

National Aeronautics and
Space Administration

NASA earth



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National Aeronautics and
Space Administration

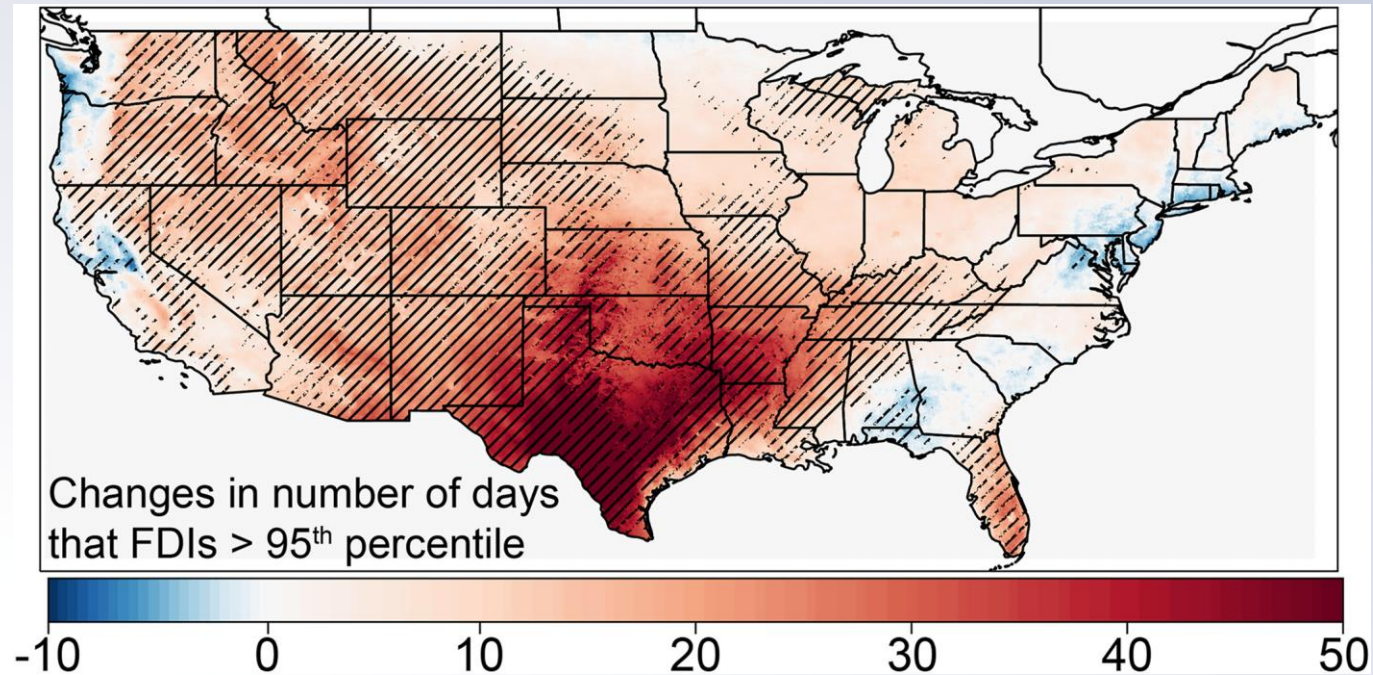


NASA Disasters Wildfire Activities: Past, Present, Future



Climate Change, Wildfires, and Communities

- Climate change is already driving increased wildfire hazard, and will continue to do so (IPCC, 2022)
- Changes in settlement patterns present increased likelihood of impact to communities and infrastructure.
- Wildland-Urban interface has increased by 12.5% from 1985-2020 (Chen et al. 2024) and will continue to grow.
- How can satellite data be used to better inform disaster mitigation decision-making?



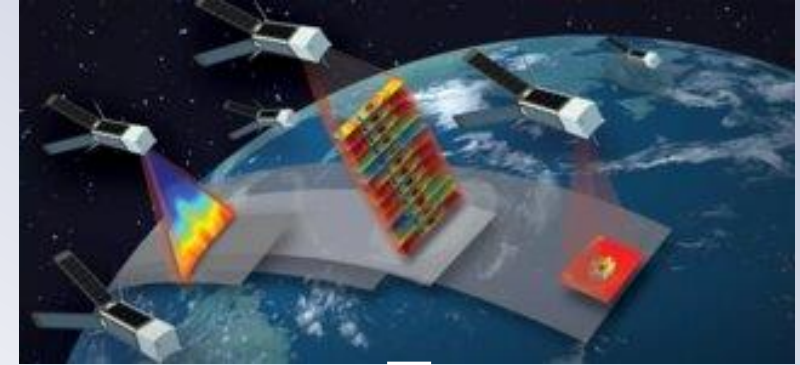
Major increases in days of extreme Fire Danger Index are expected by 2100 (Yu et al. 2023)



NASA'S DISASTERS PROGRAM

“Advancing Science for Disaster Resilience”

- We advance the field of disaster science and build open and accessible tools to help communities make smarter decisions for disaster planning.
- We work directly with local governments and response teams to support disaster response efforts with Earth observing data and expertise.
- We foster partnerships around the world to build capacity and strengthen global disaster management efforts.



Core Elements



Disaster
Applications



Disaster Response
Coordination System



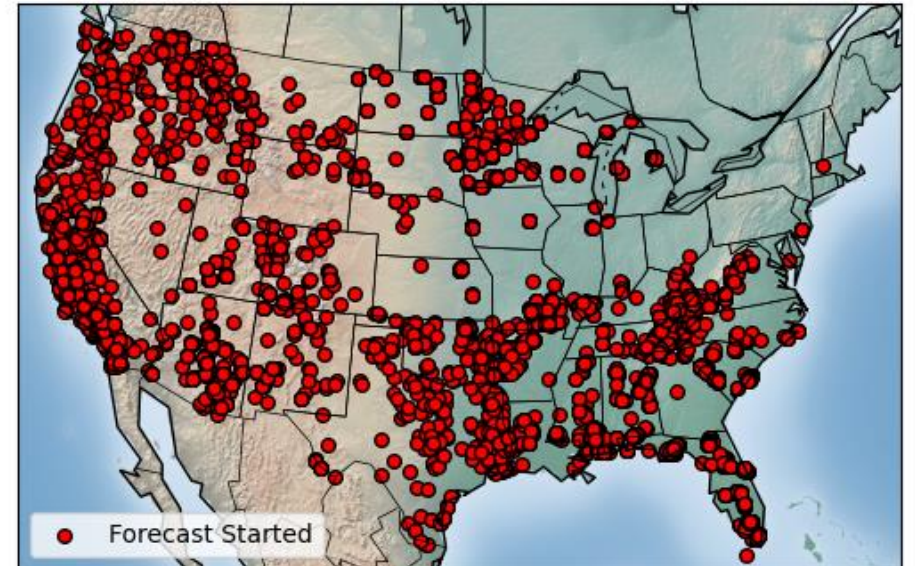
Disasters
Open Access Portal

Wildfire Research

- Program has supported extensive research into understanding pre-fire conditions, forecasting spread, and mapping damage.
- Weather Research Forecasting SFIRE (WRF-SFIRE) uses weather models, fuel moisture data and satellite fire detection to forecast fire and smoke up to 7 days out.
- Integrated operationally with US Forest Service; To date, over 2000 forecasts of potential for fire and spread have been run using the fully automated system

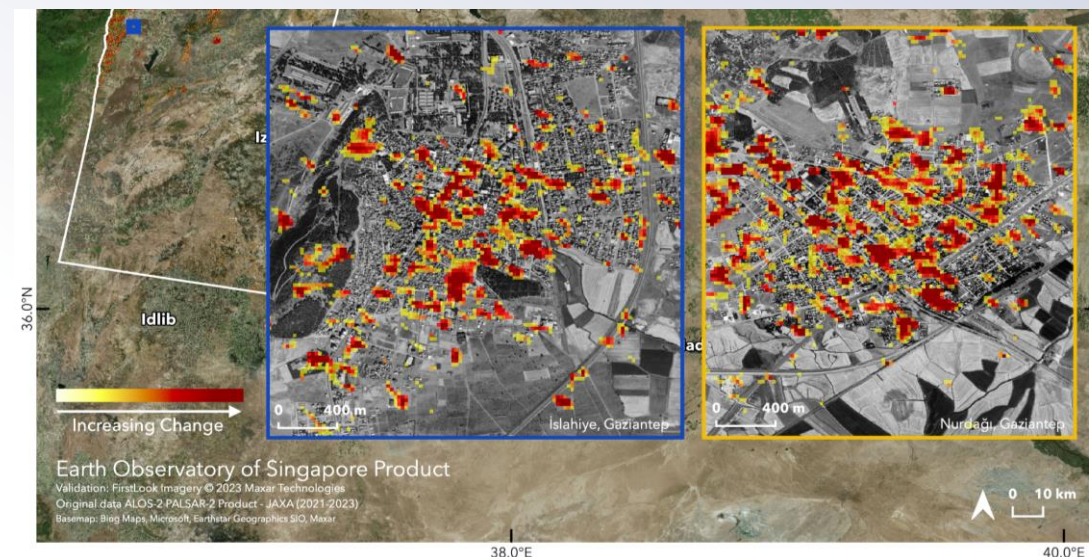
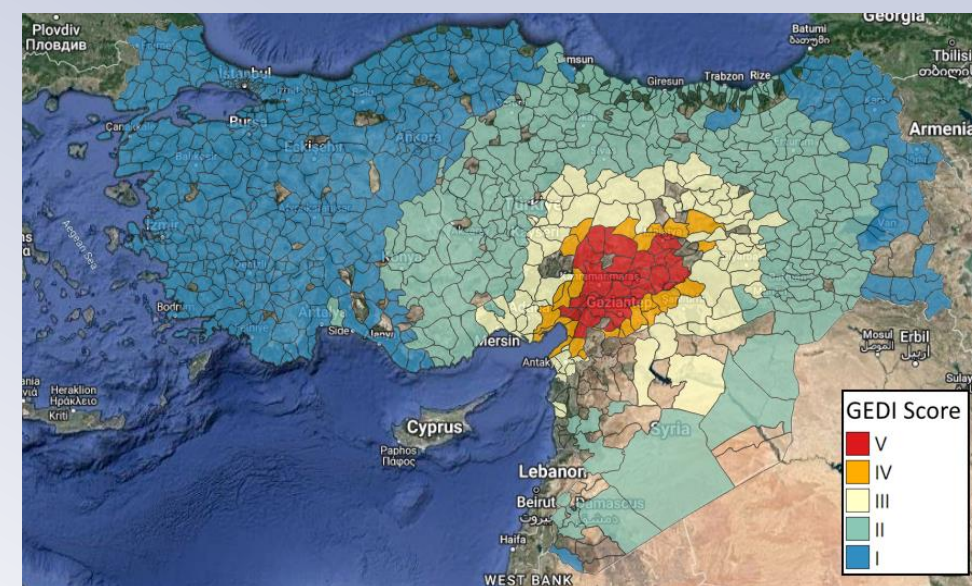


Forecasted NIFC Fire Incidents
2023_06_13 to 2024_05_15



Wildfire Research

- Damage to buildings and economic impact of Disasters, including fires, is a topic of major research focus
- Global Economic Disruption Index tool is developed to understand the impact of major disasters on specific economic sectors (above).
- SAR-based damage analysis has been pioneered by NASA teams and widely deployed for post-fire assessment of impacts to structures.



Wildfire Research: Future Directions

- Future EO data will provide valuable pre- and post-fire condition analysis.
- Hyperspectral and VSWIR data can assess leaf water content, fuel condition, and char fraction.
- Additional sources of info on fire radiative properties from NIR data can inform post-fire damage assessment.
- Operationalizing novel data sources presents extensive areas for application development.

Equivalent Water Thickness measures relative changes in canopy water content due to drought

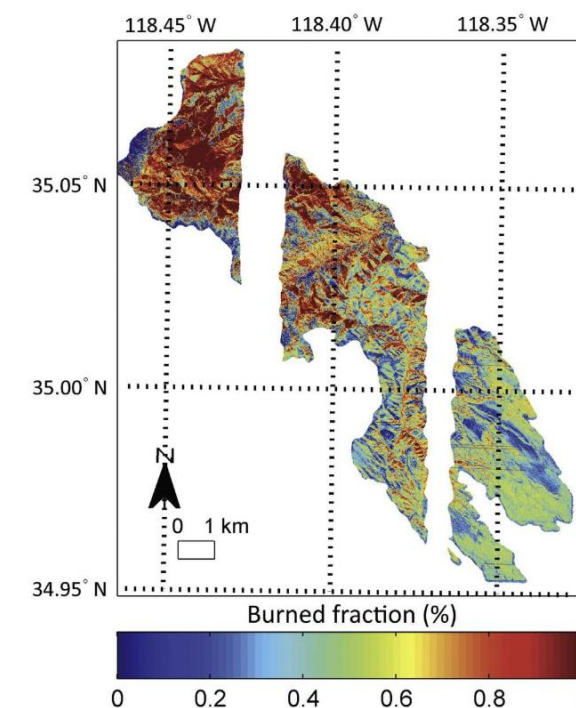
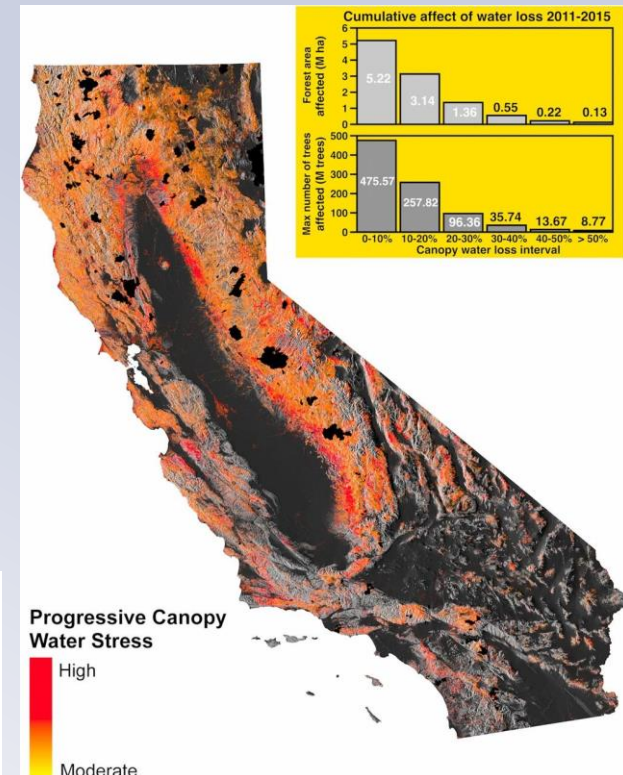


Fig. 6. Burned fraction map derived from the scenario using all Airborne Visible/Infrared Imaging Spectroradiometer (AVIRIS) bands and applying weighted multiple endmember spectral mixture (wMESMA) analysis.



Burned fraction estimate from AVIRIS data.





Disaster Response Coordination System





DISASTER RESPONSE COORDINATION SYSTEM

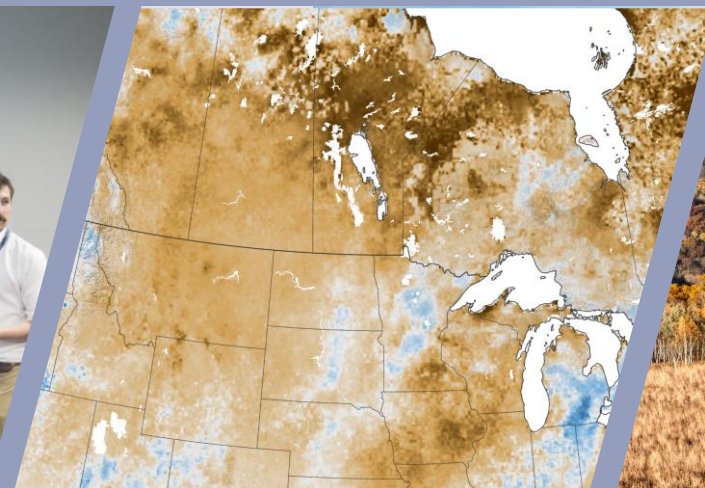
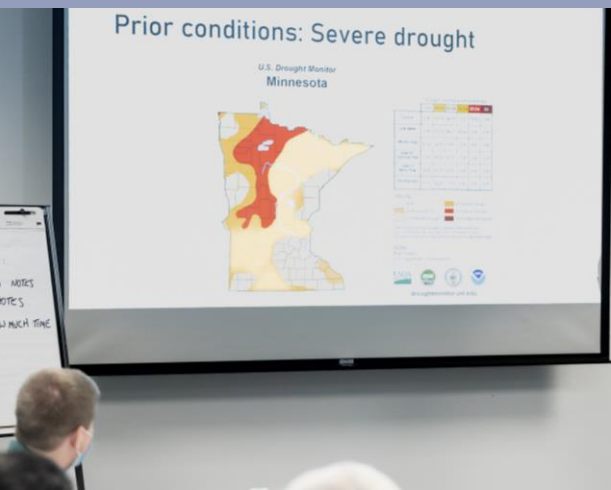
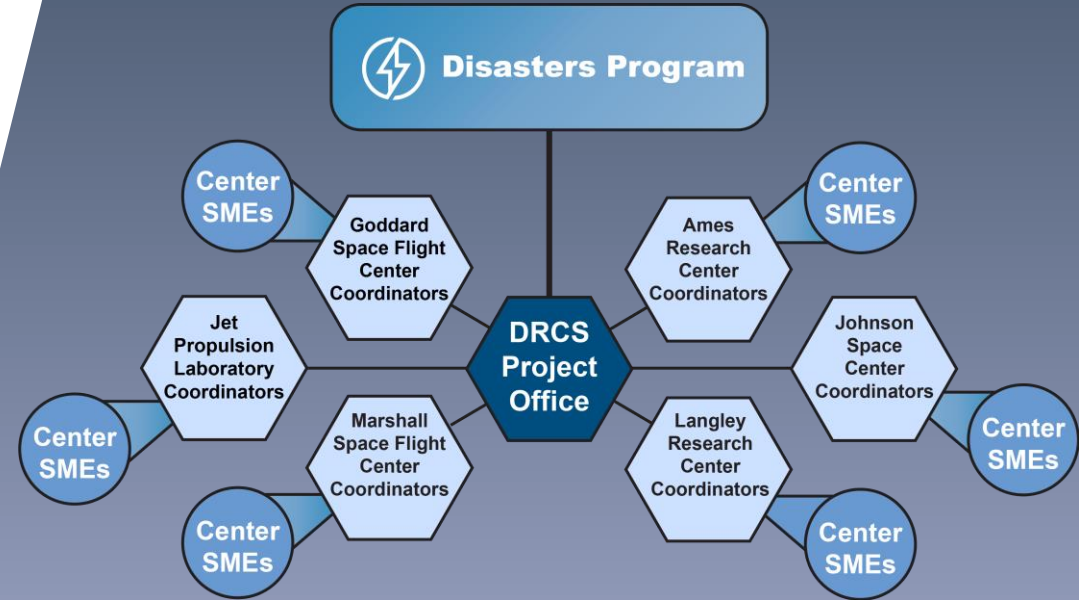
- Providing **Earth observing data and expertise** to aid government agencies, NGOs and private sector stakeholders' disaster response needs.
- Building effective response communities through **improved coordination**, engagement, and learning.
- Reducing impacts to lives and livelihoods by **empowering communities** with data.





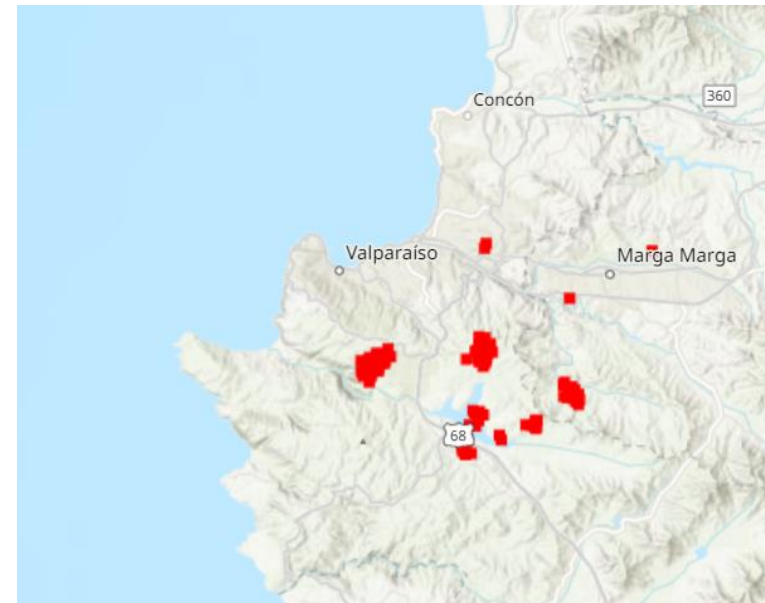
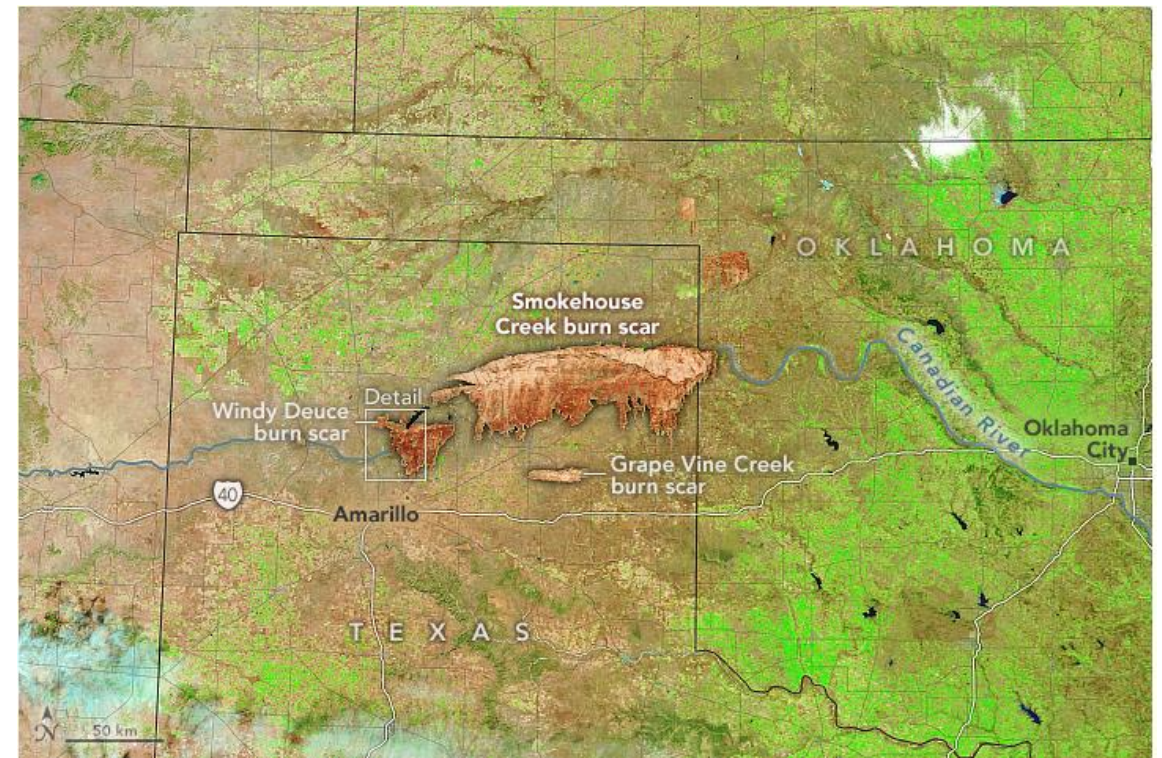
DISASTER RESPONSE COORDINATION SYSTEM

- The DRCS structure **enables response organizations and decision-makers** around the globe **to access NASA** disaster science, tools and expertise.



Recent fire activations: Texas & Chile

- DRCS supported teams responding to major fires in Feb 2024 in both Texas and Chile.
- Team leveraged FIRMS data and high-resolution PlanetScope imagery to assess burned area extent.
- Support for FEMA in Texas and the National Disaster Management agency (SENAPRED) in Chile

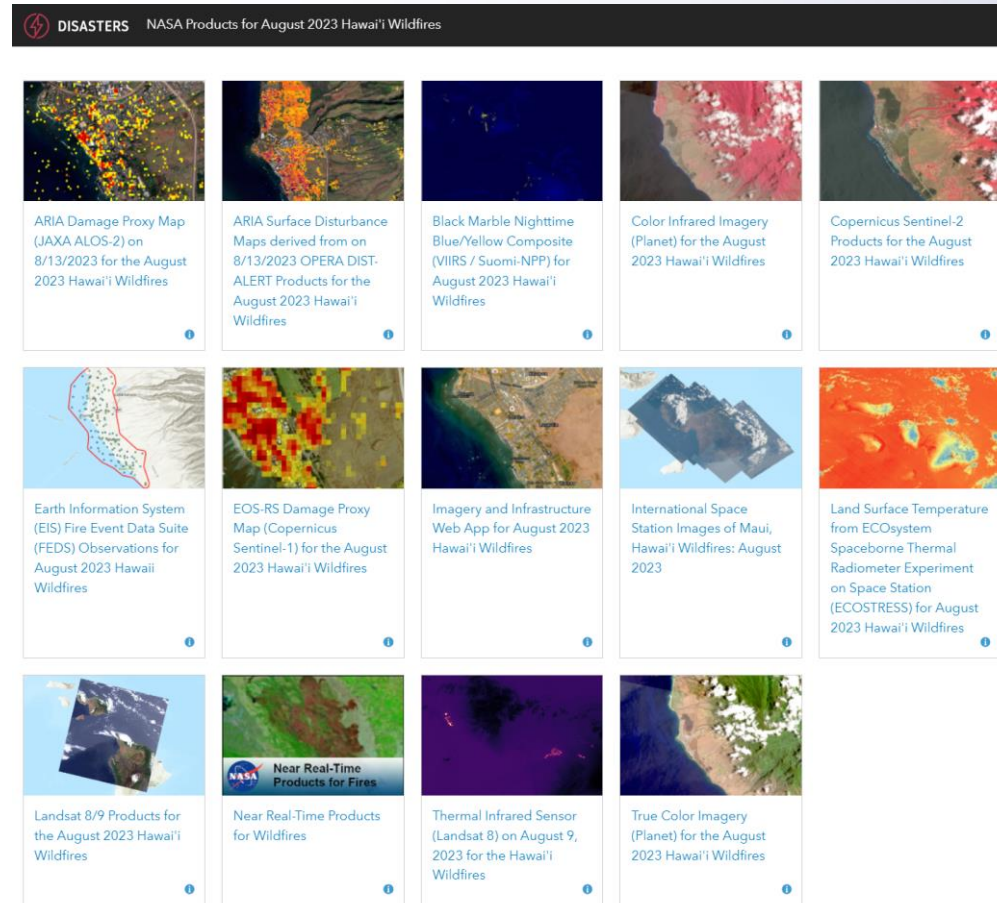


Above: False-color
MODIS imagery of
Texas burn scar.

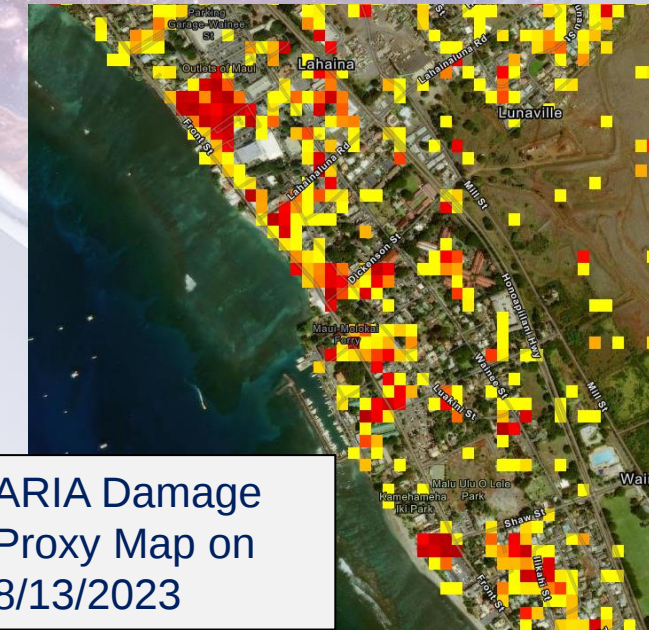
Left: FIRMS active
fire points around
Valparaiso, Chile

HAWAI'I WILDFIRES 2023

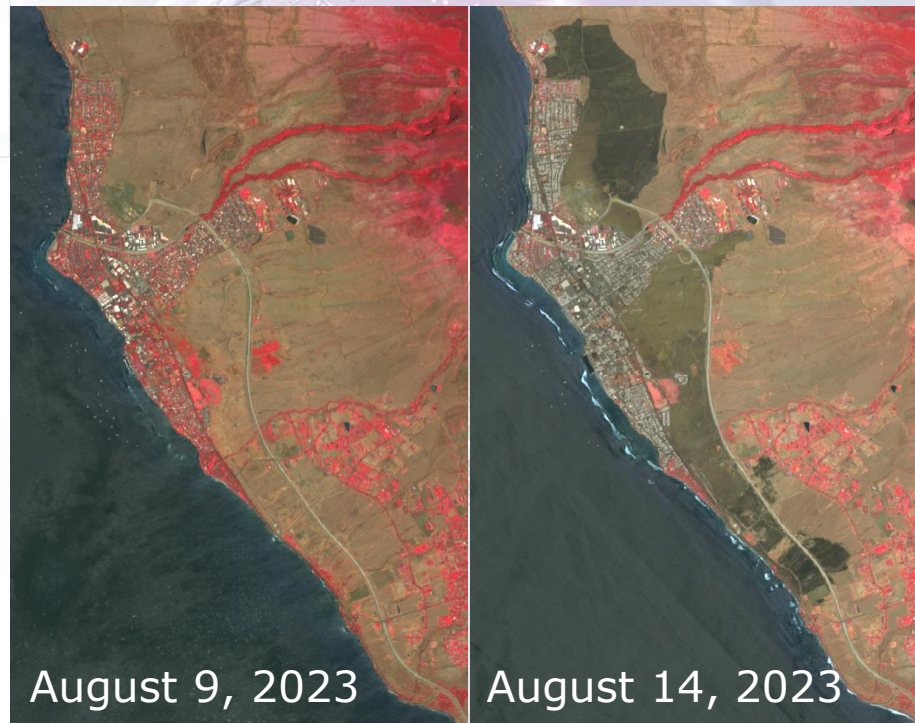
- August 2023 wildfires rapidly spread on Maui where at least 99 people were killed and causing widespread destruction in the town of Lahaina
- NASA supported stakeholders including FEMA Region IX, Esri Disaster Response Program, World Central Kitchen, and others
- 11 event-based services
 - SAR-derived damage proxy maps
 - Surface Disturbance Maps
 - Fire perimeter monitoring



Hawai'i Wildfires Product Gallery

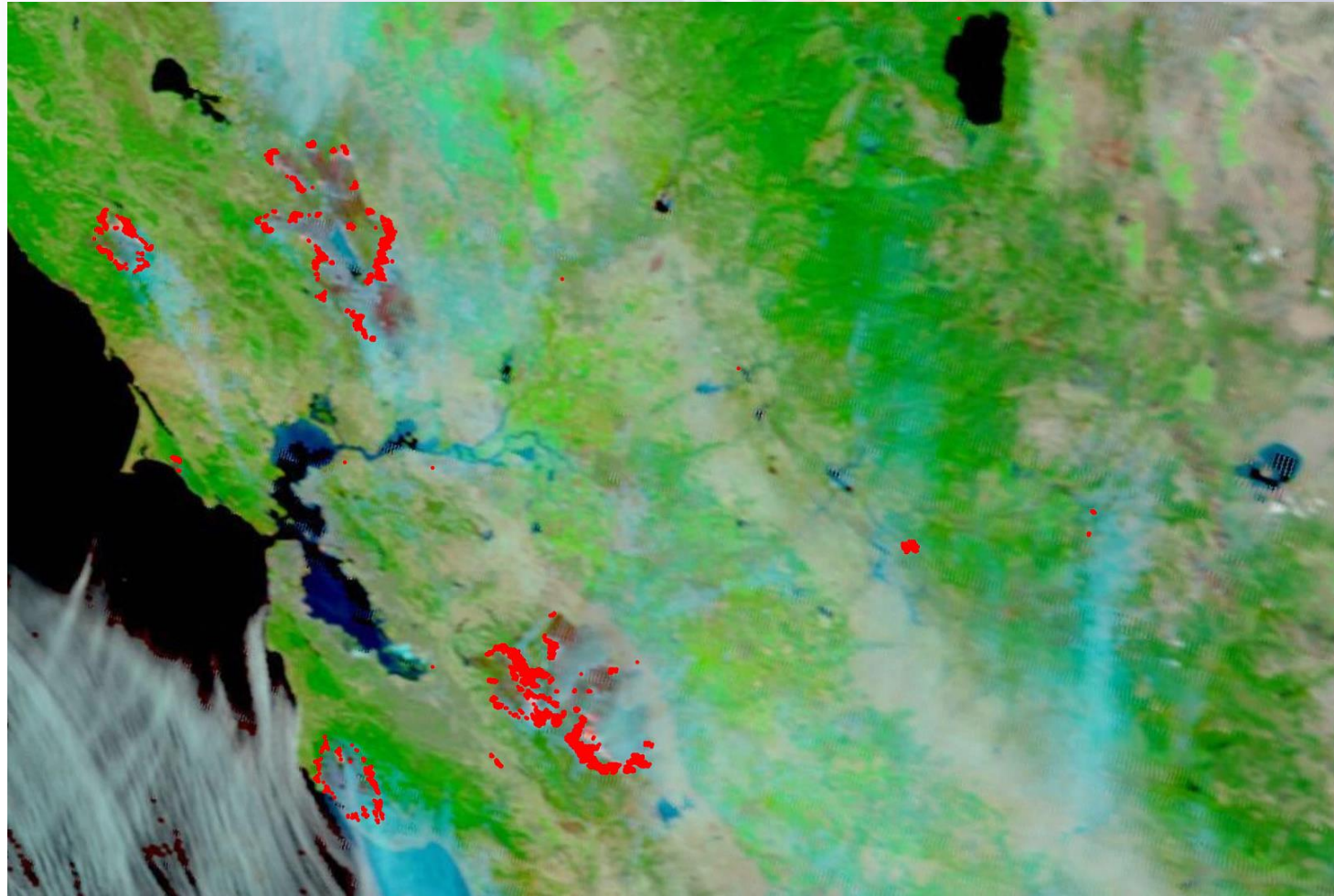


Copernicus Sentinel-2 Color Infrared Imagery



CALIFORNIA WILDFIRES 2020

- Using Near Real-Time data to monitor and track the evolution of wildfires
 - MODIS and VIIRS Natural Color Imagery
 - FIRMS Active Fires Points
- Updates multiple times per day
- Moderate resolution at 500-750 meters
- Can see active hot spots, burn scars and smoke transport



FIRMS Active Fire Points and MODIS Terra Natural Color Imagery from 8/15/20 to 9/1/20

The Future of EO for Wildfire DRR

- Extremely low latency is necessary for active fire challenges.
- Novel datasets to assess pre-fire conditions, post-fire cascading hazards
- Intersection of EO data with policymaking to increase community and regional scale resilience
- Understanding how changes in population and infrastructure vulnerability coincide with changing wildfire hazard



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For disaster response support, reach out during blue-sky periods to establish needs to: dracs@nasa.gov



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