

Leveraging Science to Advance Society

The PACE Mission Applications Program

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Plankton, Aerosol, Cloud, ocean Ecosystem

The PACE Observatory

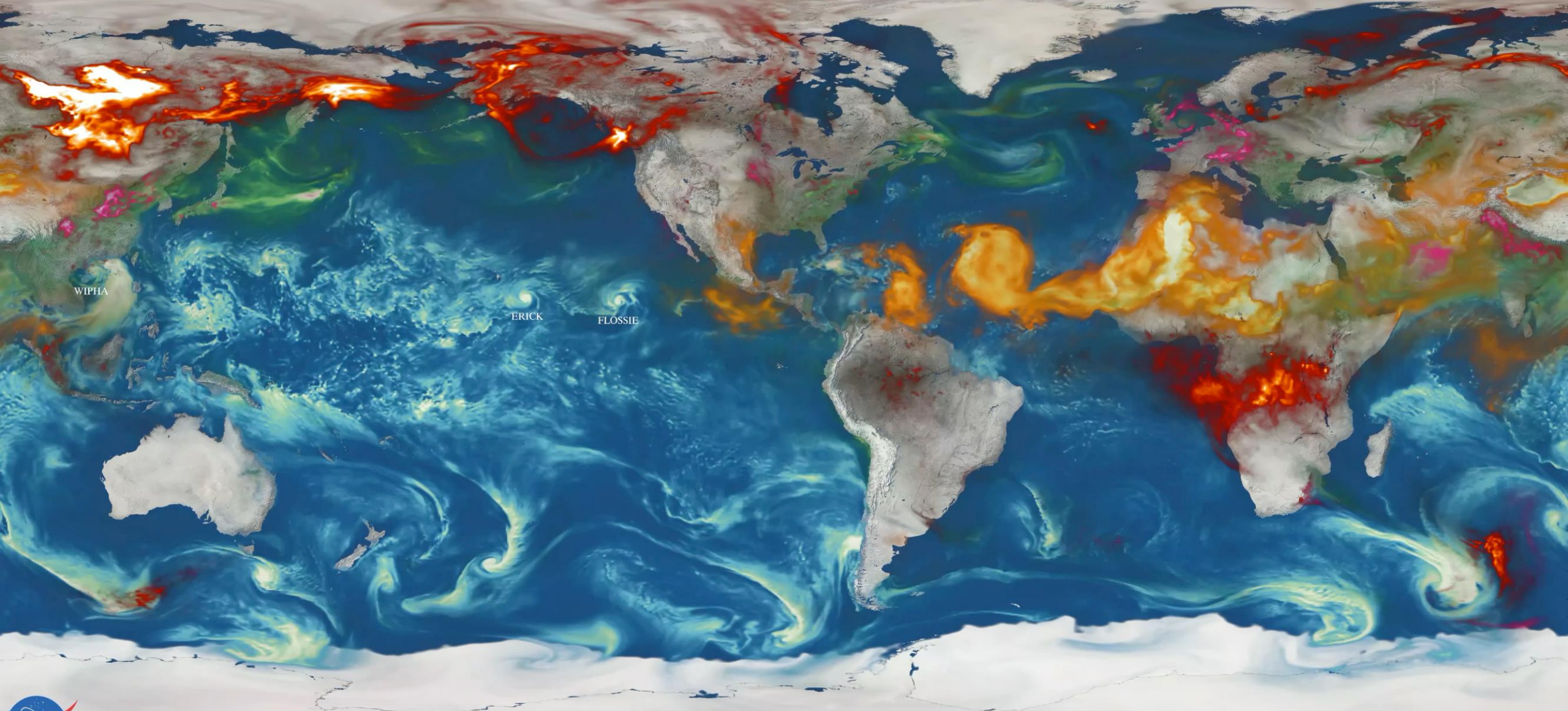
- PACE is NASA's next great investment in hyperspectral earth imagery and multi-angle polarimetry
 - Launch date: ~ 2023
 - 3-year design life; 10-year propellant
- Hyperspectral imager: **Ocean Color Instrument (OCI)**
 - Spectral resolution: UV to SWIR (340-890 nm every 2.5 nm, with 940, 1038, 1250, 1378, 1615, 2130, & 2250 nm)
 - Temporal resolution: 2 days
 - Spatial resolution: 1-km² at nadir
- Two multi-angle polarimeters
 - **HARP-2**: wide swath, hyper-angular, 4 bands across the VIS & NIR
 - **SPEXone**: narrow swath, hyperspectral (UV-NIR), 5 viewing angles



Aerosol Optical Depth at 550 nm



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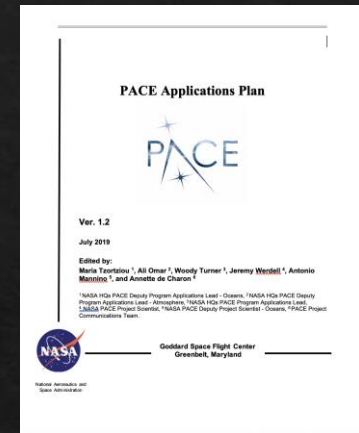
GMAO

Global Modeling and Assimilation Office

PACE Applications Program



- Address community user needs & concerns with PACE data products
- Grow relevance & sustainability of PACE
- Demonstrate the societal value & utility of PACE



The goal of the PACE Applications Program is to foster new partnerships and out-of-the-box thinking that will generate inventive solutions that aid society.

Ecological Forecasting



Air Quality



Disasters

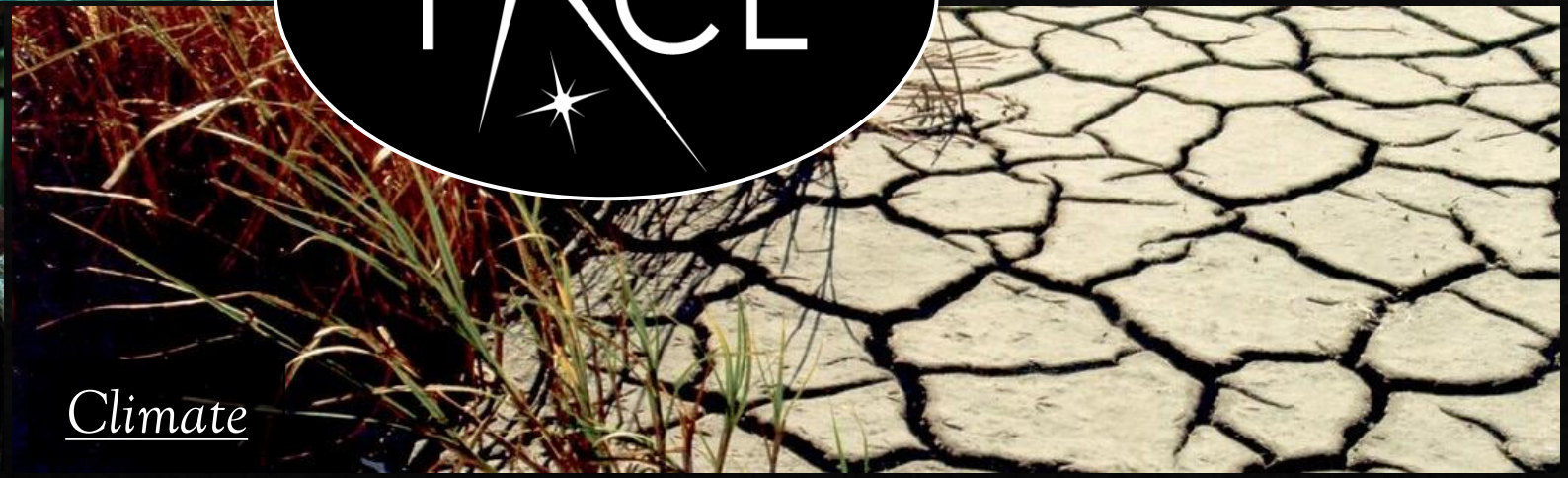


PACE

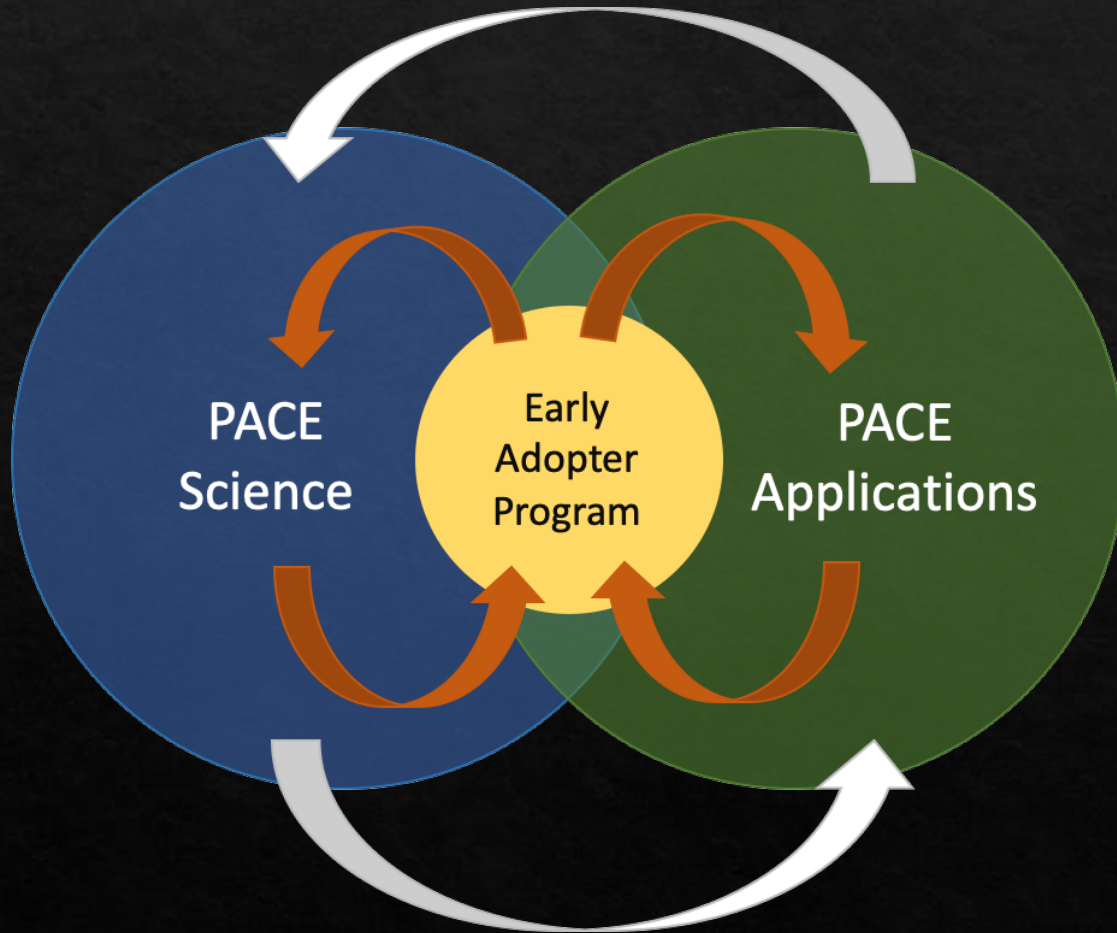
Water Resources



Climate



PACE Early Adopter Program



The goal of the Early Adopter program is to:

- Expand the user communities with practical applications that would benefit from the use of PACE data sets
- Facilitate feedback on PACE data products pre-launch
- Accelerate the use of PACE products in applications post-launch by conducting pre-launch applied research

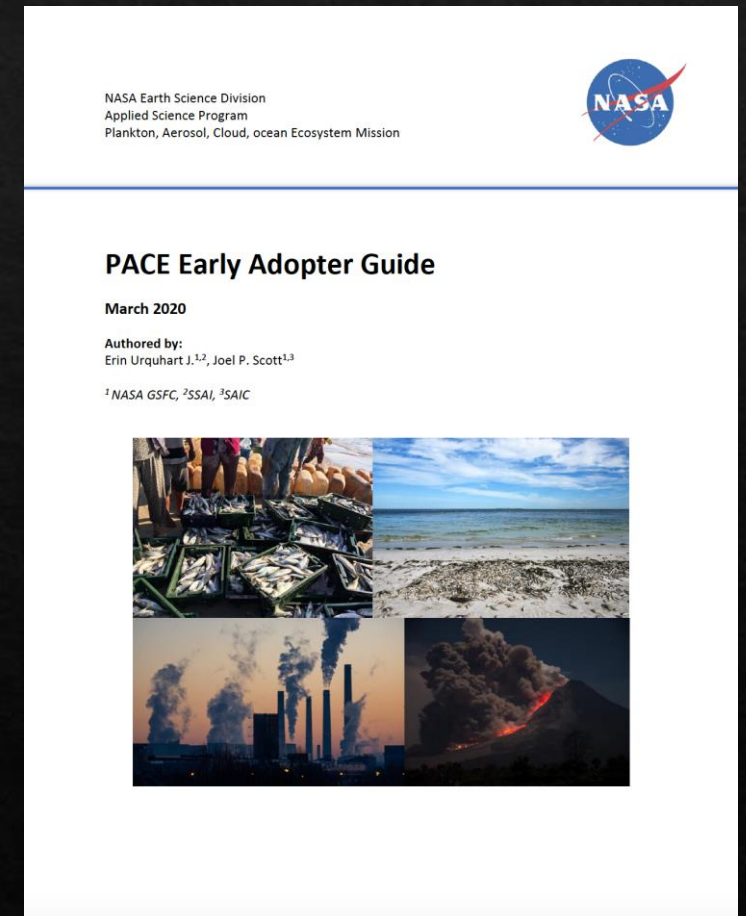
Early Adopters are individuals/groups who:

- Have a direct, clearly defined need for PACE data products
- Have an existing application or a new idea for PACE-related applications
- Have an existing user for their application
- Have existing resources to demonstrate the utility of PACE data in their application

PACE Early Adopter Program

Early Adopter Benefits:

- Engage with PACE Mission & Project Science
- Interact with other members of the Early Adopter team and PACE Science & Application Team
- Participate in PACE Applications workshops, focus sessions, & tutorials
- Access pre-launch simulated & proxy PACE data
- Updates on the PACE mission, science data products, & field campaigns



EA Project Profile: Modeling spatial and temporal exposure to air pollution in the western U.S.



Heather Holmes

University of Nevada, Reno; <https://haholmes.wordpress.com>

Application: Improve air quality & exposure models of elevated PM_{2.5} concentrations due to temperature inversions & wildfire smoke in the western U.S. Provide smoke forecasts online to aid in air quality alerts.

Significance: The western U.S. is home to 70+ mil. people with many counties in violation of at least one criteria pollutant according to the EPA. Local meteorological & geographical conditions compound air quality monitoring.

Why PACE: PACE will provide continuity of aerosol retrievals currently in use from MODIS, MAIAC, & MISR. Multi-angle polarimetry from PACE can reduce the uncertainty of smoke plume injection height & aerosol retrievals.

Stakeholders: Washoe County Air Quality District, UNR Living With Fire outreach ambassadors, Early career researchers: PhD and Post-Doc



EA Project Profile: Predictive Assessment of Clinically Active Biothreats in Coastal and Ocean Waters using PACE data



Antar Jutla

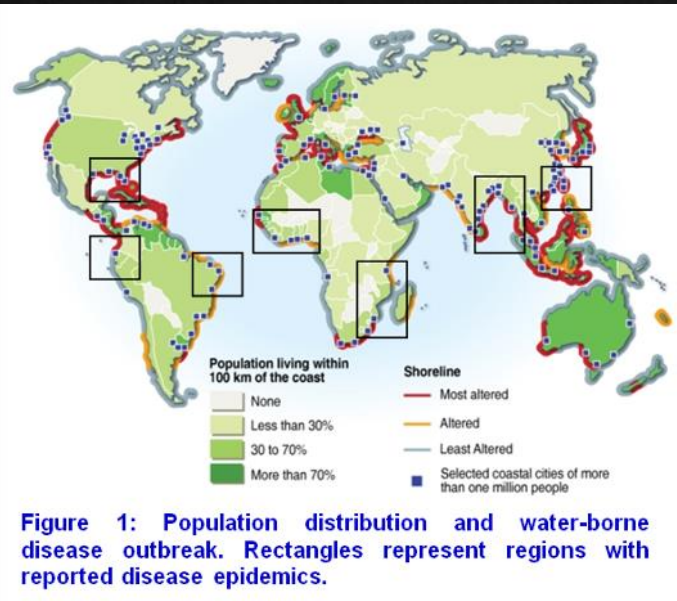
University of Nevada, Reno; <https://haholmes.wordpress.com>

Application: Enhanced cholera risk models through integration of hyperspectral remotely sensed plankton & plankton health data into algorithms for Florida and the Chesapeake Bay.

Significance: Water-borne pathogens pose a significant threat to human and environmental health. Better understanding of the relationship between plankton and *Vibrio cholerae* will improve risk assessment and improve human health advisories. This work can be used to make real-time decisions of when and where to initiate cholera relief and mitigation activities, as well as, for decision-making for safe water and sanitation.

Why PACE: The hyperspectral capabilities of PACE OCI will enhance existing prediction models (for *Vibrio cholerae*) by integrating speciation level information on plankton and plankton health into algorithms. It is anticipated that PACE will enhance such activities to support public health, policy analysis, and decision-making.

Stakeholders: United Nations Office for Coordinator of Humanitarian Affairs (UNOCHA); World Health Organization (WHO); UNCEF



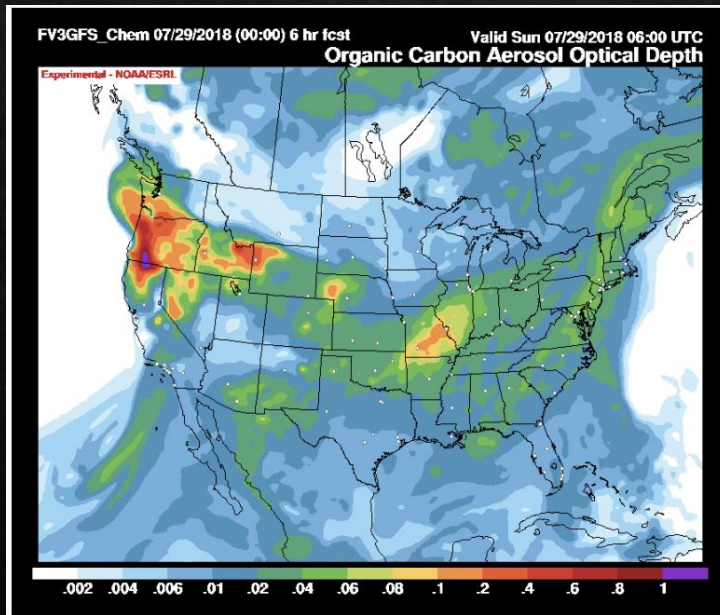
EA Project Profile: Shifts in biodiversity and linkages to ecosystem health and food security



Mariusz Pagowski

NOAA/ESRL/GSL; CIRES/Univ. of Colorado, Boulder;

<https://www.esrl.noaa.gov/gsd/>



AOD from organic carbon. Large impact from wildfires. Credit: NOAA

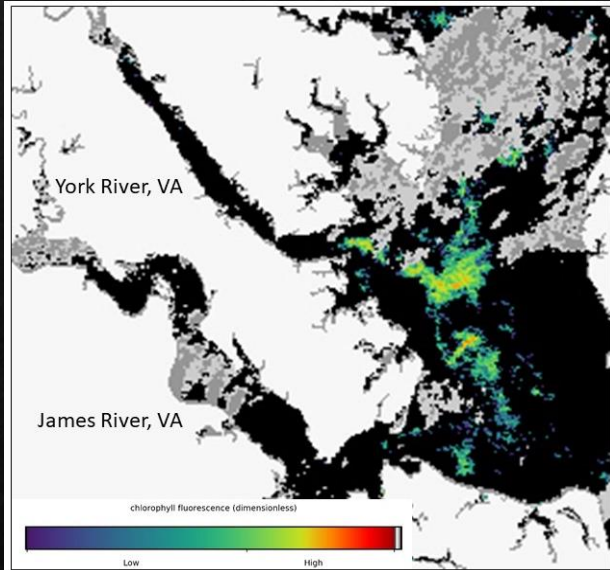
Application: Improve global air quality modeling and prediction of aerosols in NOAA's FV3-GF5/GOCART model by implementing a hybrid ensemble-variational approach assimilation framework

Significance: Fine aerosols (e.g. - PM2.5) contribute to urban smog and are the most important factor affecting human mortality due to air pollution. Aerosols of this size also affect atmospheric radiation and cloud processes thus impact weather and climate

Why PACE: Aerosol retrievals by the PACE OCI and multi-angle polarimeters will constrain aerosol species concentrations and provide information regarding their vertical distributions

Stakeholders: NOAA Climate Prediction Office: Modeling, Analysis, Predictions, and Projections Program; NOAA Office of Weather and Air Quality

EA Project Profile: *Discriminating algal blooms in turbid coastal, estuarine, and large lake environments*



Rick Stumpf

National Centers for Coastal Ocean Science, NOAA; <https://coastalscience.noaa.gov>

Application: Harmful Algal Bloom Detection, Monitoring, and Forecasting

Significance: Being able to more accurately separate HAB species from background phytoplankton would allow for more targeted management activities to advise local health department, water treatment operators, the aquaculture and commercial fishing industry as well as state managers.

Why PACE: Hyperspectral data from PACE, enables further separation of bloom types to better estimate toxicity due to HABs and provide more informative data for state managers responding to HAB events.

Stakeholders: State managers in Florida, Maryland, Virginia, Ohio, California



Upcoming Applications Events

The image shows a promotional graphic for the NASA PACE Applications 2021 Workshop. On the left, there is a blue rectangular area containing the PACE logo (the word 'PACE' in white with three white stars) and the text 'NASA PACE Applications 2021 Workshop' in white. Below this, it says 'Virtual Event' and 'September 15-16, 2021'. To the right of the blue area is a vertical strip showing a satellite view of Earth from space, with a satellite instrument panel visible at the top.

2nd PACE Applications Workshop

September 15-16th, 2021

Virtual – *Registration is open!*

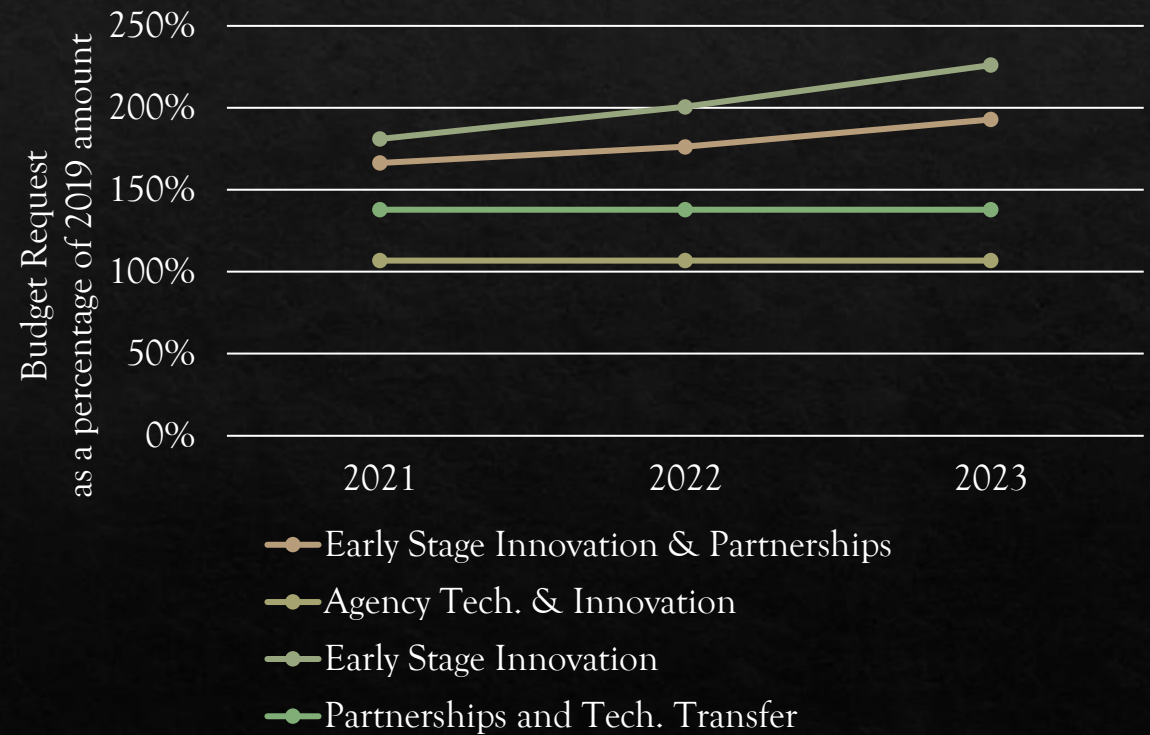
The Plankton, Aerosol, Cloud, ocean Ecosystem Mission (PACE) will host its 2021 Fall Applications Workshop on September 15 and 16, 2021. This two-day virtual workshop will provide an opportunity for early engagement with PACE end-users exploring topics of air quality, public health, water quality and resources, disasters, climate modeling, and ecological forecasting. The workshop will build a transdisciplinary dialogue centered on how PACE data products may be integrated into applications that advance society and inform decision-making processes. This workshop will encourage open collaboration from individuals and organizations across diverse backgrounds including universities, government agencies, and commercial, non-profit, and private sectors.

https://pace.oceansciences.org/app_involved.htm

Take Away Message

- Early engagement between data producers & data users builds partnerships to advance applications for decision-making
- Pre-launch applied research from PACE Early Adopters provides feedback & guidance to the mission, saving time & resources post-launch
- PACE will have several health-focused application areas close to ARL 9 by the time it's on orbit, but **we're looking for new early adopters and innovative applications!**
- PACE Applications are a measure of mission success to NASA, used to advocate and justify continued support for the mission

Budget Authority*



* FY 2021 President's Budget Request Summary



How can
PACE Applications
help you??

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<https://pace.gsfc.nasa.gov>