



# Improving Access to Near Real-time Satellite Fire and Air Quality Data Products Based on User Needs

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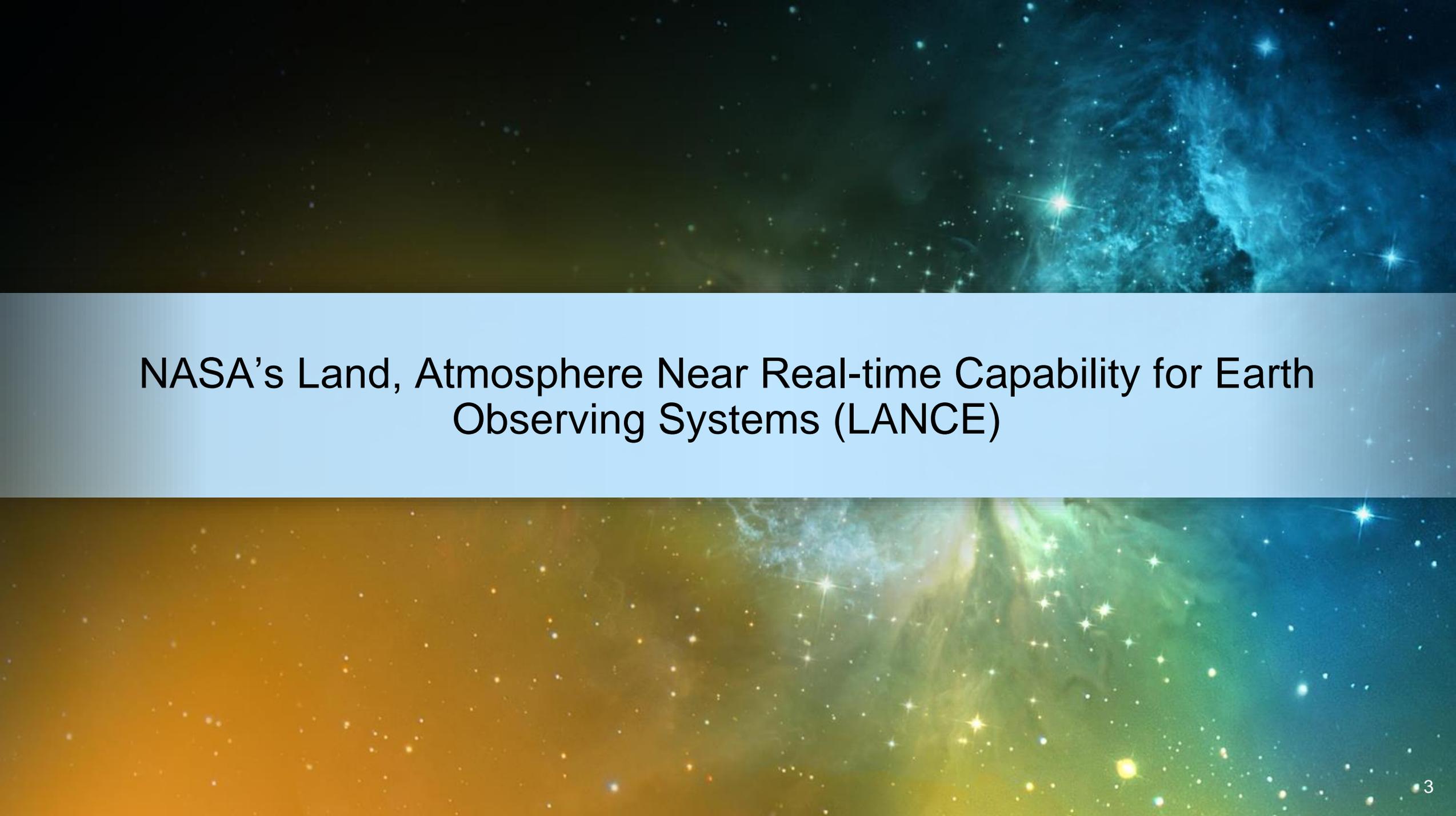
**AMS Collective Madison Meeting**

**August 08 - 12, 2022**

A decorative graphic on the left side of the slide. It features a curved, semi-circular shape containing a vibrant space scene. At the bottom, the blue and white horizon of Earth is visible. Above it, a bright yellow sun or star glows. Further up, a large, dark, cratered moon is prominent. In the background, there are various other celestial bodies, including a ringed planet like Saturn, and a colorful nebula in shades of blue and green. The overall aesthetic is futuristic and scientific.

# Outline

- NASA's Land, Atmosphere Near Real-time Capability for Earth Observing Systems (LANCE)
- NASA Earth Science Applied Sciences Program
- How We Improved Access to Near Real-time Satellite Fire and Air Quality Data Products Based on User Needs

The background of the slide is a composite of two cosmic images. The top half features a dark blue and black space filled with numerous small white stars and a prominent, bright blue nebula on the right side. The bottom half shows a similar starry field but with a warm, golden-yellow and greenish glow, suggesting a different spectral filter or a different region of space. The text is centered in a white horizontal band across the middle.

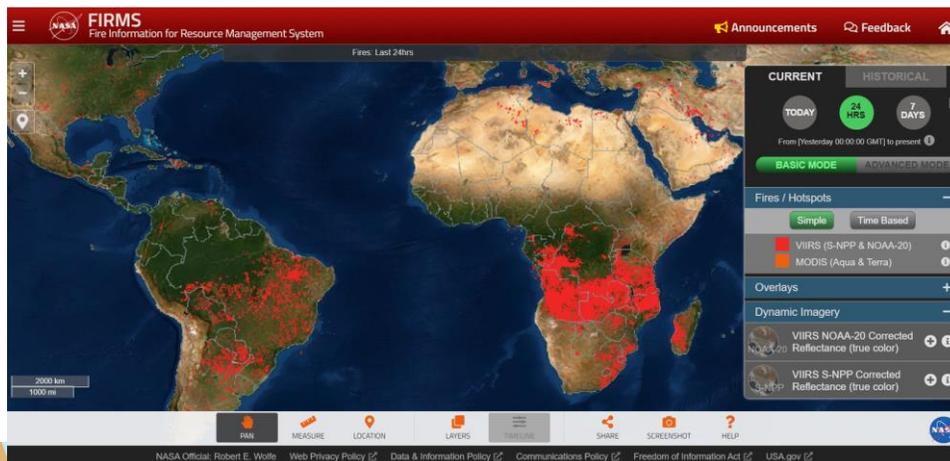
NASA's Land, Atmosphere Near Real-time Capability for Earth  
Observing Systems (LANCE)

# NASA's Land, Atmosphere Near Real-time Capability for Earth Observing Systems (LANCE)



The screenshot shows the LANCE website homepage. At the top is the NASA EarthData logo with the tagline "OPEN ACCESS FOR OPEN SCIENCE". Navigation links include Data, Topics, Learn, Engage, and About. Below the header is a banner image of a satellite map. The main heading reads "LANCE: NASA Near Real-Time Data and Imagery". A sub-heading states: "NASA's Land, Atmosphere Near real-time Capability for EOS (LANCE) supports users interested in monitoring a wide variety of natural and man-made phenomena using near real-time (NRT) data and imagery that are made available much quicker than routine processing allows." A green "Find Data" button is visible. Below this, a paragraph explains that most data products are available within 3 hours from satellite observation, with imagery generally available 3-5 hours after observation. To the right is a circular logo for LANCE and a sidebar menu with links: "More", "About LANCE", "What is Data Latency?", "Near Real-Time versus Standard Products", and "10 LANCE milestones over the years".

- LANCE (<https://earthdata.nasa.gov/lance>) supports users interested in monitoring a wide variety of natural and man-made phenomena using near real-time (NRT) data products that are made available much quicker than routine processing allows.
- LANCE provides more than 170 data products from 11 instruments including AIRS, AMSR2, ICESat-2, LIS, MISR, MLS, MODIS, MOPITT, OMI, OMPS and VIIRS.
- Fire Information for Resource Management System (FIRMS) is a part of LANCE.
- Karen Michael is the LANCE manager. Diane Davies is the LANCE Operations Manager.



The screenshot shows the FIRMS web application interface. The title is "FIRMS Fire Information for Resource Management System". The main view is a global map showing fire hotspots in red. A sidebar on the right allows users to filter data by "CURRENT" (Today, 24 Hrs, 7 Days) and "HISTORICAL" (From [Yesterday 00:00:00 GMT] to present). There are buttons for "BASIC MODE" and "ADVANCED MODE". The sidebar also includes sections for "Fires / Hotspots" (Simple, Time Based), "Overlays" (VIIRS S-NPP & NOAA-20, MODIS (Aqua & Terra)), and "Dynamic Imagery" (VIIRS NOAA-20 Corrected Reflectance (true color), VIIRS S-NPP Corrected Reflectance (true color)). The bottom of the page features a navigation bar with icons for PIN, MEASURE, LOCATION, LAYERS, TABLE, SHARE, SCREENSHOT, and HELP, along with a NASA logo and footer text: "NASA Official: Robert E. Wolfe | Web Privacy Policy | Data & Information Policy | Communications Policy | Freedom of Information Act | USA.gov".

# LANCE User Working Group (UWG)

- LANCE is managed by NASA's Earth Science Data and Information System (ESDIS) but steered by a User Working Group (UWG) responsible for providing guidance and recommendations concerning a broad range of topics related to the LANCE system, capabilities, and services.
- **The UWG meets twice a year to ensure that LANCE capabilities are aligned with the NRT community needs.**
- The UWG is chaired by Dr. Miguel Roman (Earth from Space Institute, USRA).

## LANCE UWG members

Name	Affiliation
Miguel Roman	Universities Space Research Association Earth from Space Institute (EfSI)
Robert Brakenridge	Colorado/Dartmouth Flood Observatory
Arlindo da Silva	NASA GSFC
Vanessa Escobar	NOAA/NESDIS
Mike Fromm	NRL/Washington DC
Sean Helfrich	NOAA/NESDIS/STAR
Steve Miller	Colorado State University
Maggi Glasscoe	NASA MSFC
Brad Quayle	USFS
Josh Cossuth	NRL/Monterey/Washington DC
Mark Trice	MD DNR
Mike Budde	USGS
Patrick Duran	NASA/MSFC/SPoRT



# NASA Earth Science Applied Sciences Program

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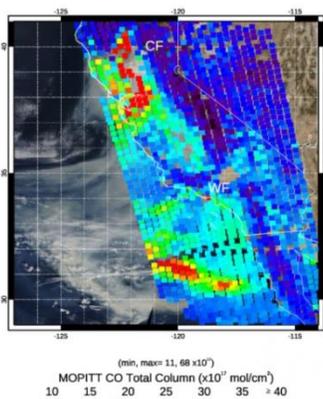
						
<b>CAPACITY BUILDING</b>	<b>DISASTERS</b>	<b>HEALTH &amp; AIR QUALITY</b>	<b>WATER RESOURCES</b>	<b>AGRICULTURE</b>	<b>ECOLOGICAL FORECASTING</b>	<b>WILDLAND FIRE</b>
Our skill-building initiatives empower people around the world to solve local challenges using Earth observations and remote sensing technologies.	Resilience. Response. Recovery. When disaster strikes, our team provides decision-makers, communities and governments with life-saving Earth observations.	We use Earth-observing data to inform air quality standards and support solutions for public health initiatives — all to strengthen our communities' well-being.	Water is one of our most invaluable resources. We help monitor the demand, supply and quality of water around the world and the development of tools to promote conservation.	From individual farmers to global food chains, we help optimize decision-making about food availability and access through Earth-observing data.	To protect our natural land, marine and freshwater resources, we promote the use of Earth observations in conservation, sustainability and resource management.	Fire is an essential process for many ecosystems, but uncontrolled fire can be disastrous to anything in their path. We leverage Earth-observing data, applied research, and partnerships to reduce risk before, during, and after a fire.

The background of the slide is a cosmic scene featuring a blue nebula in the upper right and a green nebula in the lower right, with a dense field of stars in the lower left. A light blue horizontal band is centered across the image, containing the title text.

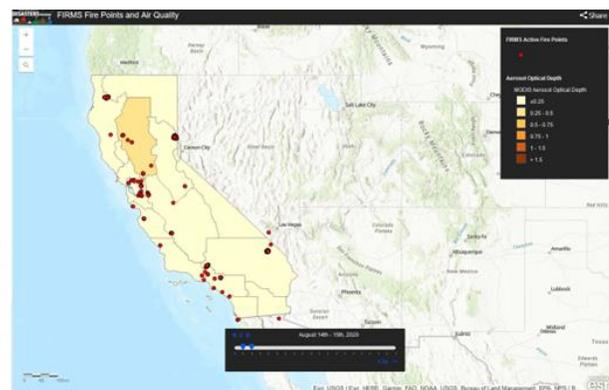
# Improving Access to Near Real-time Satellite Fire and Air Quality Data Products Based on User Needs

# Applications of NASA's LANCE Fire and Air Quality Data Products

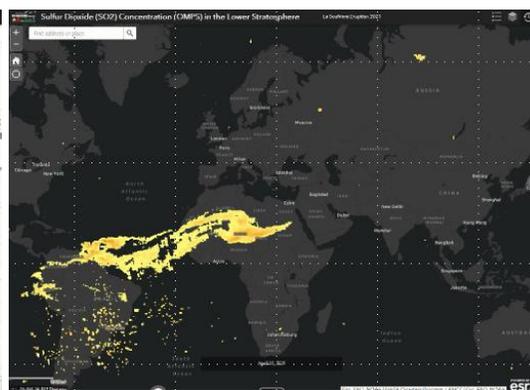
- **NASA's LANCE** provides Near Real-time (NRT) fire and air quality data products and other products that are made available much quicker than routine processing. LANCE timely data is useful for a range of applications including detecting wildland fires, tracking smoke, ash and dust plumes, monitoring air quality for criteria pollutants (aerosols, CO and SO<sub>2</sub>).



MOPITT CO Total Column Product



MODIS and VIIRS Active Fire Product

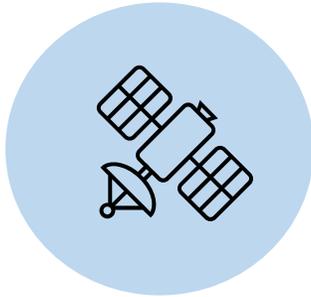


OMPS SO<sub>2</sub> Product

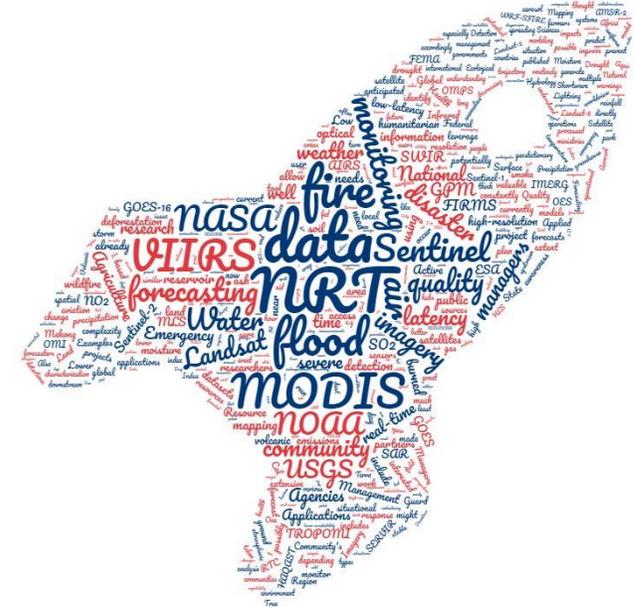
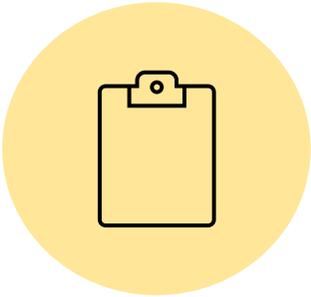


VIIRS Black Marble Night-time Light Product Suite

# To Find User Needs for Fire and Air Quality Data Products



- **Conducting ASP internal surveys.**
- **Sharing information with stakeholders and other User Working Groups.**
- **Asking questions and listening to answers from end-users.**



User feedback will be provided to NASA's LANCE User Working Group for guidance and recommendations.

# User Feedback on Satellite Data Formats

## GeoTIFF

“GeoTIFF is usually a favorite. It is often useful for our audience, that can be directly ingested into a GIS mapping software.” ---- Eric Anderson

## HDF-EOS and HDF

HDF5 is common, but it always goes through some conversion to a more friendly format along the way.

## NetCDF

NetCDF format can store data with multiple dimensions.

## CSV

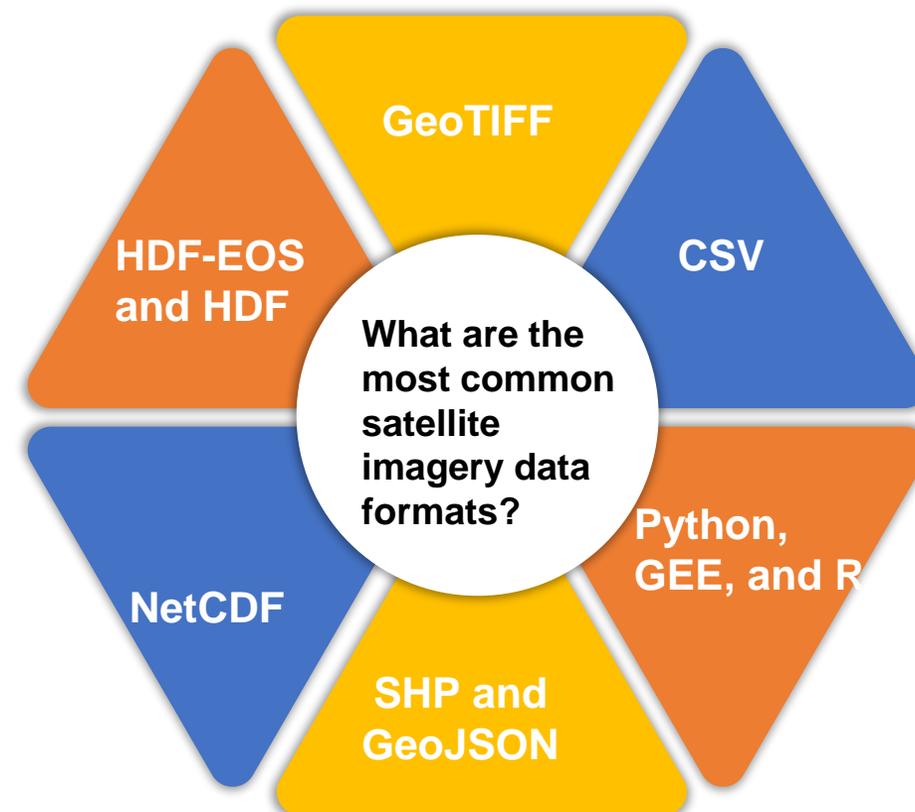
CSV is great when we're looking to communicate point-based information.

## SHP and GeoJSON

Vector and feature data format.

## Python, GEE, and R

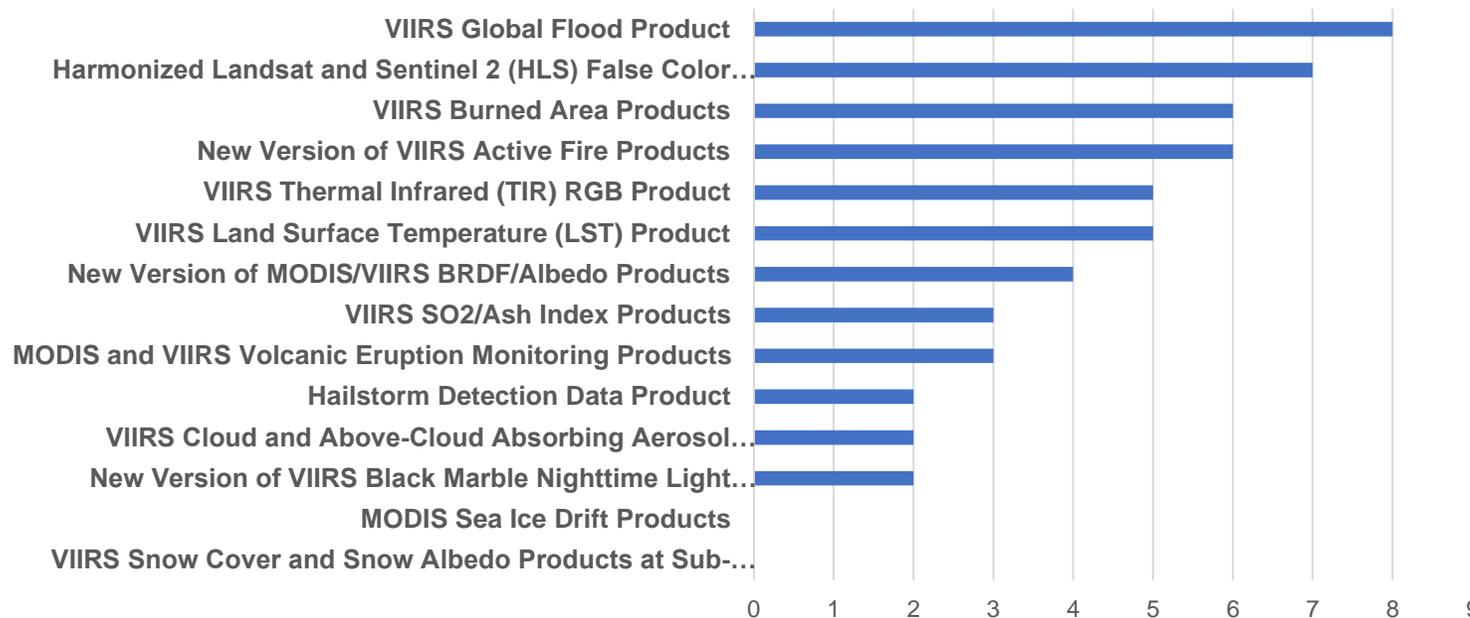
We use python, GEE, and R quite a bit, and therefore we work with their versions of arrays, raster stacks, etc.



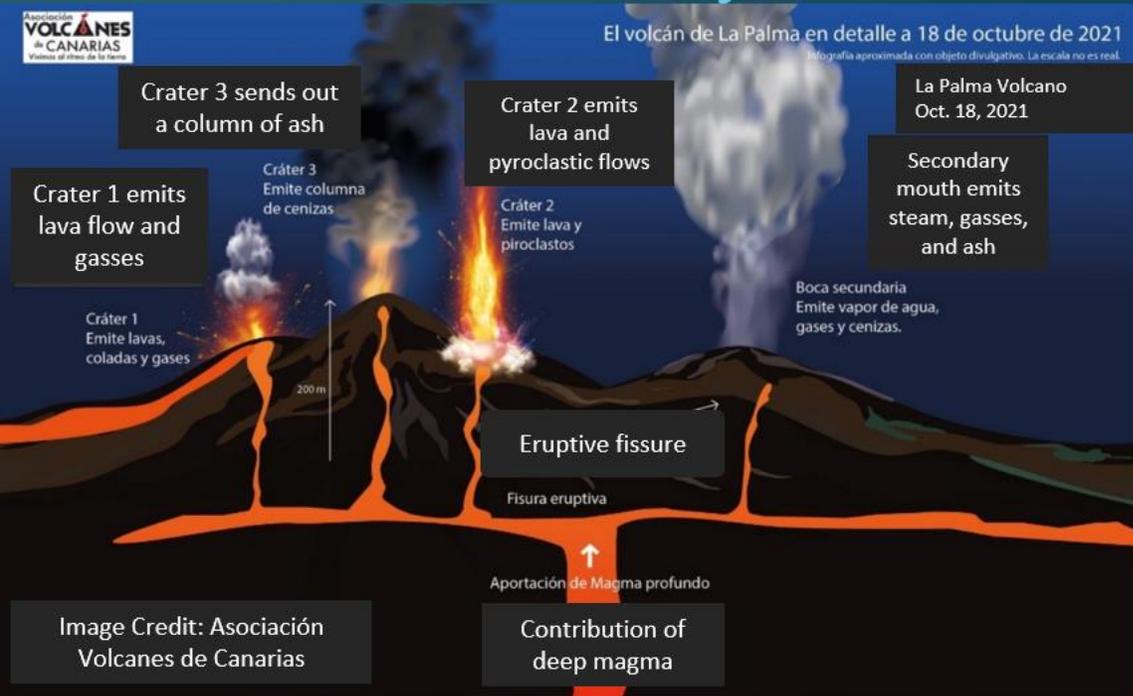
# Feedback from Users in Latin America and the Caribbean (LAC) Countries

- Earlier this year, a survey was conducted to collect feedback on NASA's LANCE potential new products from users in LAC countries.

Are you interested in the following LANCE potential new NRT products?



# VIIRS satellite hotspots guide responders in La Palma to identify new vents



8 p.m. local time Oct. 17, 2021 Credits: Juan Carlos García López-Davalillo (IGME-CSIC)

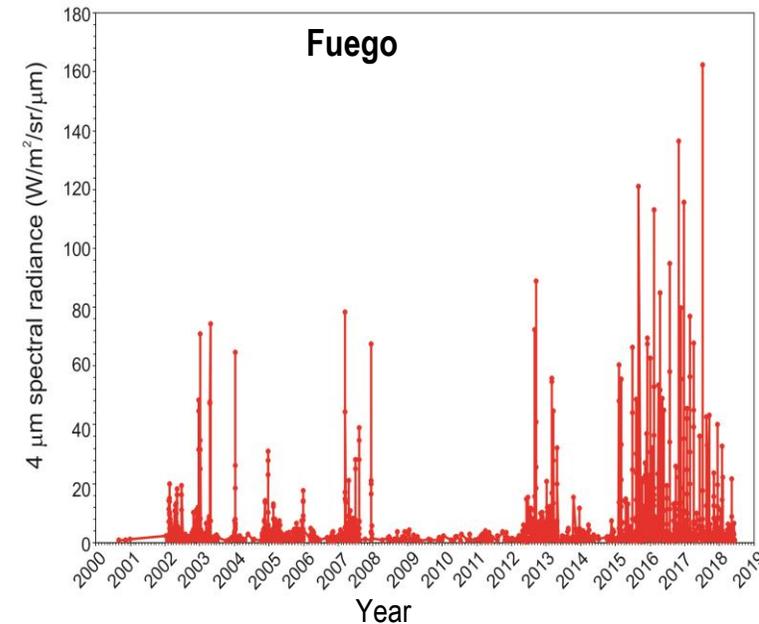
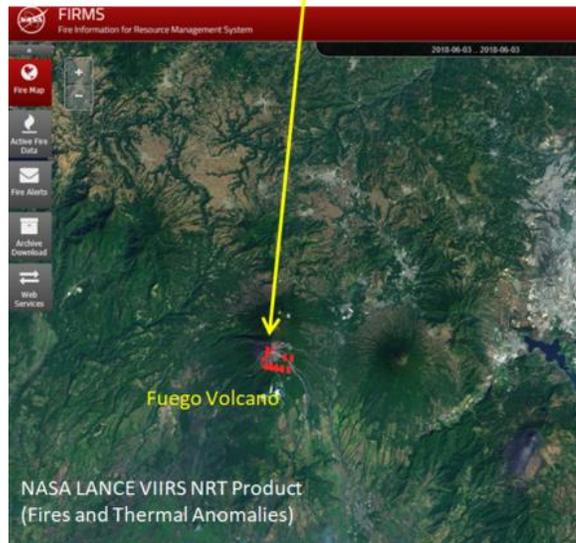
*NASA Disasters partner with IGME to help avoid unforeseen movements that can affect the population*



Marta Pizarro, a researcher from IGME (Geological and Mining Institute of Spain), notes how their team on the ground use VIIRS data in order to understand the eruption and help authorities anticipate what it will do next:

*“The thermal anomaly maps are useful to identify caldera reactivation and the opening of new vents. We have observed that days of high thermal radiation are coincident with reactivation of the northern lava flows. Also, we observed the emergence of fumarole fields in locations just before covered by hot spots in the thermal maps”*

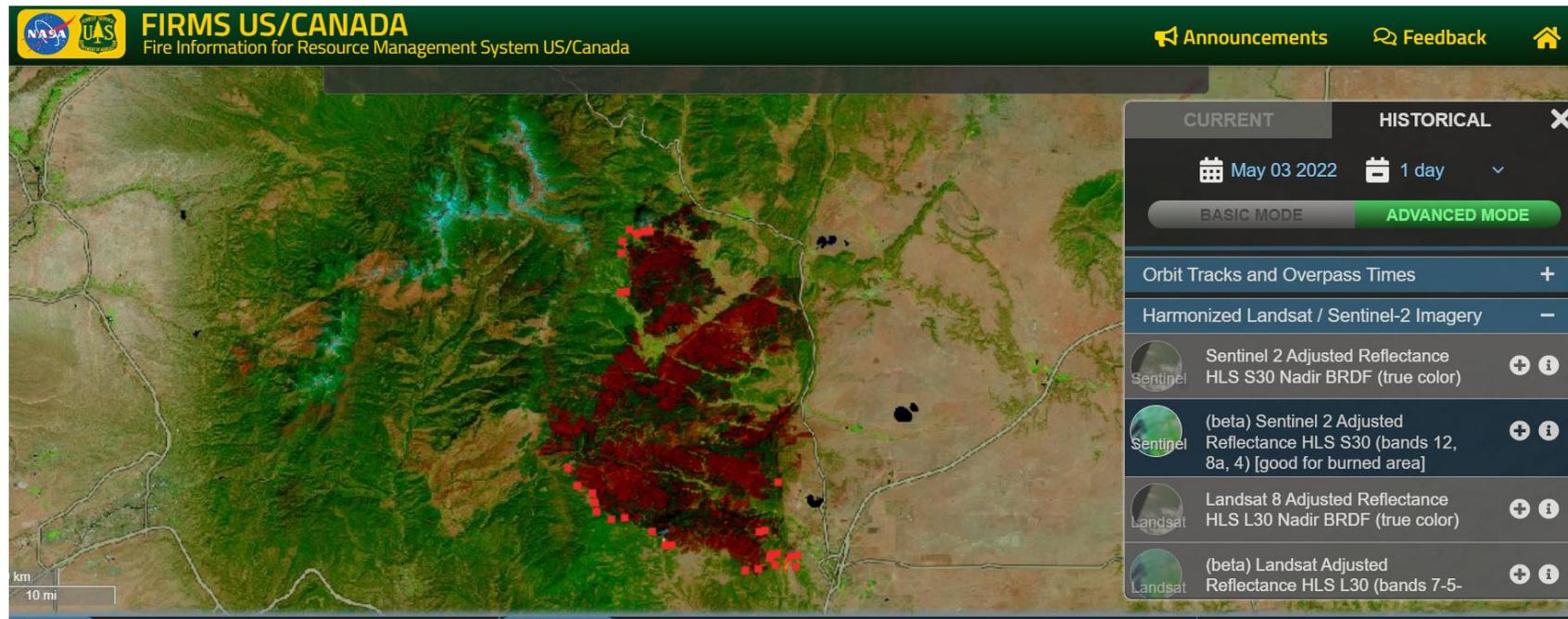
# Measurements of the Thermal Energy Output from the Fuego Volcano Eruption in Guatemala



The upper-right figure shows a plot of total emitted radiance (at 4 microns) from Fuego observed by **MODIS Near Real-Time MODVOLC Volcano Hot Spots product (Product PI: Robert Wright)** from 2000 to present. The time-series data appear that the 2018 Fuego eruption came at the end of a long waxing-then-waning period of thermal output which began in 2015 and peaked sometime late 2017.

# LANCE FIRMS New HLS Products for Detecting Burned Areas

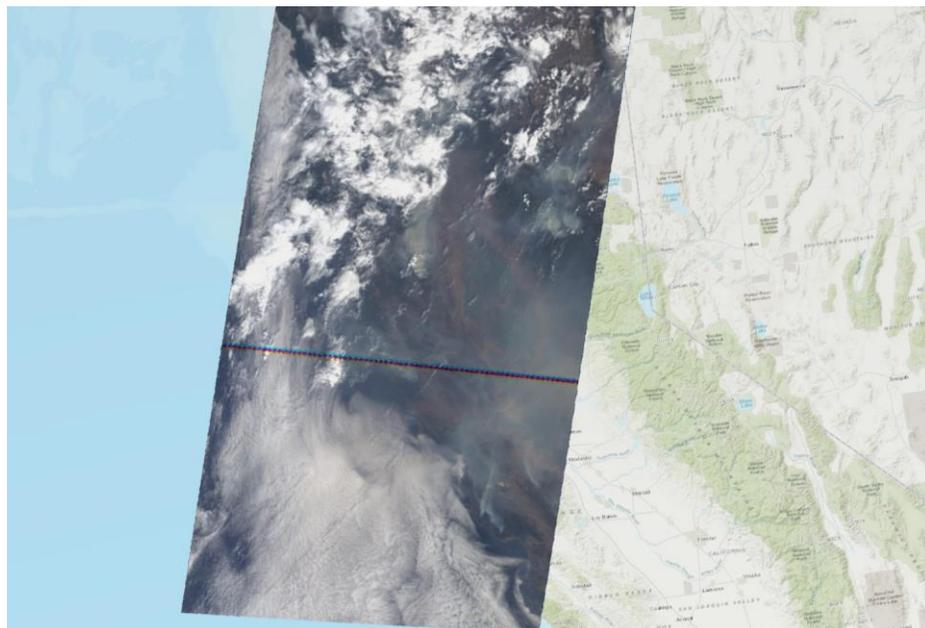
- In collaboration with the Interagency Implementation and Advanced Concepts (IMPACT) project, the new Sentinel-2 Adjusted Reflectance Harmonized Landsat Sentinel (HLS) data products are being introduced into LANCE FIRMS to help users and fire fighters delineate burned areas.



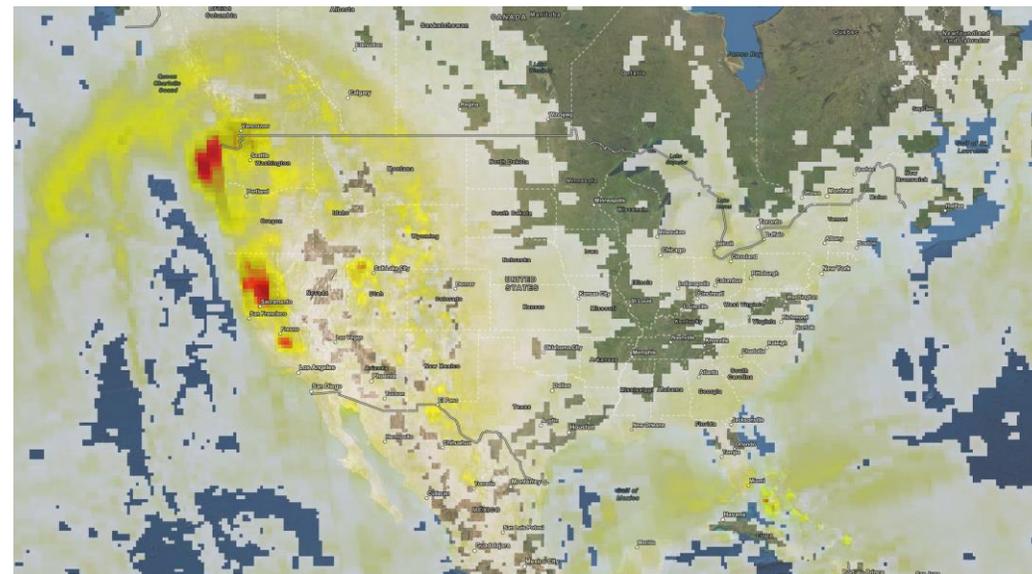
In the image above, the burned areas appear in brick red with 30-meter resolution and are overlain with MODIS and VIIRS active fire pixels from Hermits Peak Fire in New Mexico, USA on May 3rd, 2022. More details could be found via <https://www.earthdata.nasa.gov/learn/articles/hls-false-color-composite>. Credit: Joseph M. Smith.

# Integrating LANCE Fire and Air Quality Products into NASA Disasters Mapping Portal

- Utilizes LANCE NRT products to provide information before, during, and after a wildfire.
- Uses Web Applications and Story Maps to show how different NASA datasets can be used with each other and with other non-NASA data.

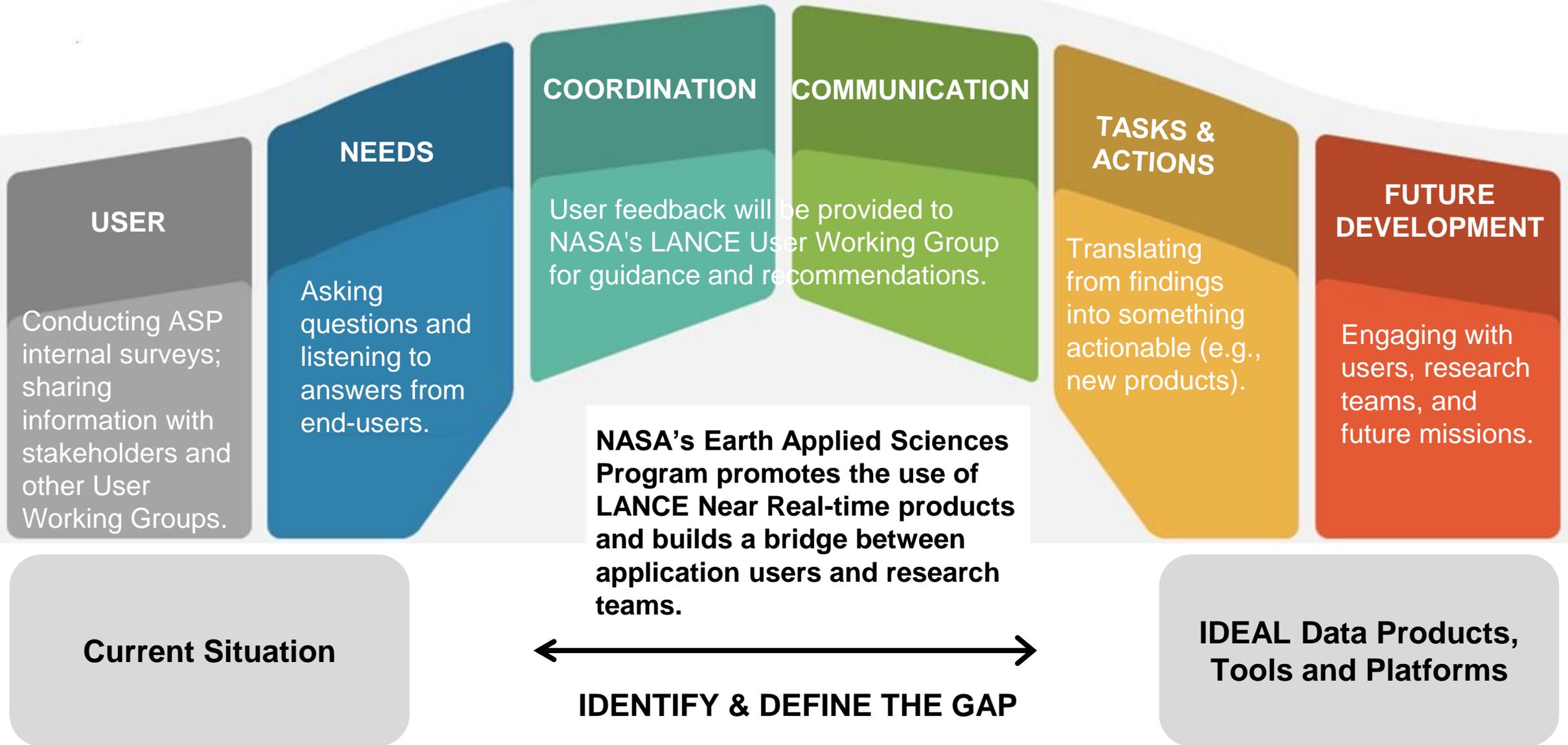


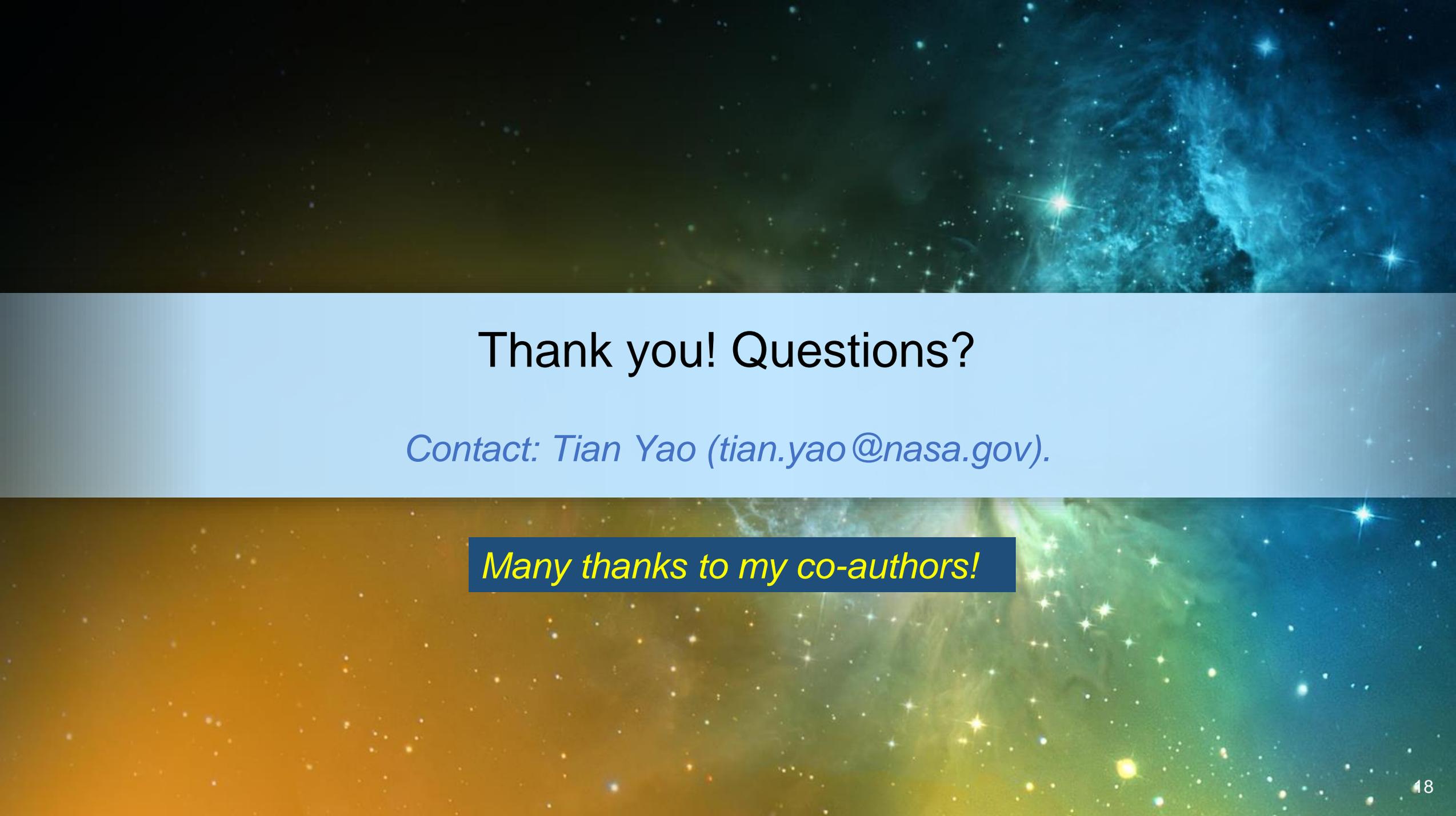
*MISR 3D Smoke Plume Height and FIRMS Active Fire Points on 2D Smoke Plume imagery from 8/24/20*



*OMPS Aerosol Index for early September 2020, Yellow to Red indicates denser smoke*

# Summary





Thank you! Questions?

*Contact: Tian Yao (tian.yao@nasa.gov).*

*Many thanks to my co-authors!*