

Organized by the HAQ and Science Communications Support Teams (**Marit Jentoft-Nilsen**, **Amy Moran**), the four NASA Hyperwall talks at the exhibit hall booth included: *Earth Observations Applied to a Changing World: NASA Health & Air Quality Applications* (**John Haynes**); *NASA's Satellite Observations for Air Quality Applications* (**Ali Omar**); *Mapping Diseases: Mosquitos vs. MODIS* (**Sue Estes**); and *Linking Satellite Data to the One Health Approach* (**Helena Chapman**). **Ali Omar** also shared his career path and provided advice to graduate students and early-career researchers on the *Career Panel: Professional Development Guidance*.
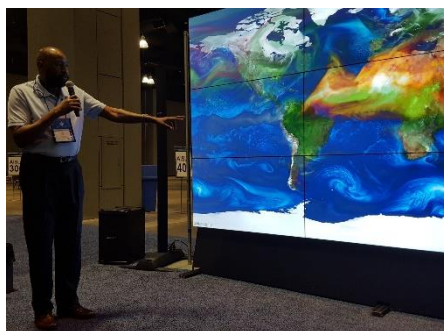
A. Omar, S. Estes, and H. Chapman present at the NASA Hyperwall (Left to Right). Photo credits: H. Chapman, A. Moran

H. Chapman, A. Omar, J. Haynes, and S. Estes (Left to Right). Photo credit: AWMA
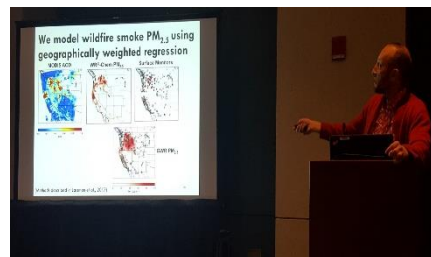
J. Haynes and J. Pierce present at the NASA scientific session (Left to Right). Photo credit: H. Chapman

ECOSTRESS LAUNCH: JUNE 29, 2018

Photo credit: NASA

Launched on the NASA-contracted SpaceX Dragon spacecraft, the **Ecosystem Spaceborne Thermal Radiometer Experiment on Space Station (ECOSTRESS)** instrument headed to the **International Space Station**. The mission objective is to measure the temperature of plants and examine how they use water and respond to stressors (e.g., droughts).
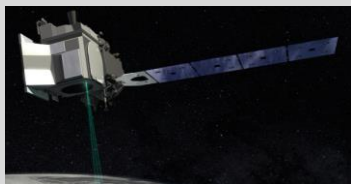
ICESAT-2 LAUNCH: SEPT 15, 2018

Photo credit: NASA

Ice, Cloud, and Land Elevation Satellite-2 (ICESat-2), which follows the original ICESat mission (2003-2010), aims to deploy the spaceborne sensor, Advanced Topographic Laser Altimeter System (ATLAS), and collect altimetry data of the Earth's surface to monitor changes in ice sheet elevation, sea ice thickness, and global vegetation biomass.

NASA TRACKS AND PREDICTS MOSQUITO-BORNE DISEASE OUTBREAKS

From Fall 2017 to Spring 2018, two **NASA GSFC DEVELOP teams** integrated NASA satellite data and citizen science data (from the Global Mosquito Alert Consortium) to develop an open-source map on Google Earth Engine and improve prediction models for vector-borne diseases in Western Europe.

UPCOMING

Funding Opportunities:
ROSES-2018
Letters of Intent due
March 2018 – January 2019
Full Applications due
May 2018 – April 2019

Meetings:
American Public Health Association Annual Meeting & Expo
November 10-14, 2018
San Diego, CA

American Geophysical Union Fall Meeting
December 10-14, 2018
Washington, DC

HAQAST 5 Team Meeting
January 3-4, 2019
Phoenix, AZ

American Meteorological Society Annual Meeting
January 6-10, 2019
Phoenix, AZ

2018 EPA AIR TRENDS REPORT

In July 2018, the EPA released the annual report on air quality, *Our Nation's Air: Status and Trends Through 2017*. Notably, SO_2 data based on **NASA OMI/Aura SO_2 animations** were incorporated in the analysis. This report highlighted that there was a 73% decrease in the combined emissions of six key pollutants (CO, Pb, NO_2, O_3, PM, SO_2) between 1970 and 2017. Simultaneously, it also concluded that the U.S. economy grew by more than three times.

Spotlight:
Summer 2018 Interns
NASA Applied Sciences Program
Auset Taylor

Auset is a rising sophomore at Princeton University, majoring in Ecology and Evolutionary Biology. She prepared maps that identified site locations of HAQ projects and developed summary reports of HAQAST Tiger Teams 2017. She also wrote a policy brief that highlighted the benefits of using satellite data to reach SDG3.

Photo credit: A. Taylor

Gertrude Pavur

Gigi is a rising junior at the Georgia Institute of Technology, majoring in Earth and Atmospheric Sciences. She designed maps that identified site locations of Disaster projects and prepared communication stories about HAQAST Tiger Team 2017 leads. She also prepared a policy brief that described using Earth observations to reduce the social, economic, and environmental impacts of disasters to achieve SDG11.

Photo credit: G. Pavur

G. Pavur, A. Taylor, P. Bond, and H. Chapman (Left to Right) at HAQAST4. Photo credit: H. Chapman

AESAS 2018 poster presentation by G. Pavur and A. Tayor (Left to Right). Photo credit: H. Chapman

PAST

Webinars:
[Techniques for Wildfire Detection and Monitoring](#)
July 12-19, 2018

In-Person Trainings:
[Satellite Remote Sensing of Dust, Fires, Smoke, and Air Quality](#)
July 10-12, 2018
Pullman, WA

Meetings:
[Air and Waste Management Association's Annual Conference & Exhibition](#)
June 25-28, 2018
Hartford, CT

[HAQAST 4 Team Meeting](#)
July 17-18, 2018
Madison, WI

[International Society of Exposure Science and International Society for Environmental Epidemiology (ISES-ISEE) Joint Meeting](#)
Ottawa, Canada
August 26-30, 2018

HAQ Annual Team Meeting
Burlington, VT
September 18-19, 2018

PUBLICATIONS

[Climate Change and Heat-related Excess Mortality in the Eastern USA](#). *EcoHealth.* (V. Limaye et al.)

[Ammonia Emissions from Biomass Burning in the Continental United States](#). *Atmospheric Environment.* (C. Bray et al.)

[Air-quality-related Health Impacts from Climate Change and from Adaptation of Cooling Demand for Buildings in the Eastern United States: An Interdisciplinary Modeling Study](#). *PLoS Medicine*. (D. Abel et al.)

[Future Ozone-related Acute Excess Mortality under Climate and Population Change Scenarios in China: A Modeling Study](#). *PLoS Medicine*. (K. Chen et al.)

[HTAP2 Multi-model Estimates of Premature Human Mortality due to Intercontinental Transport of Air Pollution and Emission Sectors](#). *Journal of Atmospheric Chemistry and Physics.* (C-K Liang et al.)

[Two-scale Multi-model Ensemble: Is a Hybrid Ensemble of Opportunity Telling us More?](#) *Journal of Atmospheric Chemistry and Physics.* (S. Galmarini et al.)

[The Impact of Future Emission Policies on Tropospheric Ozone using a Parameterised Approach](#). *Journal of Atmospheric Chemistry and Physics.* (S. Turnock et al.)