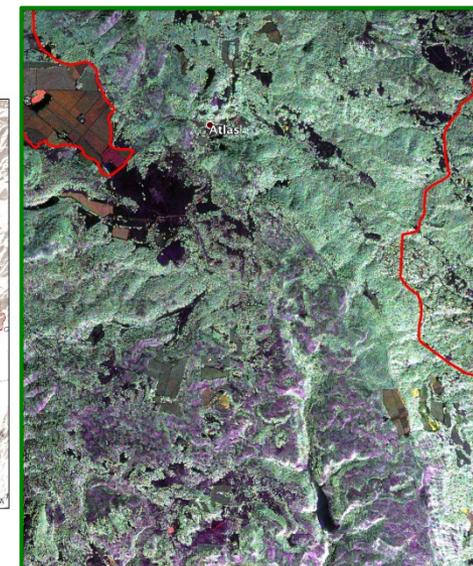
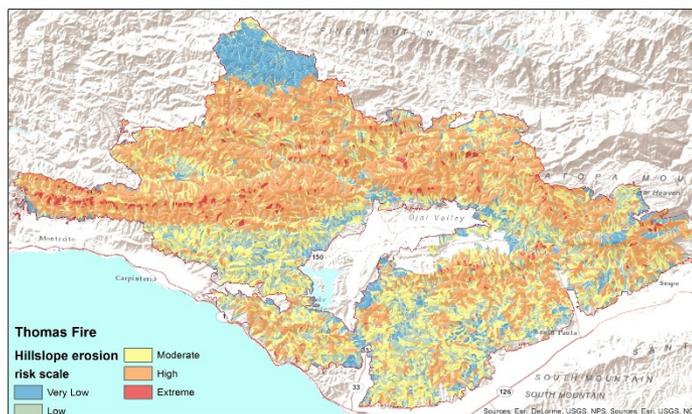
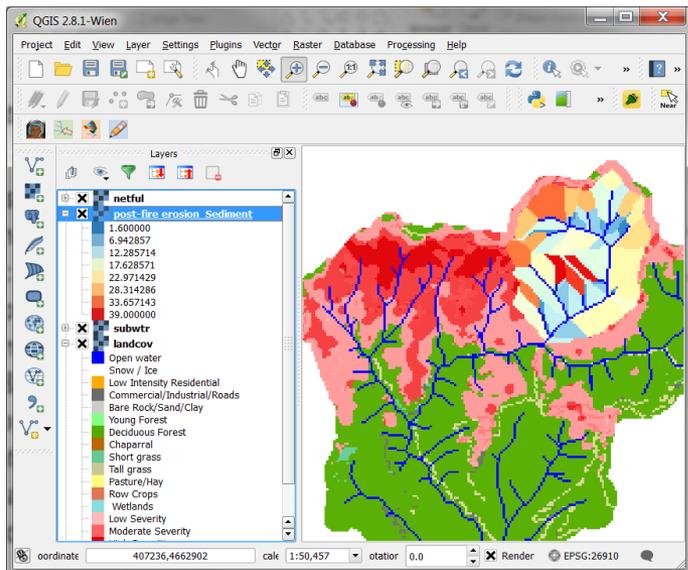




NASA Support of 2017 CA Wildfires: Lessons Learned



NASA Applied Sciences Program: Disasters and Wildland Fire Program Elements

Presented by Maggi Glasscoe
Jet Propulsion Laboratory, California Institute of Technology

ESIP Summer Meeting
17 July 2018

Disasters Lifecycle Cluster
Operational Readiness Levels:
Establishing Trusted Data to Improve Situational Awareness

NASA Applied Science: Disasters



<https://disasters.nasa.gov>
<https://maps.disasters.nasa.gov>

The Disasters Applications area promotes the use of Earth observations to improve prediction of, preparation for, response to, and recovery from natural and technological disasters. Disaster applications and applied research on natural hazards support emergency preparedness leaders in developing mitigation approaches, such as early warning systems, and providing information and maps to disaster response and recovery teams.

- The Program targets a spectrum of disasters, including floods, earthquakes, volcanoes, and landslides as well as combined hazards and cascading impacts.
- The Program has Coordinators at NASA HQ and across NASA Centers to enable generation and delivery of data and products to end-users during disaster event activations.
- Since NASA is not an operational agency, the Disasters Program activates during an event upon an end-user request
- Products are shared directly to the end-user, posted to the Disasters website, and through the Disasters Geoportal.



Earthquakes



Volcanoes



Landslides



Floods



Fires



Land Subsidence

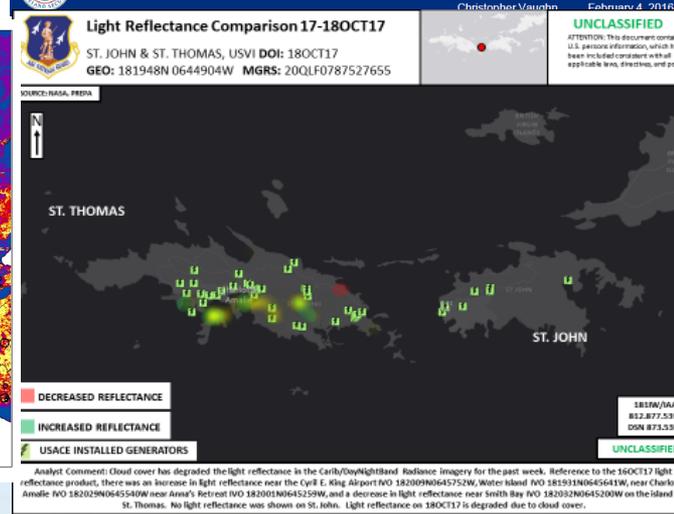
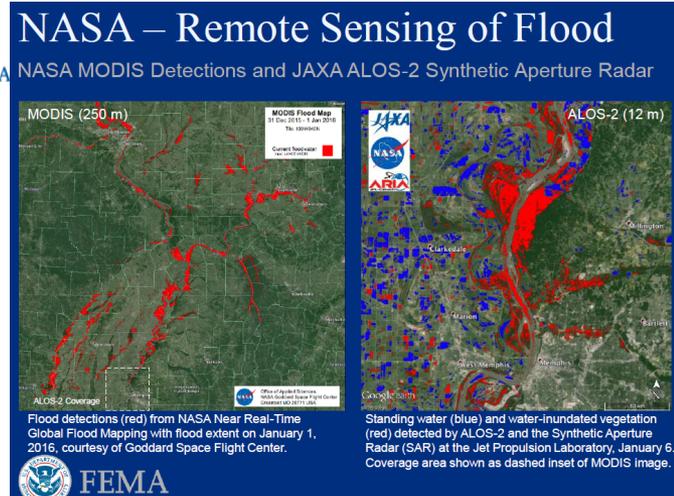
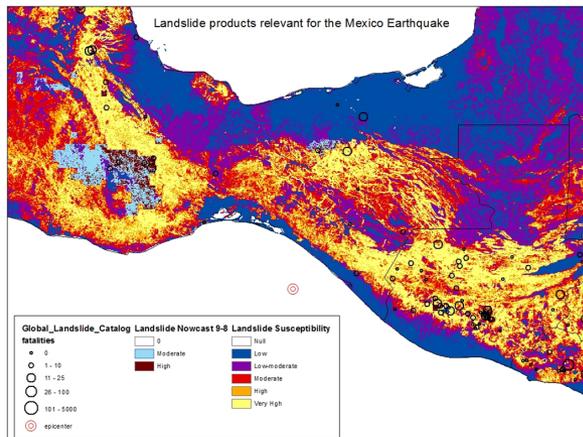
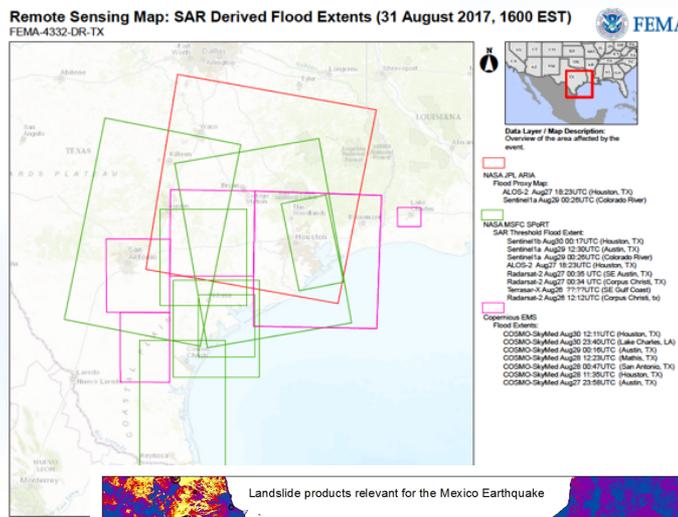
Recent Response Activities



NASA Collaboration and Key Partnerships providing End-to-end Response

Using Multiple Sensors, Models and Maps to Answer Critical Questions

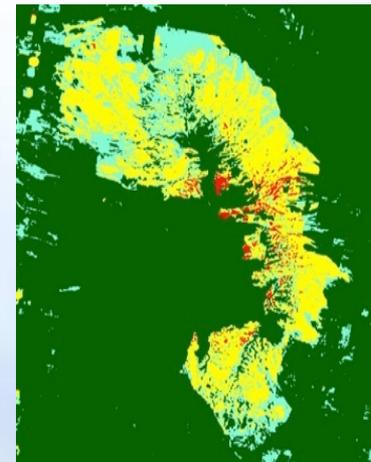
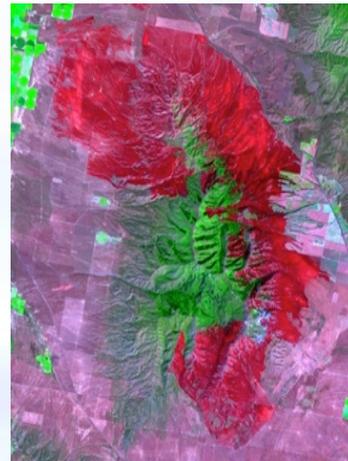
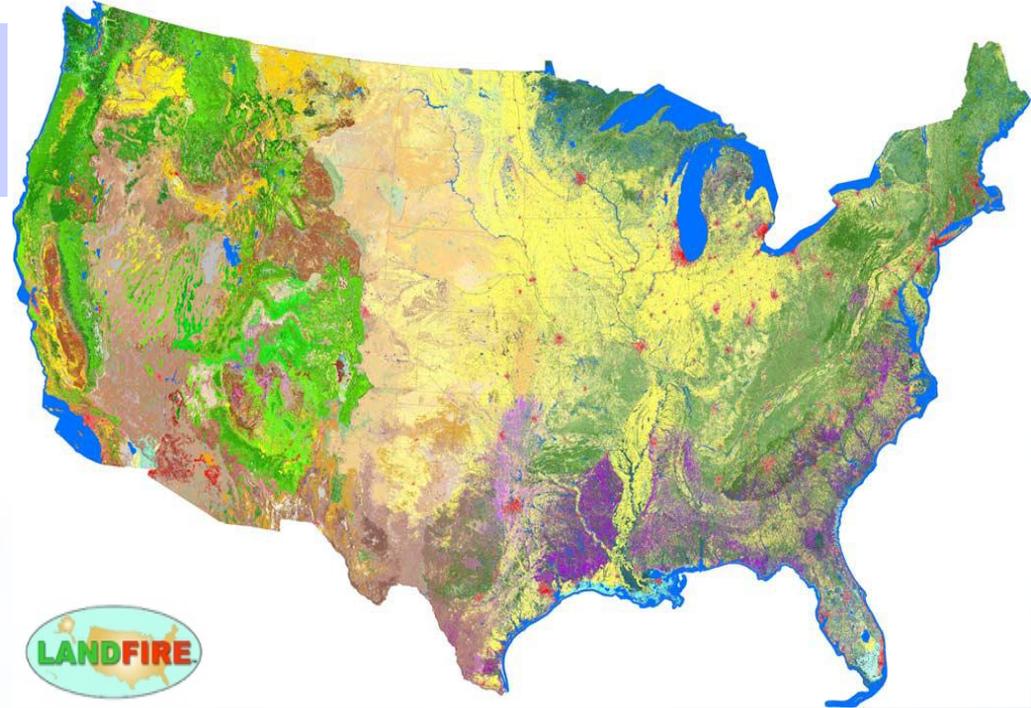
Mobilizing Resources to Assist Saving Lives and Protecting Property



NASA Applied Science: Wildfires



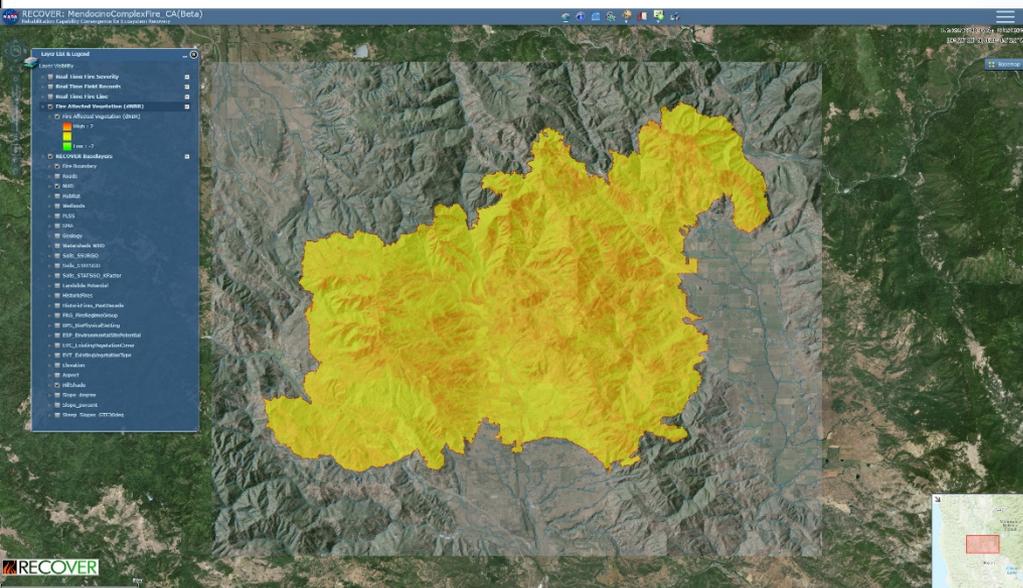
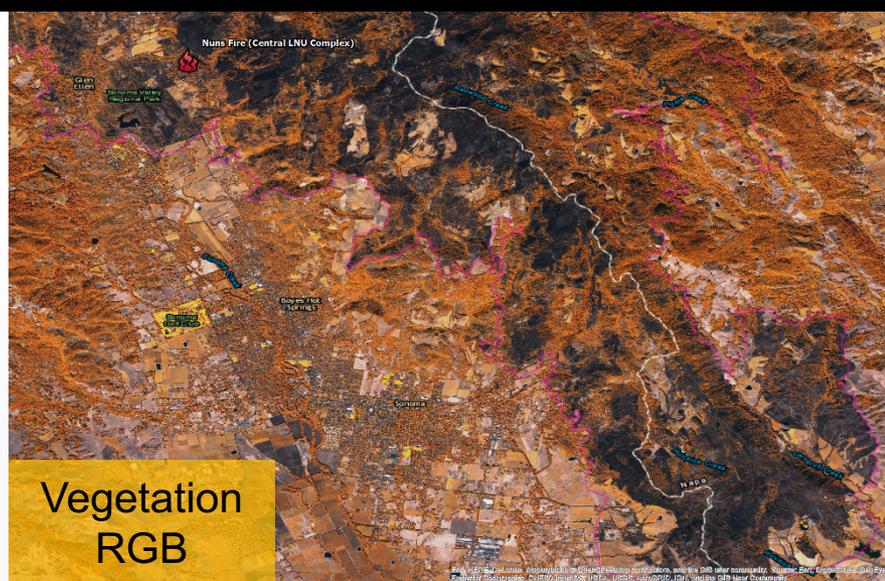
Nine (9) Projects Supporting Wildfire EO



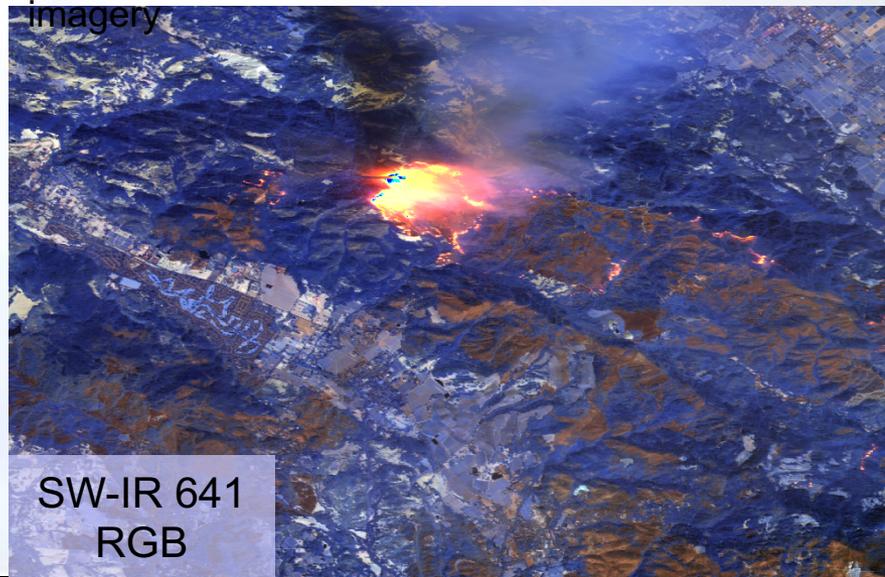
Above: A USGS Landfire map.
Left: 2007 Black Pine 2 Fire, Idaho, U.S. On the left: imagery, right: burn severity. USDA RSAC.

- Pre-Fire Mapping
 - Vegetation density and extent
 - Soil moisture/drought severity
 - Topography
- Active Fire Mapping
 - Total area currently burning
 - Fire Radiative Power (FRP) using thermal bands
- Post-Fire Mapping
 - Total area burned
 - Burn severity
 - Post-fire vegetation regrowth (NDVI)

California Fires, October 2017



Digital Globe Worldview imagery RGB processed at NASA Marshall from HDDS downloaded imagery

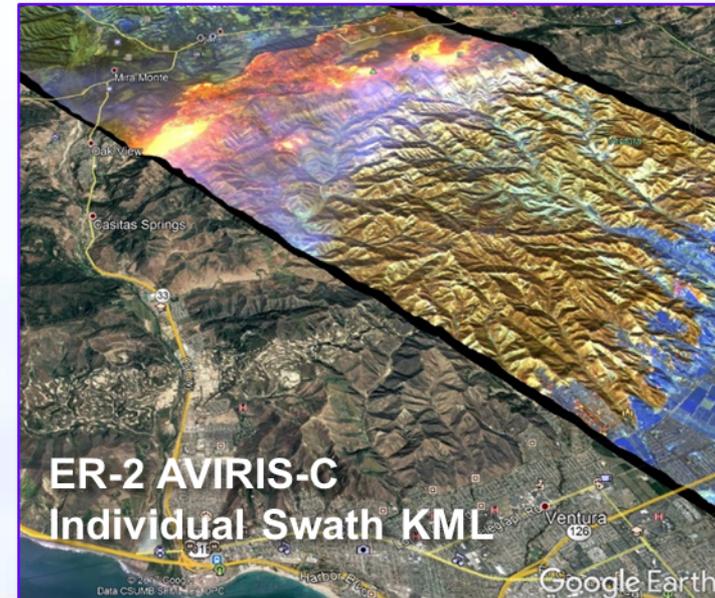
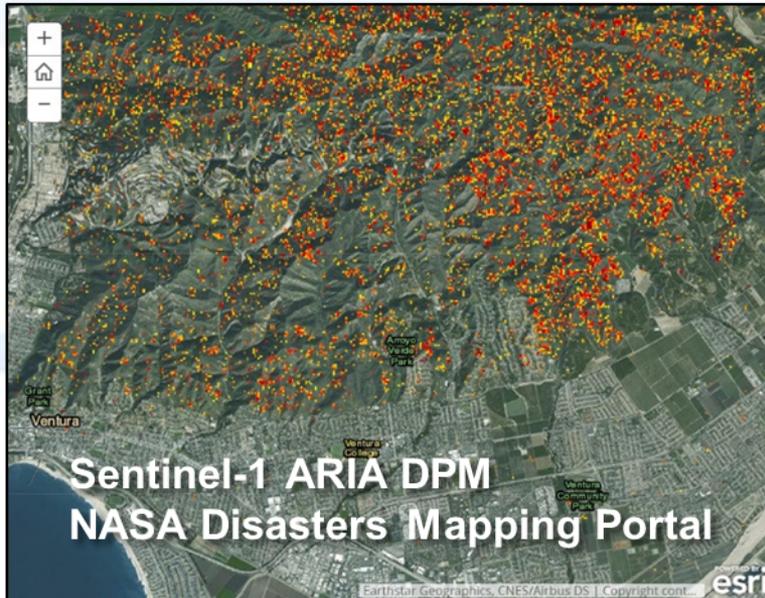


The NASA RECOVER DSS rapidly assembled dozens of GIS layers and earth observation imagery to provide fire fighters and managers with actionable information to respond to California's wildfires http://giscenter.isu.edu/research/Techpg/nasa_RECOVER/ The DSS for the Mendocino complex of fires was available in 5 minutes with fire severity imagery (shown on the figure below) added shortly after.

California Wildfires, December 2017



- Extreme Santa Ana winds contributed to outbreak of 10+ wildfires, including Thomas Fire (Largest officially recorded in California, 281,000 acres).
- NASA scientific data was available but required additional processing into useable formats requested by end users (CalOES, FEMA, NGB J2, CA ANG).
- This response served as a catalyst to improve Program ability to translate valuable scientific data into actionable geospatial information prior to disaster events occurring – ensuring all data we provide is useable and temporally relevant.
- Sentinel-1 ARIA DPM provided to CalOES ER-2 AVIRIS-C provided to NGB/CA ANG

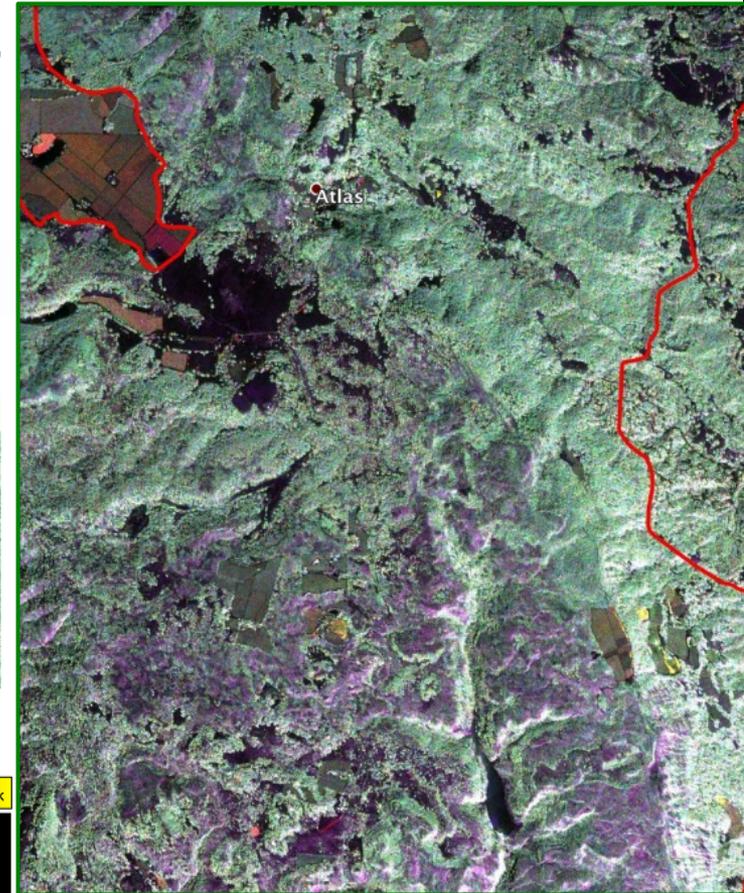


NASA Airborne Science Data



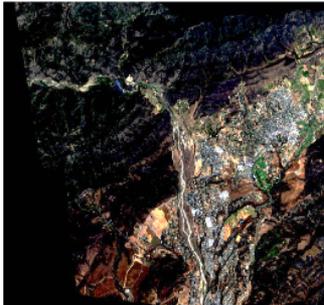
<https://airbornescience.nasa.gov/>

UAVSAR aboard NASA G-III aircraft imaged Napa County, California on October 16 to observe areas affected by several wildfires that started on October 8 and burned thousands of buildings as well as vineyards and forests.

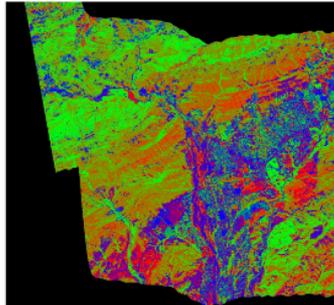


6/28/17
Pre-Fire

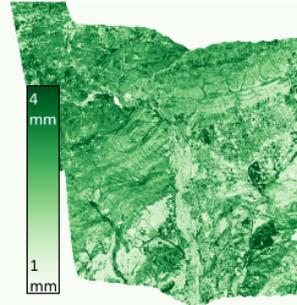
Visible image
(R: 650 nm G: 550 nm B: 450 nm)



Fuel load via spectrum fitting: Green Vegetation
NonPhotosynthetic Vegetation Soil / Rock

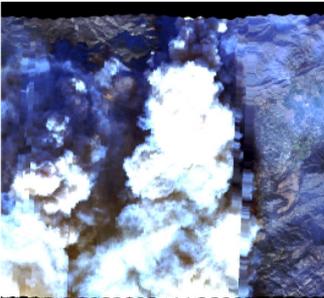


Equivalent Water Thickness (EWT) in
vegetation Canopies

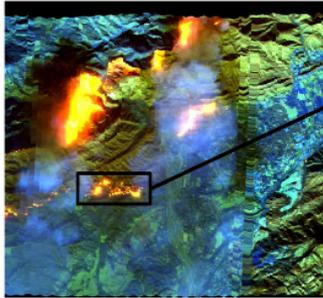


12/7/17
During Fire

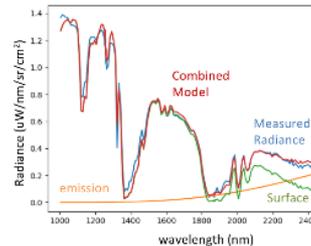
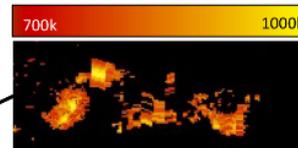
Visible image
(R: 650 nm G: 550 nm B: 450 nm)



Infrared image
(R: 2250 nm G: 1650 nm B: 1000 nm)



Fire temperature by spectrum fitting



**Spectroscopic Fire Measurements by the Airborne
Visible Infrared Imaging Spectrometer (AVIRIS)**

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Geospatial Enablement & Data Delivery

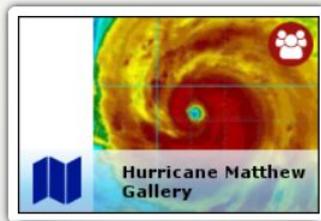


Disaster Mapping Platform **BETA**

Featured Maps and Apps



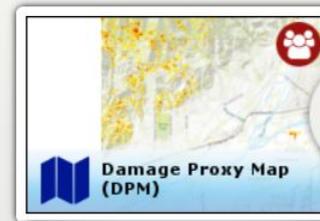
Disasters IOC Hurricane Matthew Map



Hurricane Matthew Products Gallery



NASA's Earth Science Disasters Program



Damage Proxy Mapping for Southern Ca. Wild Fire

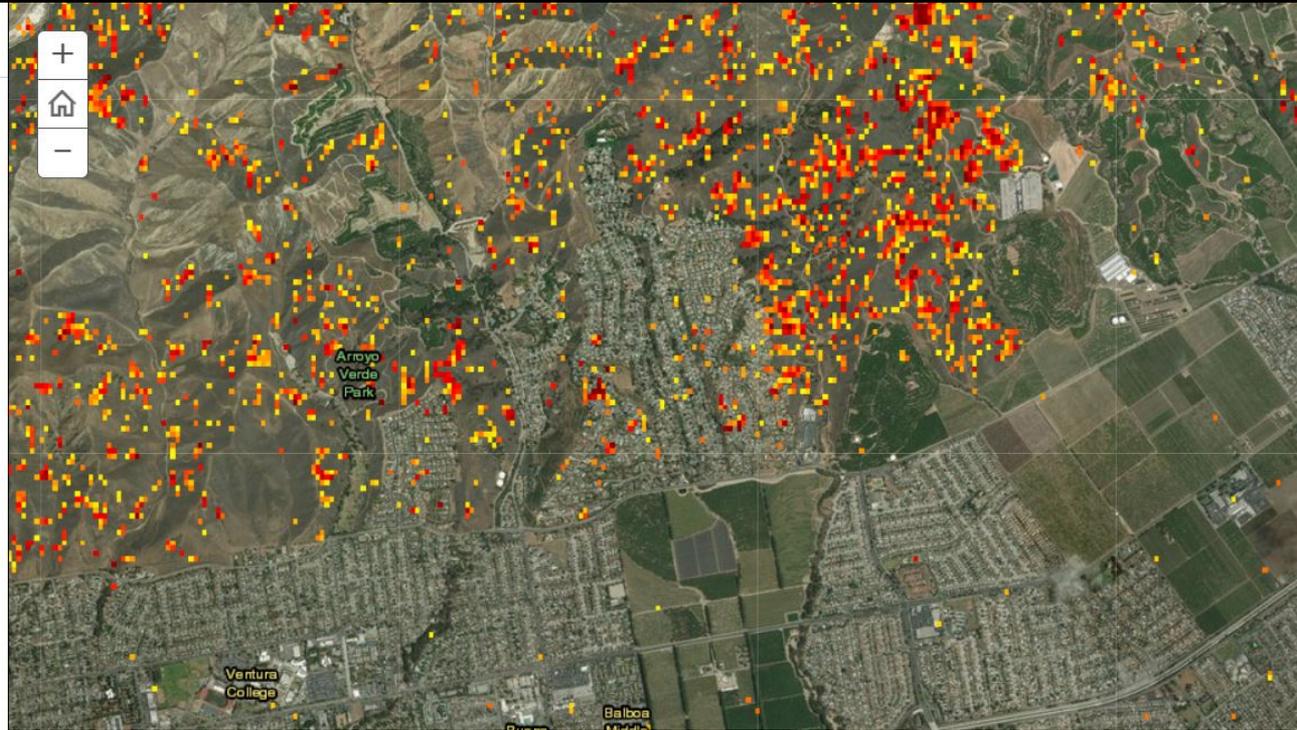
*The Disasters Program is developing the Disaster Mapping Platform in order to provide **action-driven geospatial content and capabilities** supporting integration, analytics and collaboration across the disaster management landscape. <https://maps.disasters.nasa.gov>*

Southern California Wild ...



Damage Proxy Mapping for Southern Ca. Wild Fire

The Advanced Rapid Imaging and Analysis (ARIA) team at NASA's Jet Propulsion Laboratory in Pasadena, California, and Caltech, also in Pasadena, created this Damage Proxy Map (DPM) depicting areas in Southern California, including Ventura, that are likely damaged (shown by red and yellow pixels) as a result of wildfires. The map is derived from synthetic aperture radar (SAR) images from the Copernicus Sentinel-1



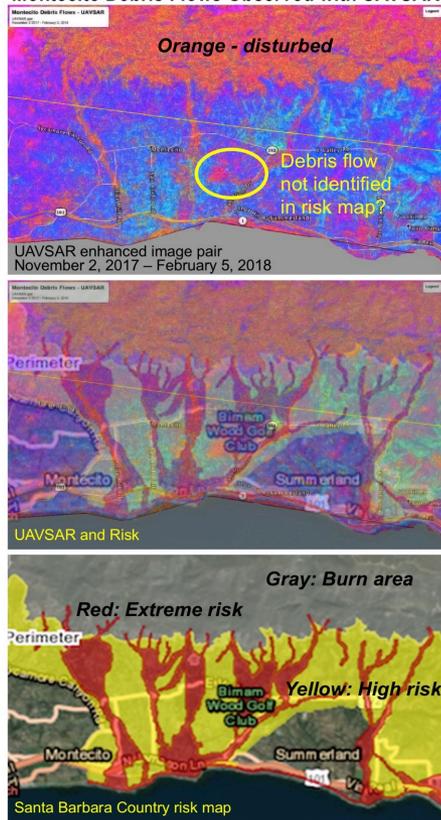
*The Disaster Mapping Platform **bridges the gap** between the NASA Science Communities' generated products and the disaster community that could benefit from the data.*

Hot off the presses! New data result!



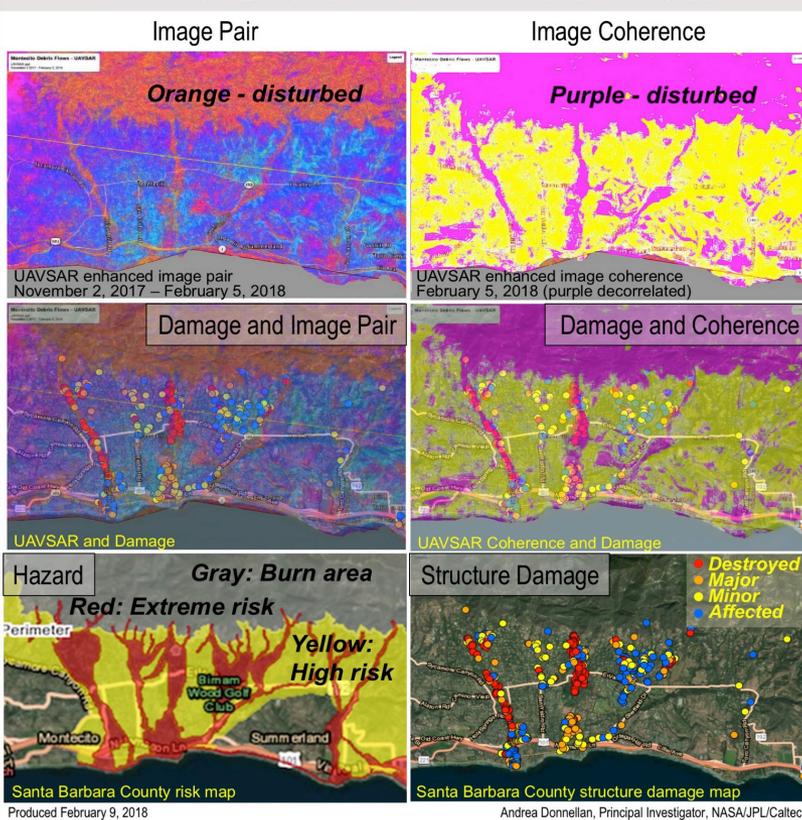
1

Montecito Debris Flows Observed with UAVSAR



2

Montecito Debris Flows Observed with UAVSAR



3

KML

On the day of the 2017 Fires Geospatial AAR Workshop in Sacramento, CA (9 February 2018) we had a case where a PI had a science/DS result that was ready to be shared – the only problem was that it may not have been in the best format, platform, etc. How did we end up sharing it? Via Powerpoint/JPEG image and through email. It was only later that we worked on making it available through “friendlier” means for the end users.



Acknowledgments

Dave Borges (NASA Langley Research Center)

Lori Schultz (NASA Marshall Space Flight Center)

Vince Ambrosia (NASA Ames Research Center)

Randy Albertson (NASA Armstrong Flight Research Center)

NASA Disasters and Wildland Fire Program Elements

Lessons Learned



- End users are still confused about what products are actually available – modeling, remote sensing (satellite vs. airborne) and how to get these products and ingest them into their systems
 - Work needs to be done to consolidate information and make end-users aware of these, as well as make them more readily available to them in standardized format.
- Understand High Resolution Data Availability vs Needs
 - Pan sharpened true color imagery (sub meter resolution) with minimal latency generally wanted by all end users following disasters – is this something that is NASA/Disasters Program specific, or are we aiding end users to find/use this data? What are NASA capabilities vs. commercial or other providers?
- Need for standardized formats and data delivery
- Need for training and engagement



Further Information

[*https://appliedsciences.nasa.gov/programs/disasters-program*](https://appliedsciences.nasa.gov/programs/disasters-program)

[*https://appliedsciences.nasa.gov/programs/wildfires-program*](https://appliedsciences.nasa.gov/programs/wildfires-program)

[*https://disasters.nasa.gov*](https://disasters.nasa.gov)

NASA Earth Science Applied Sciences Program

NASA Headquarters
Washington, DC
1.202.358.7200

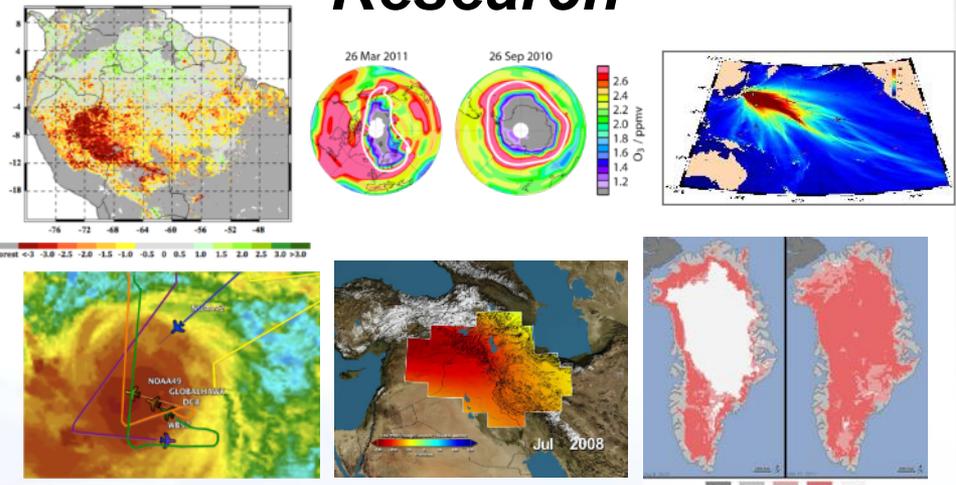


Backup



Earth Science Division

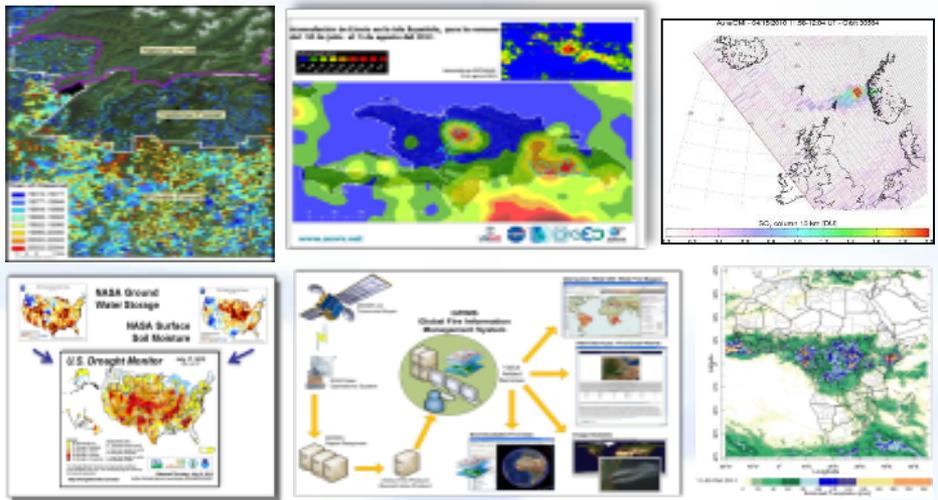
Research



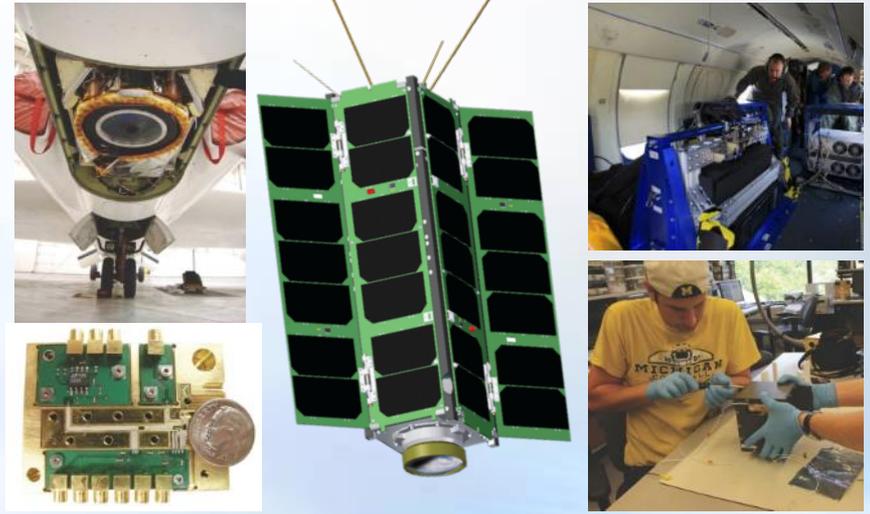
Flight



Applied Sciences



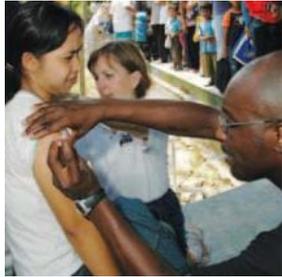
Technology



Applications Themes & Societal Benefit Areas



Emphasis in 4 Applications Areas



Health & Air Quality



Water Resources



Disasters

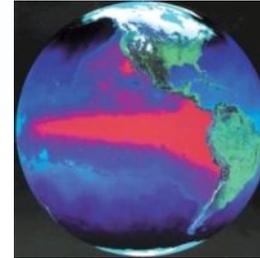


Ecological Forecasting

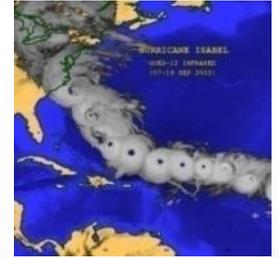
Support opportunities in 5 additional areas



Agriculture



Climate



Weather



Energy



Oceans



Crosscutting theme:
Wildland Fires



NASA Airborne Science Fleet

<https://airbornescience.nasa.gov/>

