National Aeronautics and Space Administration

Use Cases and Feedback on VIIRS Data Products from NASA Earth Science Applications Community

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VIIRS User Meeting - Celebrating 10 years of SNPP
June 29-30, 2022

Outline

- NASA Earth Science Applied Sciences Program
- Use Cases of VIIRS Data Products from NASA Applications Community
- Future Perspectives

Through the NOAA-NASA partnership, together we add greater value to satellite data.

NASA Earth Science Applied Sciences Program

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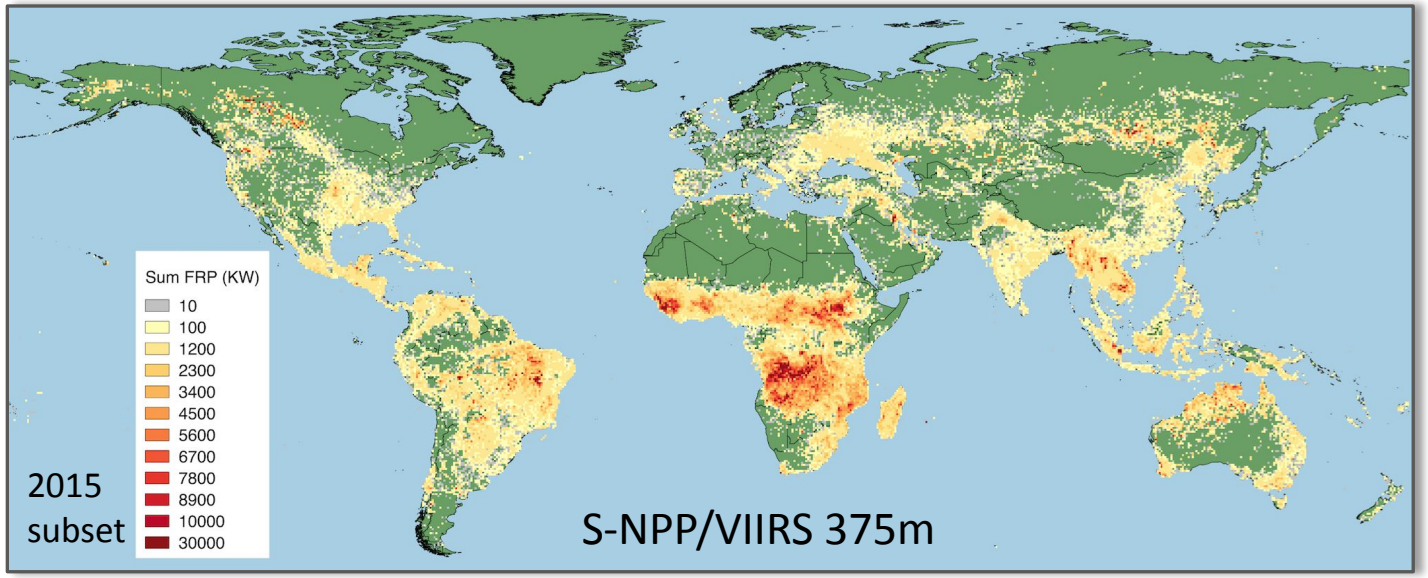
CAPACITY BUILDING	**DISASTERS**	**HEALTH & AIR QUALITY**	**WATER RESOURCES**	**AGRICULTURE**	**ECOLOGICAL FORECASTING**	**WILDLAND FIRE**
Our skill-building initiatives empower people around the world to solve local challenges using Earth observations and remote sensing technologies.	Resilience. Response.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

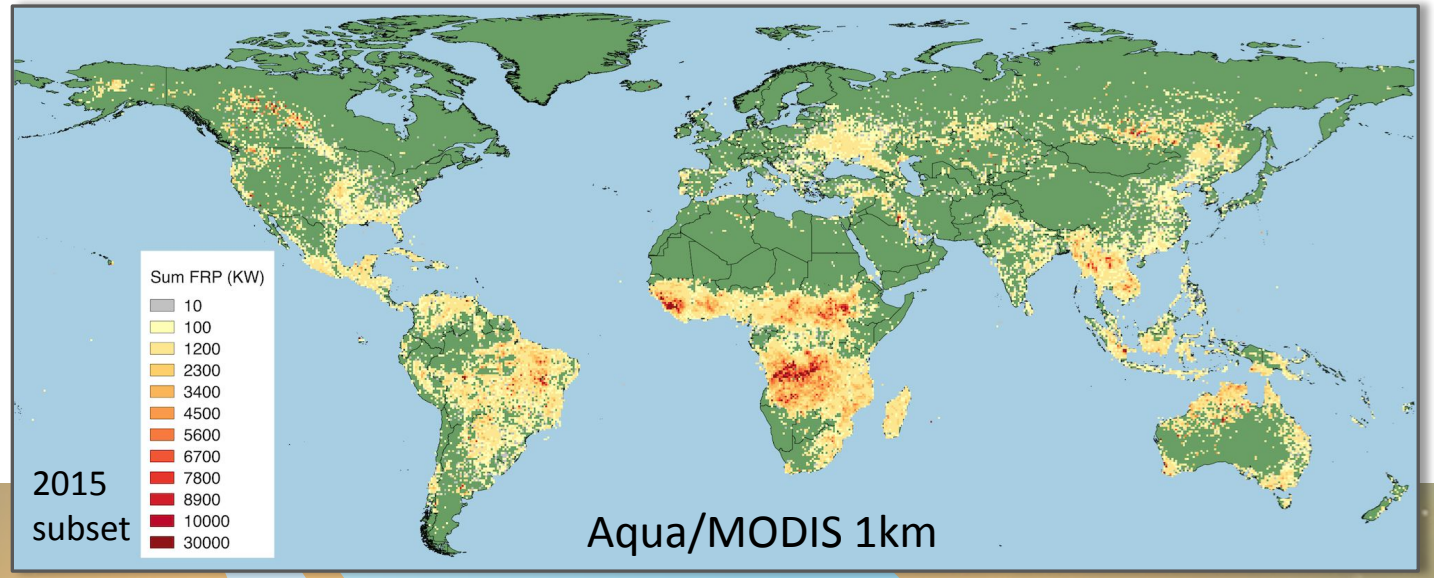
NASA Earth Science Applied Sciences Website: https://appliedsciences.nasa.gov/

Use Cases of VIIRS Data Products from NASA Applications Community

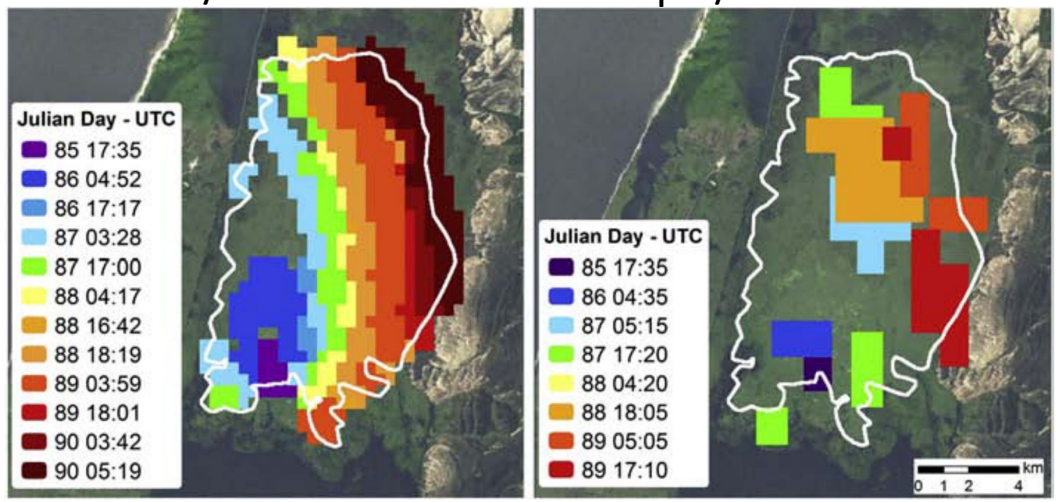
Through the NOAA-NASA partnership, together we add greater value to satellite data.

Improved Global Detection of Small/Lower Intensity Fires Using VIIRS Active Fire Data





S-NPP/VIIRS 375m | Aqua/MODIS 1km



Shrubland fire in southern Brazil, March 2013

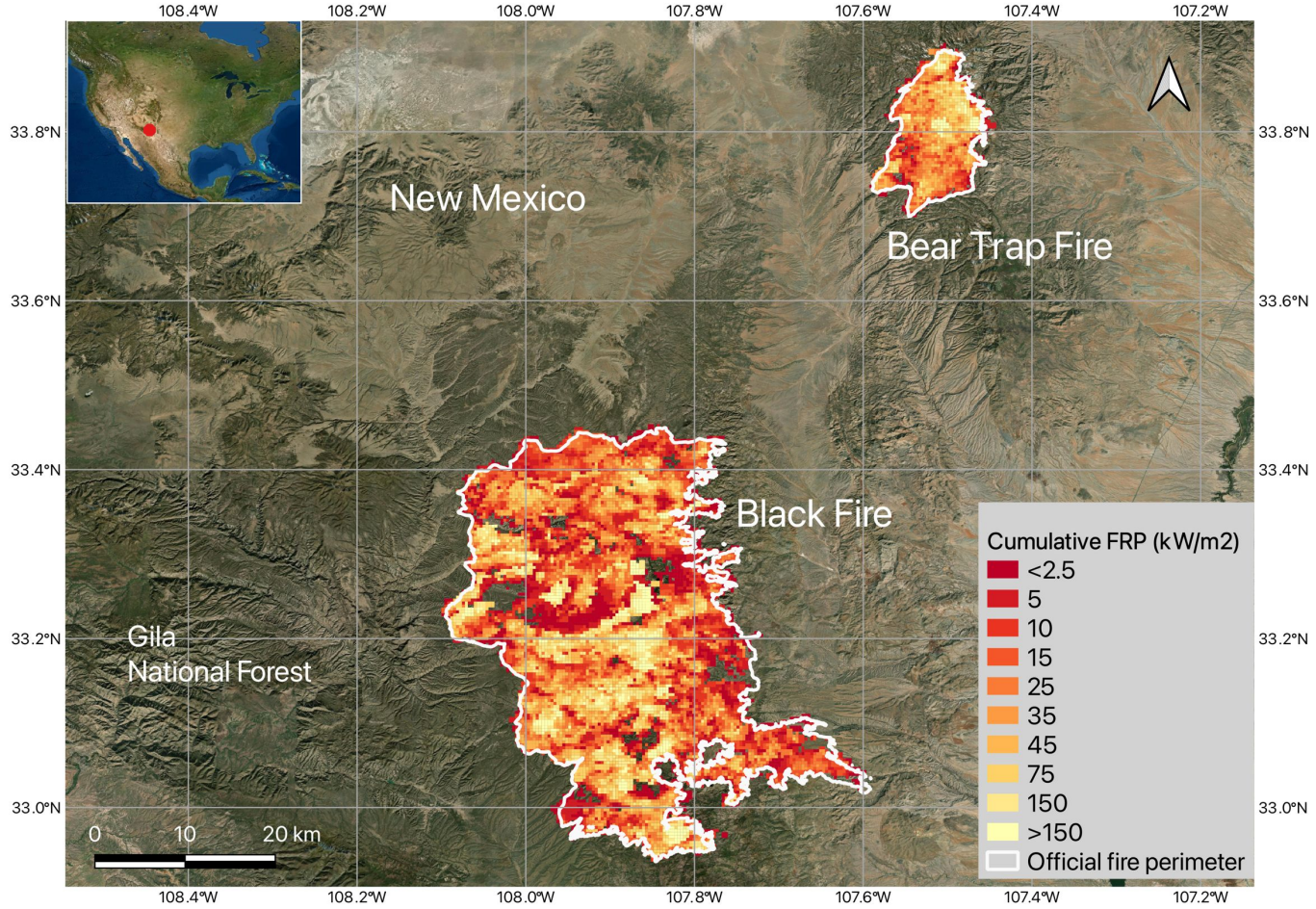
Key improvements compared to near-coincident Aqua/MODIS 1km data:

- No imaging gaps across tropics
- Improved detection performance during both day and nighttime orbits
- 50% increase in total fire radiative power [FRP] detected globally

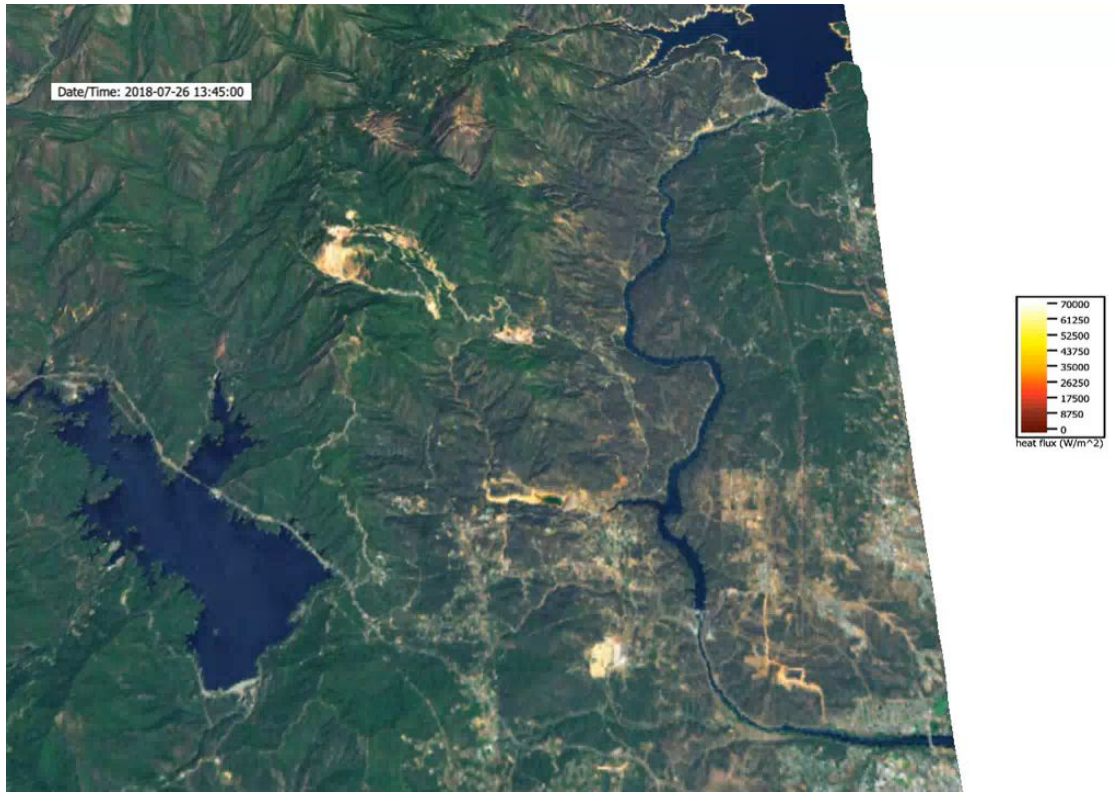
 Data has been adopted by numerous national & international fire programs

Credit: Wilfrid Schroeder & Ivan Csiszar/NOAA, Louis Giglio/UMD

Improved Mapping and Modeling of Large Wildfires Using VIIRS Active Fire Data



Cumulative VIIRS 375m fire data observed during Black and Bear Trap wildfires in New Mexico May-June/2022



Carr Fire/CA 26 July 2018 Coupled Atmosphere-Wildland Fire Environment (CAWFE) model simulation using VIIRS active fire input data

https://www2.mmm.ucar.edu/people/coen/files/newpage_m.html

Credit: Wilfrid Schroeder/NOAA & Janice Coen/NCAR

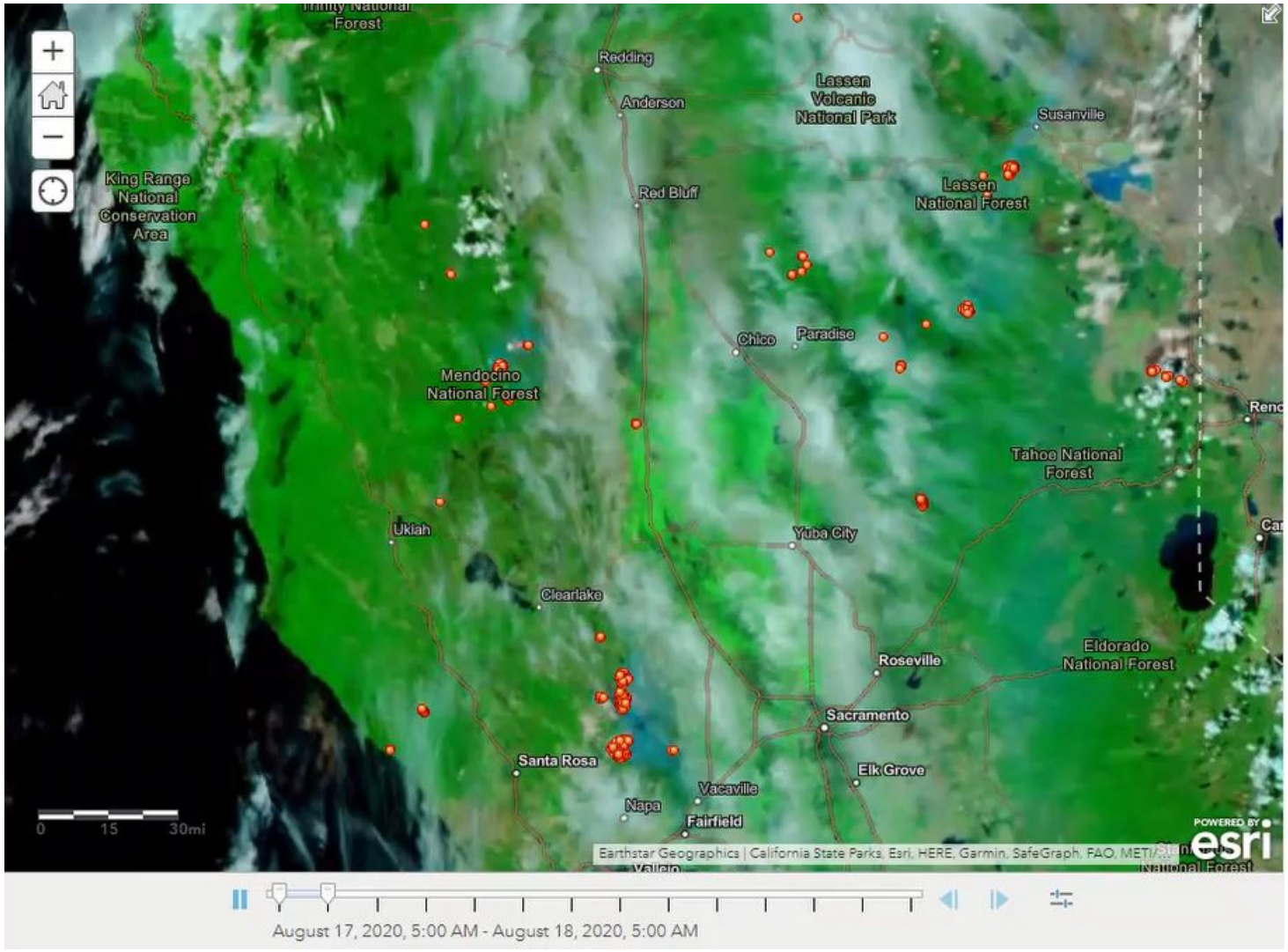
Integrating VIIRS Data Products in NASA Disasters Mapping Portal

Near-Real Time VIIRS Data Products

- Black Marble Nighttime Blue/Yellow Composite
- True Color and False Color RGBs
- LANCE FIRMS Active Fire Points

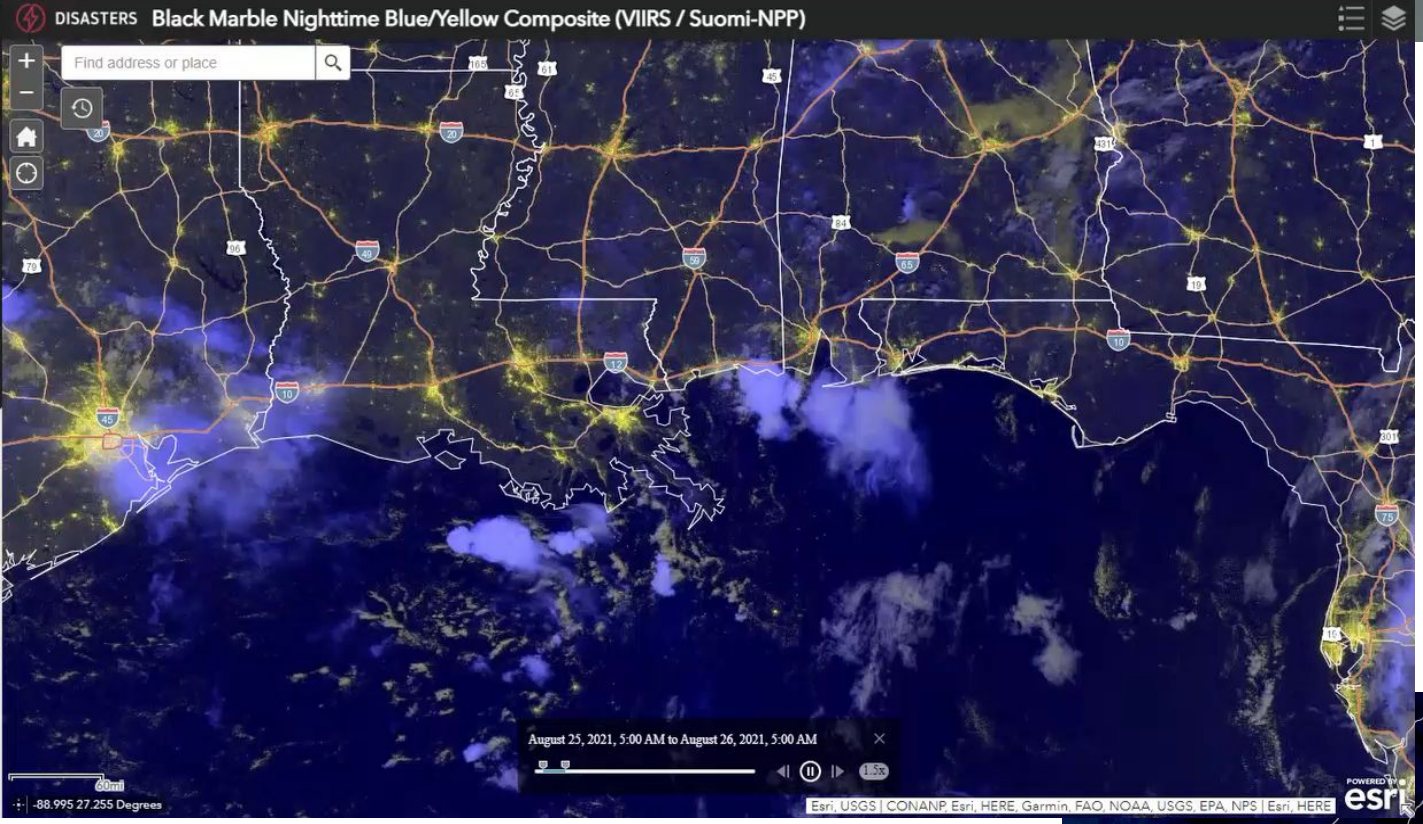
Event-Based VIIRS Data Products

- Sulfur Dioxide Index
- Ash Index
- Black Marble High Definition
- Thermal Infrared RGB

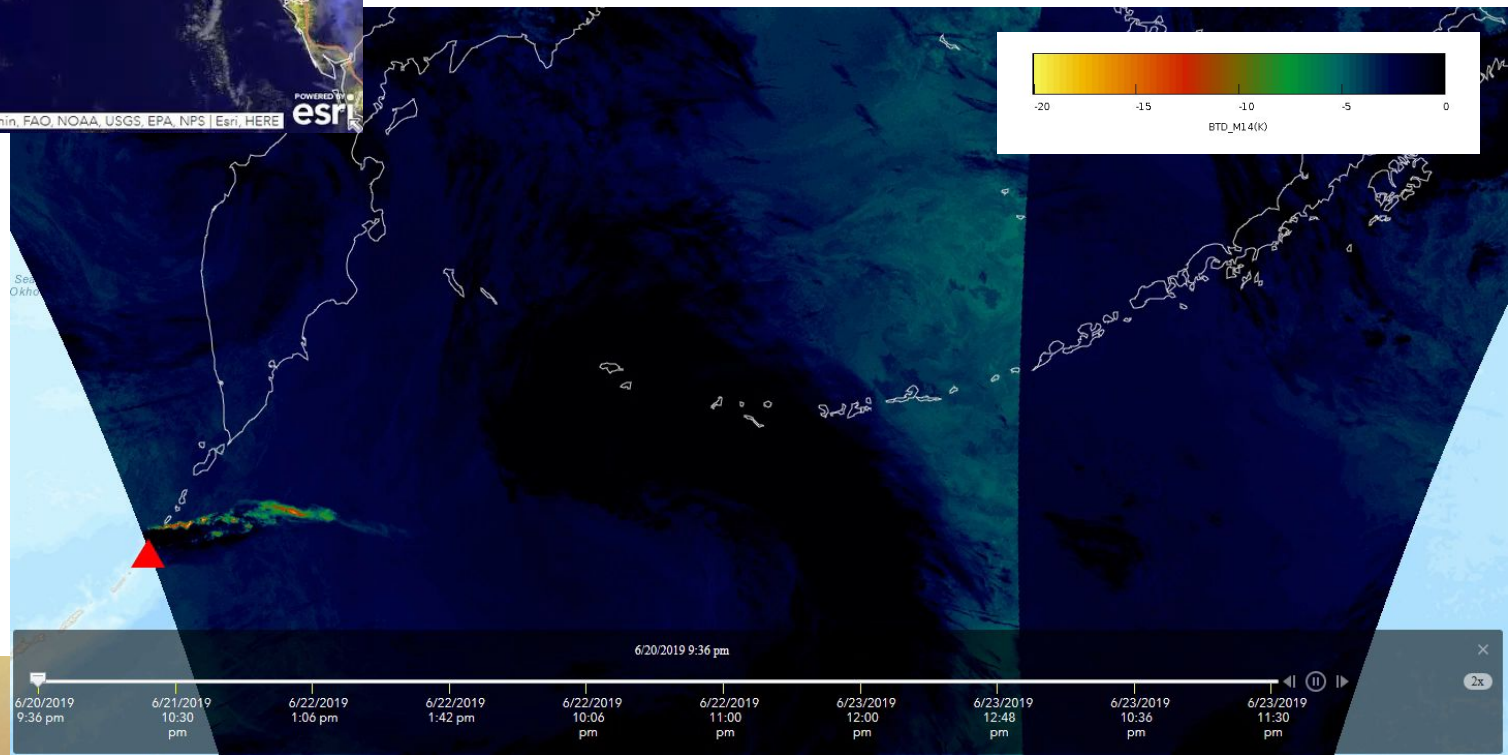


VIIRS Natural Color RGB with FIRMS Active Fire Hotspots from August 2020 California Wildfires.

Credit: Garrett Layne.



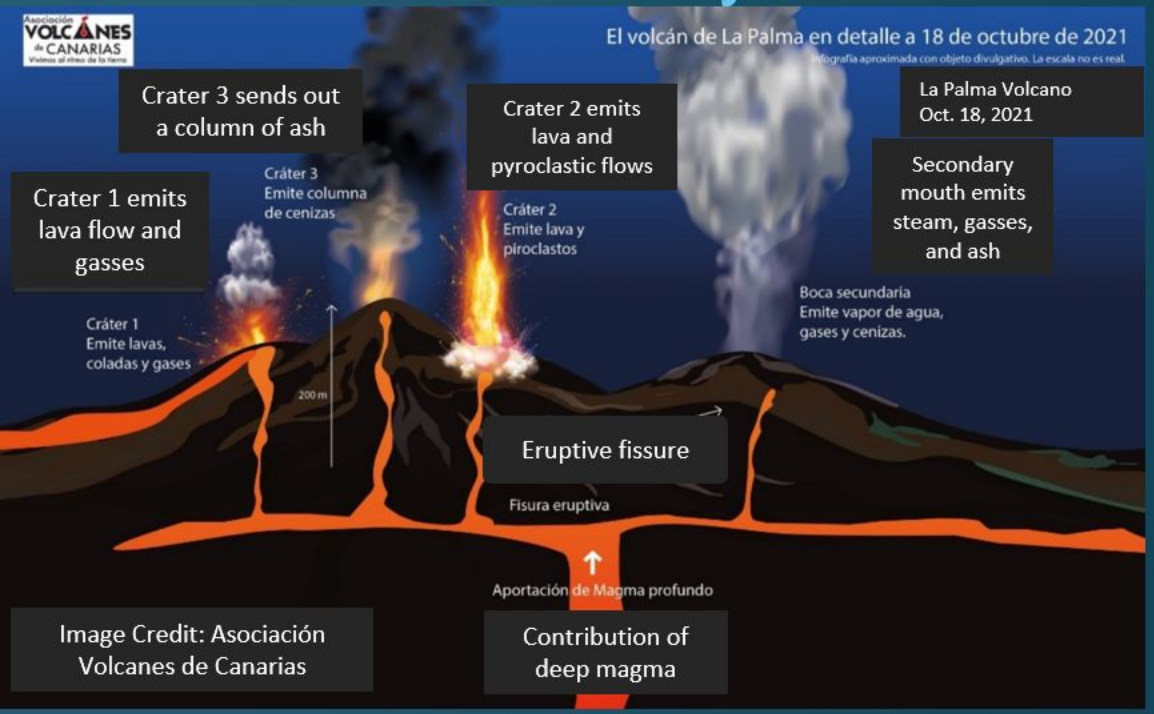
Left: VIIRS Black Marble Blue/Yellow Composite for Hurricane Ida 2021



Right: VIIRS SO2 Index for 2019 Raikoke Volcano Eruption

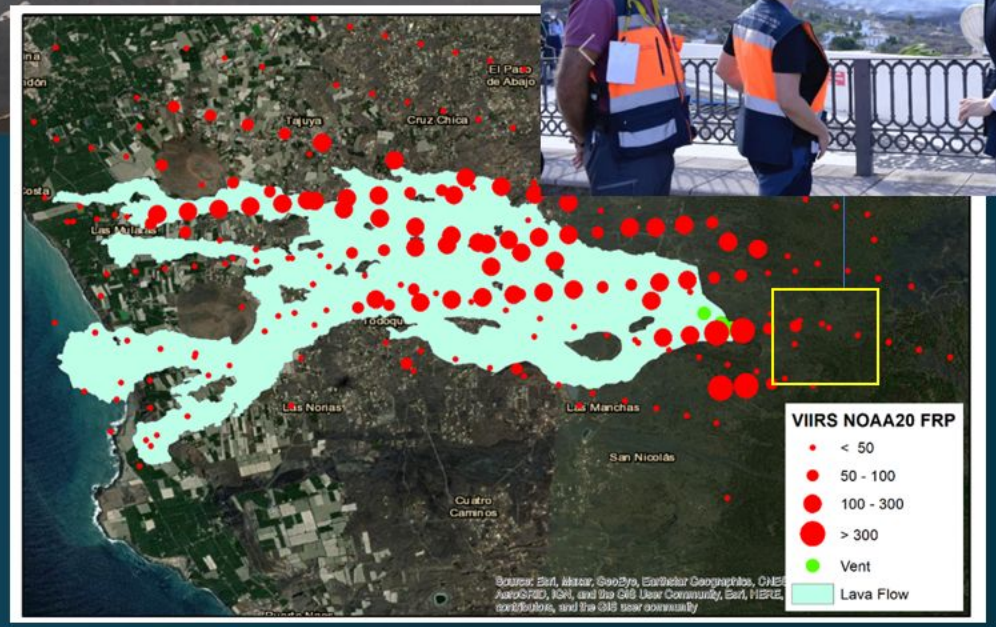
Credit: Garrett Layne.

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:

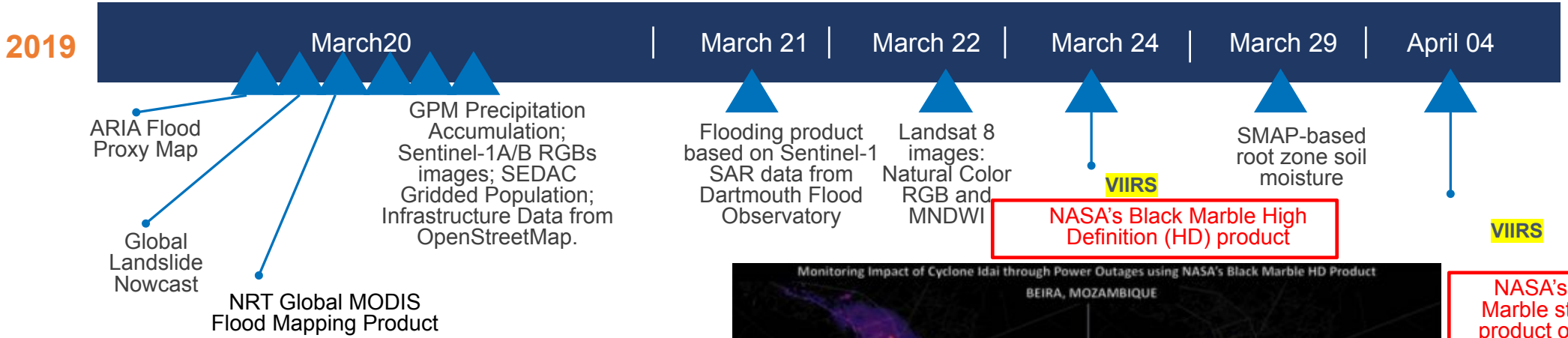
"The thermal anomaly maps are useful to identify caldera reactivation and the opening of new vents. We have observed that days of high thermal radiation are coincident with reactivation of the northern lava flows. Also, we observed the emergence of fumarole fields in locations just before covered by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

Credit: Jean-Paul Vernier.

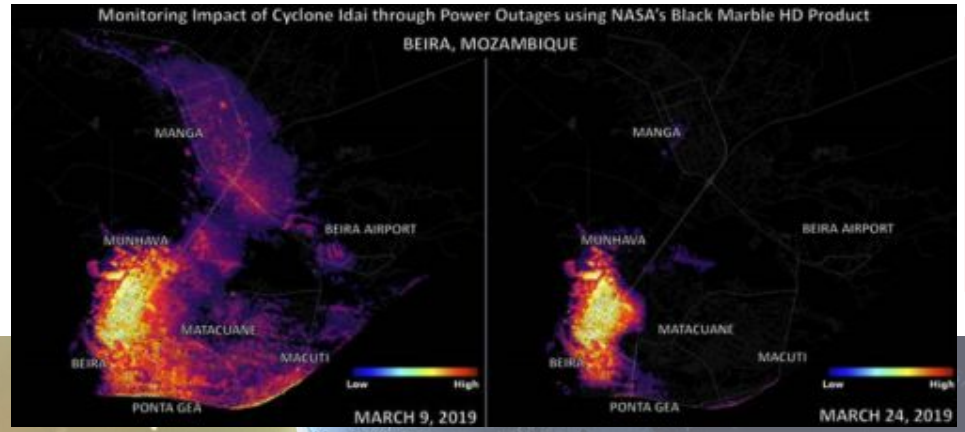
Using VIIRS Data Products in NASA Response for Tropical Cyclone Idai

"I've heard from our field teams that the maps that we are making with NASA data are also being used ***by the Mozambique government for initial assessments and decision-making****, so that's great news. The data you're providing is very useful for us as we work with partners to respond to the flooding."* ***Lauren Bateman, IFRC***

" In terms of any direct asks we have relating to data needs for our current production on Tropical Cyclone Idai, there is one item of interest that stands out.
Black Marble Power Outages – We see this is available for the city of Beira. Is it possible to get this on the scale of the entire province of Sofala in Mozambique? Access to electric is key for proper hygiene, especially this long after the onset of the disaster and, combined with flood extent and displacement, can be really helpful in showing the scale of potential Cholera/disease outbreaks." ***Ryan Latgis, Humanitarian Information Unit, U.S. Department of State***

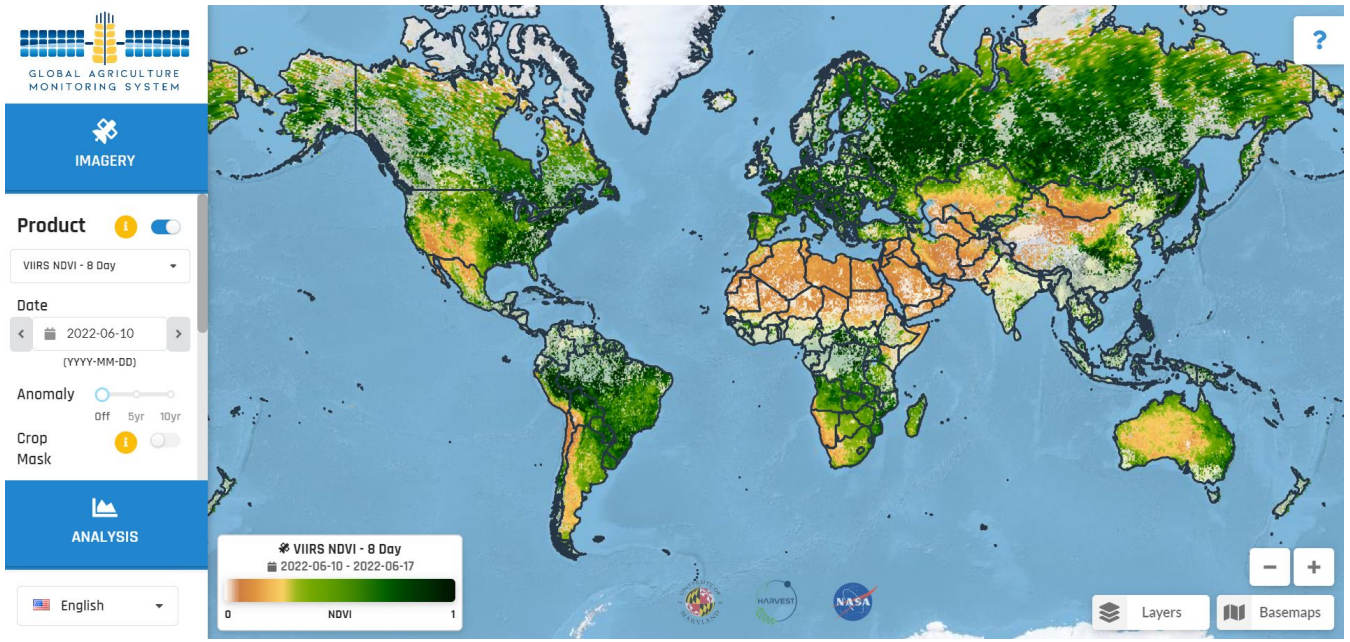


NASA Response and Engagement Timeline for Tropical Cyclone Idai (March-April 2019)



NASA's Black Marble standard product over AOI in response to the requests from Department of State's Humanitarian Information Unit

GLAM System: Cloud-Based Global Agricultural Monitoring



NASA's "Harvest maintains a satellite-based Global Agriculture Monitoring system (**GLAM**) developed by the University of Maryland with NASA and USDA. GLAM was customized for East Africa, enabling the implementation of the World Bank's Disaster Risk Financing and Insurance Program. **In Uganda, this program has supported >300,000 individuals in Karamoja**, providing alternative livelihoods to smallholder farmers affected by drought. This system also enables the delivery of newer maps and solutions using ML including crop maps and yield forecasts. **Harvest's 2019 crop map of Togo was used to implement the YOLIM program which has served more than 50,000 people**."

---- *The International Research Institute on AI under the auspices of UNESCO (IRCAI).*

Credit: Alyssa Whitcraft, Chris Justice, Michael Humber.

NASA Applied Remote Sensing Training Program (ARSET)

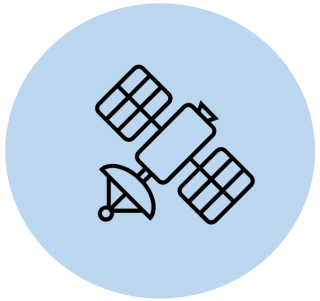
ARSET offers online and in-person trainings for beginners and advanced practitioners. Online trainings include presentations and guided instructions for exercises on how to access, interpret and use NASA data products in applications of air quality, agriculture, disaster, land, water resources and wildland fire management.

1048 Participants	755 Participants	619 Participants
92 Countries	77 Countries	97 Countries
715 Organizations	500 Organizations	300 Organizations

Credit: Brock Blevins.

Future Perspectives

Future Perspectives



Bands and Spectral Coverage:

- **Day/Night Band (DNB)** to provide data of human activity and energy behaviors during the nighttime.
- **Red-edge bands** which are consistent with Sentinel-2.
- **Thermal bands** to support large scale ET and soil moisture.

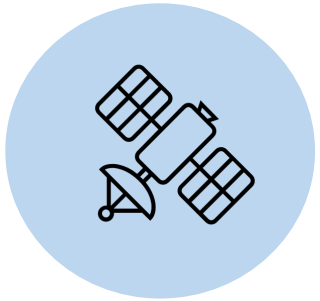
Spatial Resolution:

- **Refined spatial resolution** is useful for disaster responses, wildland fire management and agricultural management. For example, a user in wildland fire management indicates the 30-m spatial resolution is good to detect small fires. Another feedback from agricultural community indicates that VIIRS data products won't work in field-level analyses because fields in many parts of the worlds are smaller than 15 ha.

Temporal Resolution:

- For air quality application, the finer the temporal resolution the more valuable.
- For disaster responses and wildland fire management, the 12-hours temporal resolution is acceptable. An additional overpass later in the day when fires are most active will be ideal for wildland fire application.
- For agricultural management, the temporal resolution should be below 5 days.

Future Perspectives (continued)



Observation time:

- **Morning observations**: There are few clouds in the morning but many more in the afternoon.

Latency:

- For disaster applications and wildland fire management, **latency within 3 hours** is useful while latency greater than 12 hours is not able for operational use.
- Ideal latency for volcanic application is 10-15 minutes.

Data Format:

- Provide analysis-ready data in user-friendly data formats.

Capacity Building and Training:

- Trainings and webinars are important for users to be able to access, interpret and use data products and tools for their decision making.

Thank you! Questions?

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