National Aeronautics and Space Administration

Why Near Real-time/Low Latency is Important to Monitor the Changing World

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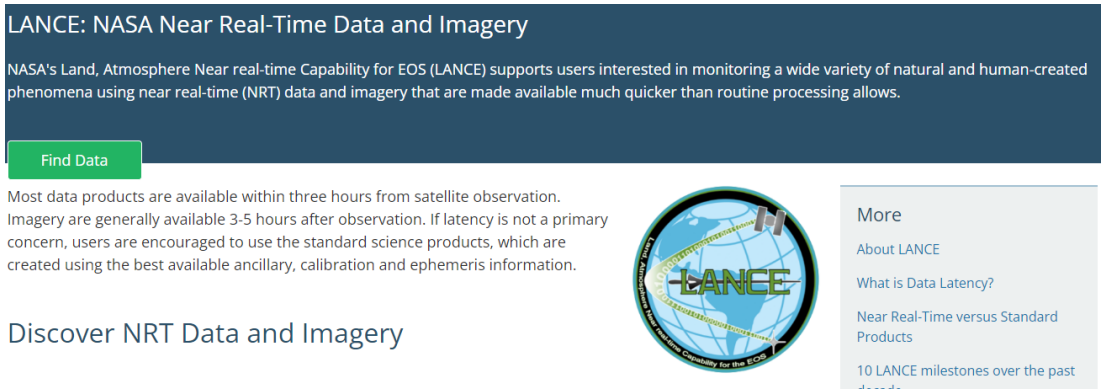
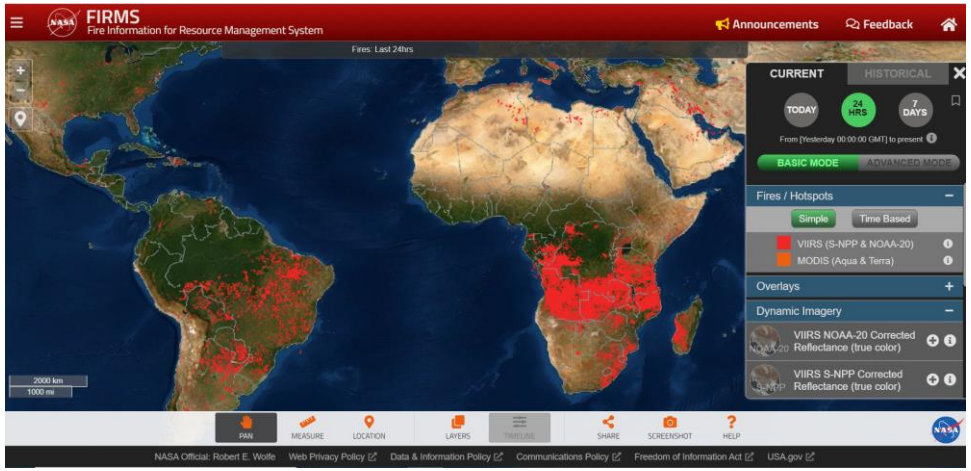
Outline

- NASA's Land, Atmosphere Near Real-time Capability for Earth Observing Systems (LANCE)
- NASA Earth Science Applied Sciences Program
- How LANCE can Help Improve Monitoring the Changing World

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

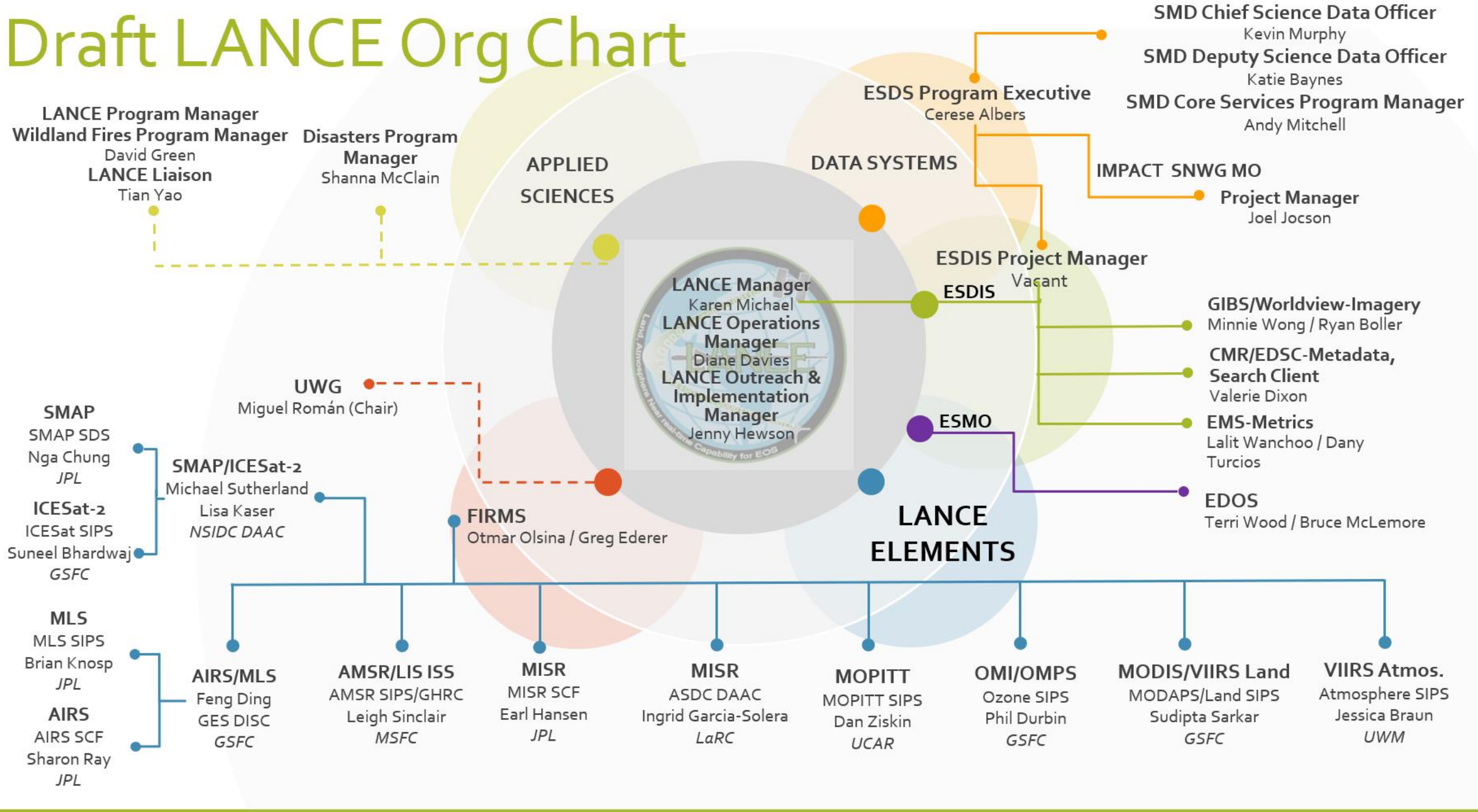
NASA's Land, Atmosphere Near Real-time Capability for Earth Observing Systems (LANCE)





- LANCE (https://earthdata.nasa.gov/lance) supports users interested in monitoring a wide variety of natural and man-made phenomena using data products that are made available much quicker than routine processing allows.
- LANCE provides data products from satellite instruments including AIRS, AMSR2, ICESat-2, LIS, MISR, MLS, MODIS, MOPITT, OMI, OMPS and VIIRS.
- The Fire Information for Resource Management System (FIRMS) is a part of LANCE.

Draft LANCE Org Chart



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 at least once a year to ensure that LANCE capabilities are aligned with the NRT community needs.
- The UWG is chaired by Dr. Miguel Roman (Leidos).

LANCE UWG members

Name	Affiliation	Element of Interest
Miguel Román (Chair)	Leidos	All Elements
Robert Brakenridge	University of Colorado, Boulder - Dartmouth Flood Observatory	MODIS
Mike Budde	US Geological Survey (USGS)	MODIS, VIIRS
Josh Cossuth	Naval Research Laboratory (NRL), Monterey/Washington, D.C.	MODIS, VIIRS, AMSR-E
Patrick Duran	NASA Marshall Space Flight Center - Short Term Prediction Research and Transition Center (SPoRT)	MODIS, VIIRS, AIRS, AMSR-E
Vanessa Escobar	NOAA	Early Adopters
Mike Fromm	Naval Research Laboratory (NRL), Washington, D.C.	MODIS, VIIRS
Maggi Glasscoe	University of Alabama in Huntsville (UAH)/NASA Marshall Space Flight Center	MODIS/VIIRS, SAR
Sean Helfrich	NOAA/NESDIS/OSPO	MODIS, VIIRS
Steve Miller	Colorado State University, Cooperative Institute for Research in the Atmosphere (CIRA)	MODIS, VIIRS
Brad Quayle	US Forest Service (USFS)	MODIS, VIIRS
Arlindo da Silva	NASA Goddard Space Flight Center	MODIS, VIIRS, AIRS
Lori Schultz	NASA Marshall Space Flight Center	MODIS, VIIRS
Fred Stolle	World Resources Institute (WRI)	MODIS, VIIRS
Mark Trice	Maryland Department of Natural Resources (MD DNR)	MODIS, VIIRS

NASA Earth Science Applied Sciences Program

NASA Earth Science Applied Sciences Program

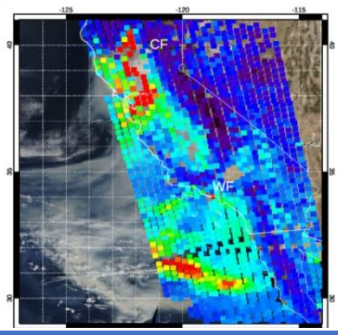
CAPACITY BUILDING	DISASTERS	HEALTH & AIR QUALITY	WATER RESOURCES	AGRICULTURE	ECOLOGICAL FORECASTING	WILDLAND FIRE
Our skill-building initiatives empower people around the world to solve local challenges using Earth observations and remote sensing technologies.	Resilience. Response. Recovery. When disaster 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.

NASA Earth Science Applied Sciences Website: https://appliedsciences.nasa.gov/

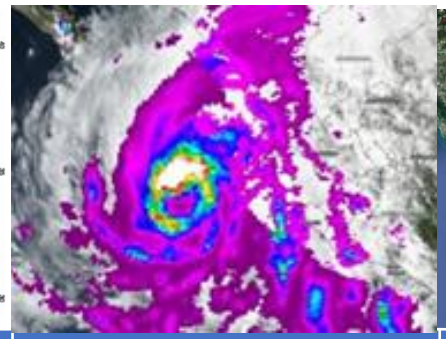
How LANCE can Help Improve Monitoring the Changing World

Providing Images and Data Products for Time-sensitive Applications

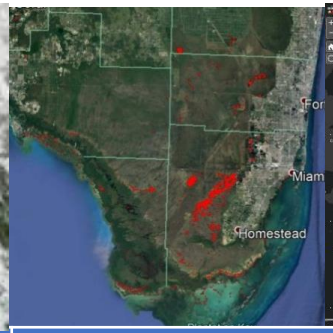
- With satellite data products that are made available much quicker than routine processing, NASA's LANCE provides a continuous and complete view of the entire Earth every day.
- Users could observe areas of interest, discover patterns, identify infrastructure destructions, detect and track changes in the environment and make timely decisions.
- Time-sensitive applications include detecting wildland fires and volcanic eruptions, tracking smoke, ash and dust plumes, monitoring air quality for criteria pollutants (aerosols, CO and SO_2) and tracking extreme weather events.



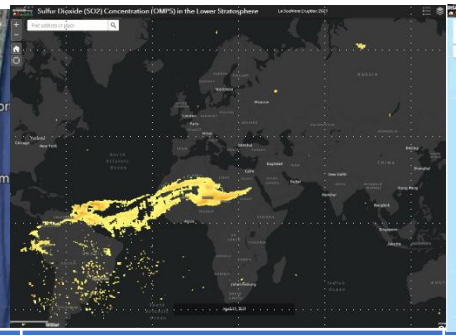
MOPITT CO Total Column Product



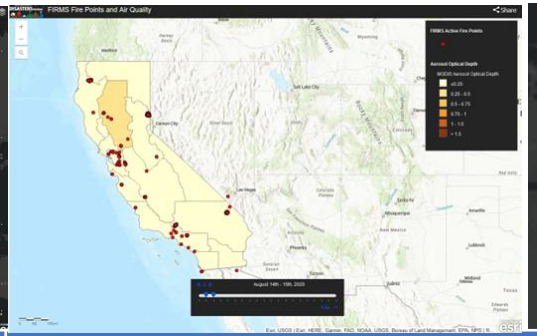
AMSR2 Surface Precipitation Rates product



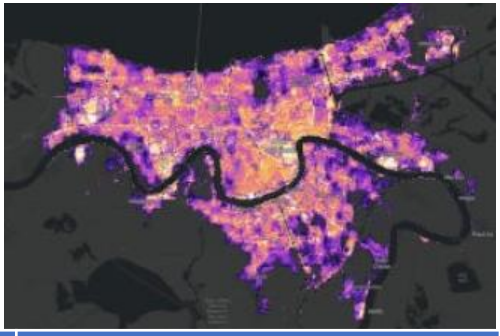
MODIS Flood Product



OMPS SO_2 Product

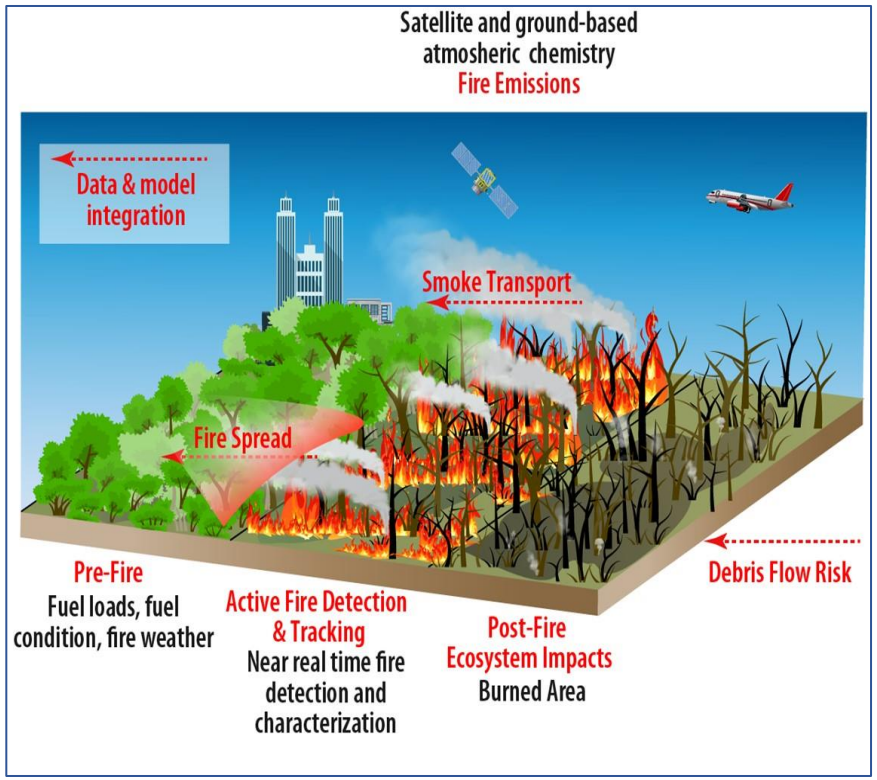


MODIS and VIIRS Active Fire Product



VIIRS Black Marble Night-time Light Product Suite

Use Cases of LANCE Near Real-time and Low Latency Data Products from NASA ASP Wildland Fire Management Program

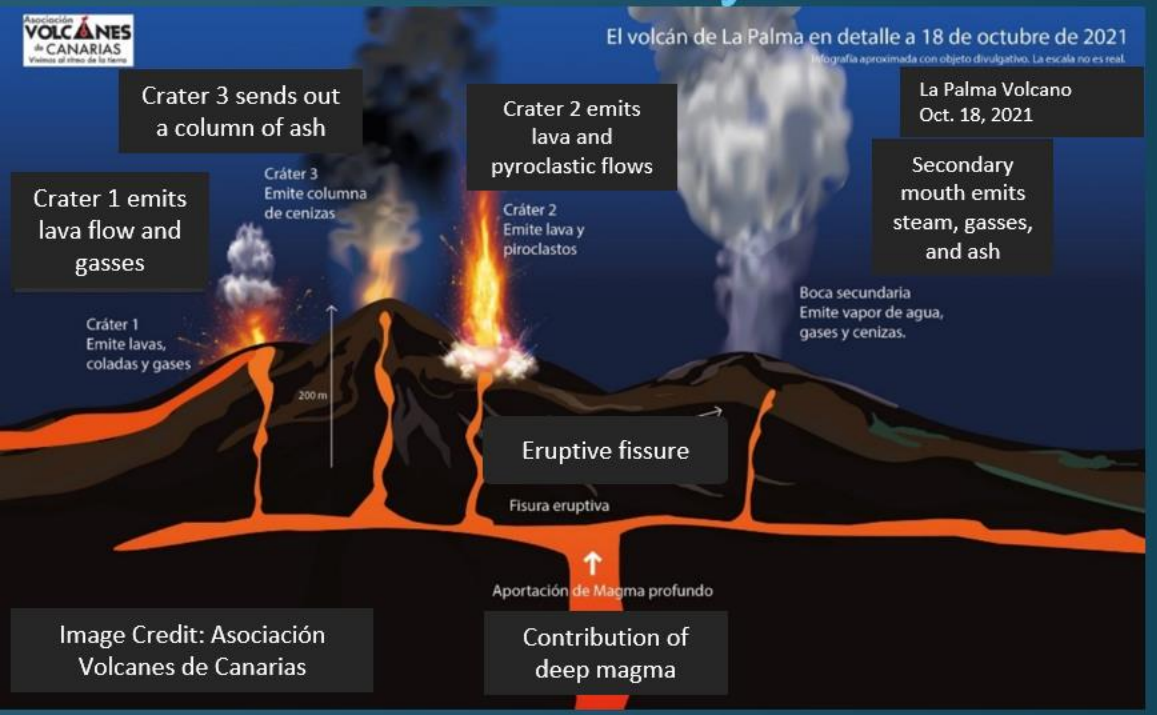


The vast majority of low-latency needs within the NASA ASP Wildland Fire Management Program portfolio are associated with the "Active Fire" portion of the fire cycle:

- CAL FIRE command center ingests LANCE MODIS/VIIRS data to monitor fire behavior during an active fire incident.
- Technosylva's Wildfire Analyst software, which utilizes LANCE FIRMS active fire data, has been adopted within several projects, including the WRF-SFIRE system project.
- NRT fire detections used for modelling fire behavior, fire perimeters, and progression in several projects.
- Funded project focused on the direct broadcast (within 60 seconds) of ABI, MODIS & VIIRS active fire data through FIRMS.
- Funded project integrating low-latency Landsat-8/9 data into NASA FIRMS.
- Lower latency data used for rapid assessment of wildfire burn severity estimates for post-fire BAER teams.

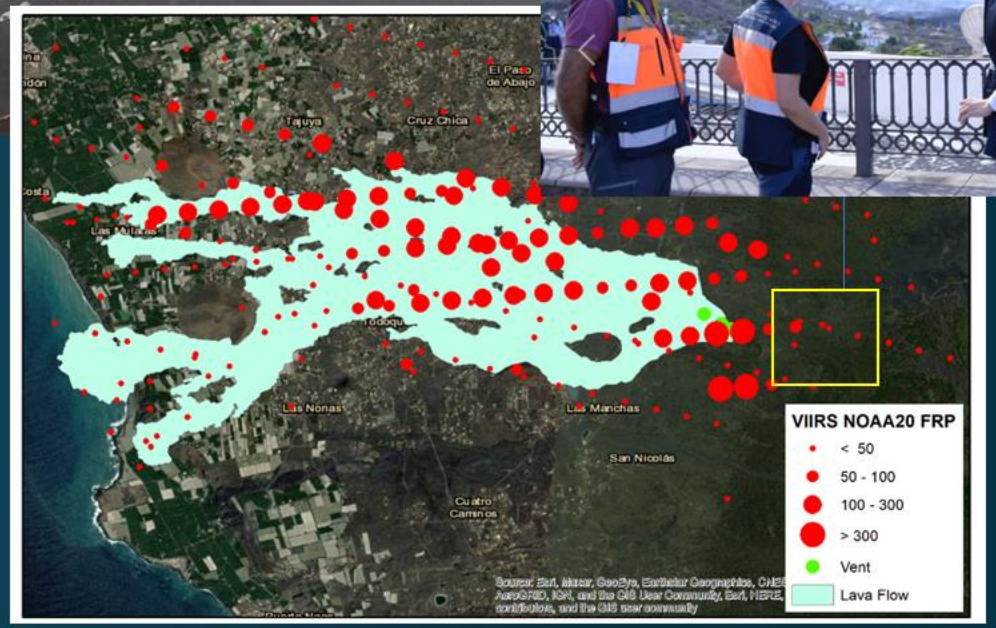
(Slide is provided by Joanne Vanessa Hall)

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



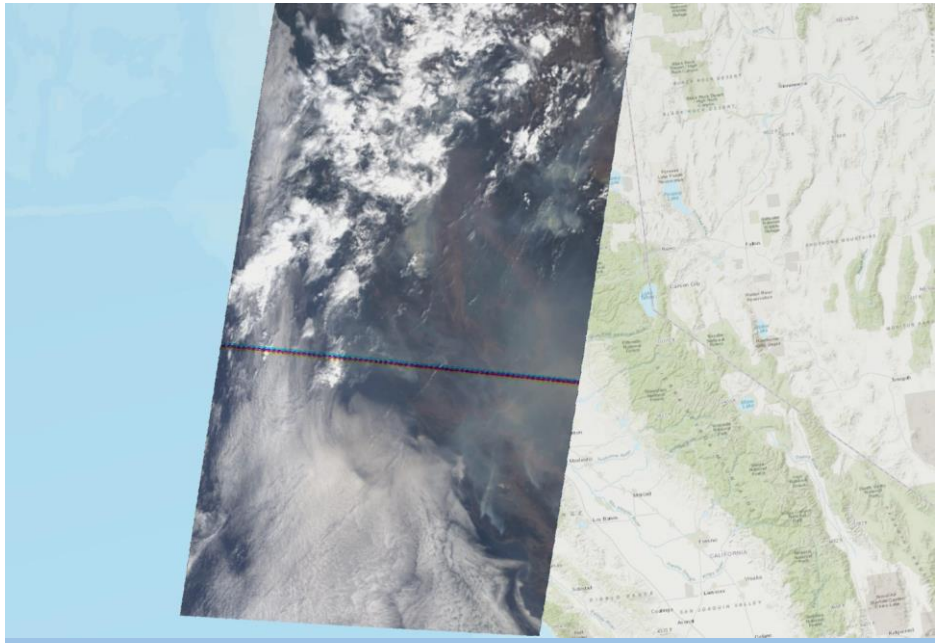
Marta Pizarro, a researcher from IGME (Geological and Mining Institute of Spain), notes how their team on the ground use VIIRS data in order to understand the eruption and help authorities anticipate what it will do next:

"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"

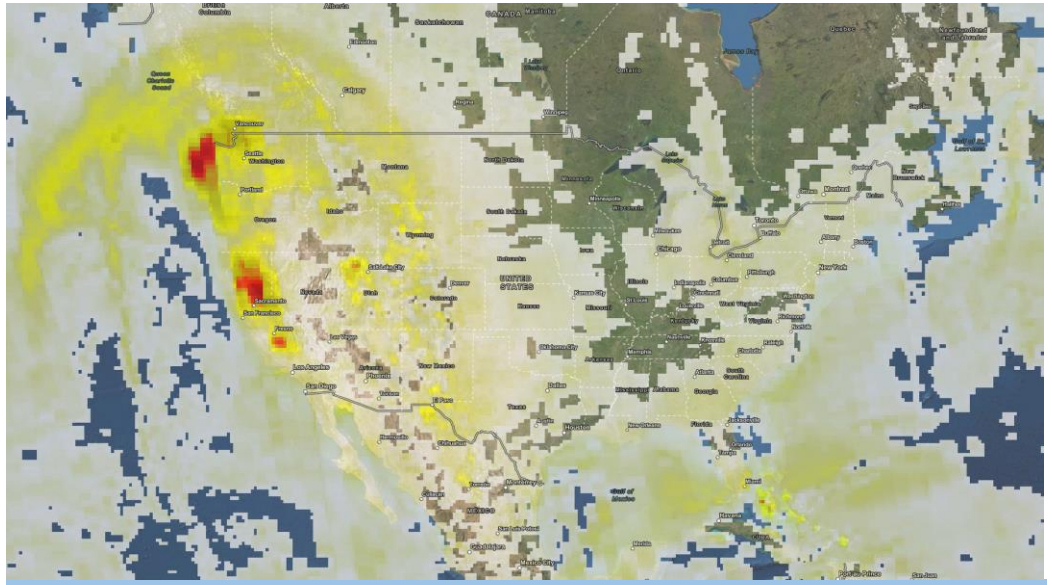
(Slide is provided by Jean-Paul Vernier)

Integrating LANCE 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.



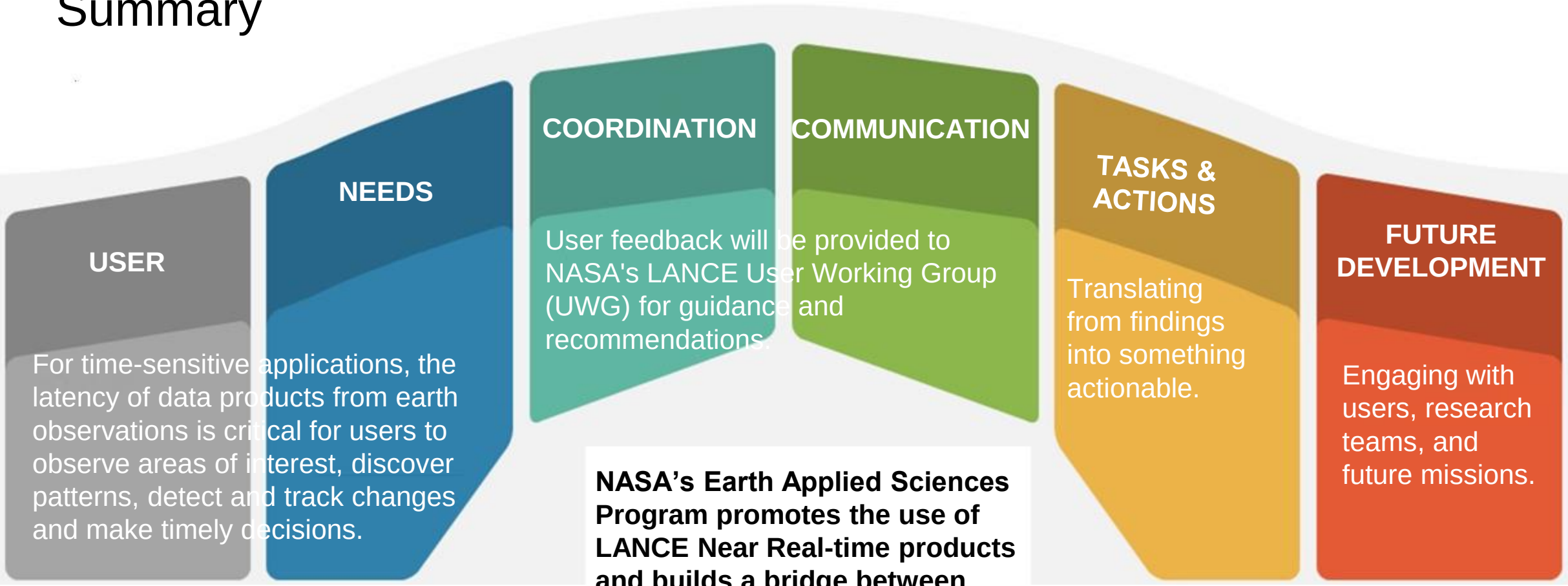
MISR 3D Smoke Plume Height and FIRMS Active Fire Points on 2D Smoke Plume imagery from 8/24/20



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

(Slide is provided by Garrett Layne)

Summary



NASA's Earth Applied Sciences Program promotes the use of LANCE Near Real-time products and builds a bridge between application users and research teams.

Current Situation

IDENTIFY & DEFINE THE GAP

IDEAL Near Real-time and Low Latency Data Products, Tools and Platforms

Thank you!

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

https://earthdata.nasa.gov/lance

NASA Earth Science Applied Sciences Program

https://appliedsciences.nasa.gov/

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Many thanks to my co-authors Diane Davies, Karen Michael and David Green!