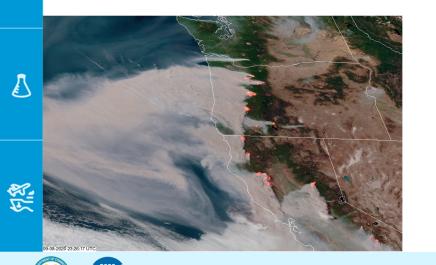


Rethinking How Satellite Data Are Transformed Into Actionable Insights for Fire Applications



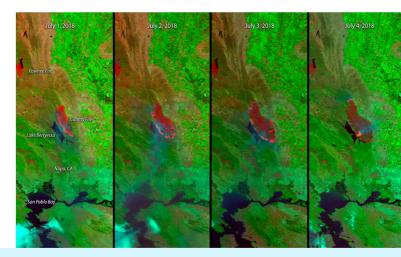
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Mike Pavolonis NOAA/NESDIS Fire Lead





Impact Centric Framework

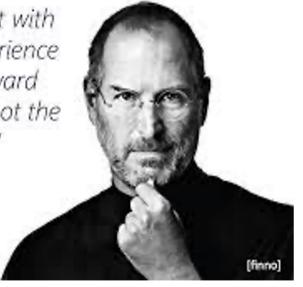
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"You've got to start with the customer experience and work back toward the technology – not the other way around"

Steve Jobs



Less: "Here is a product I developed. How can it help you?"

More: Start with a focus on tasks users are trying to accomplish

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Product vs Impact Mindset

Algorithm/Product Centric Focus

 Develop a new or improved algorithm/product

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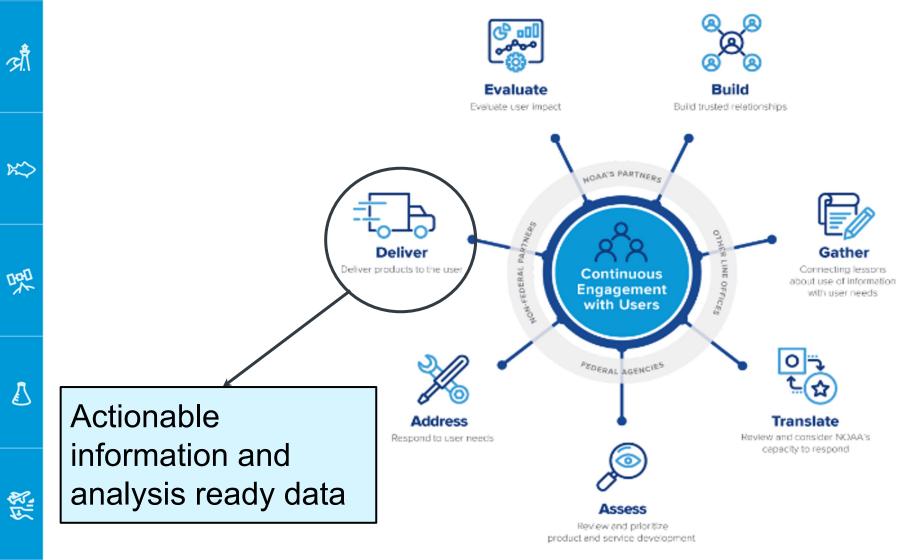
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 Example goal: develop an algorithm for satellite-based fire detection

Impact Centric Focus

- Develop and deliver timely, accurate, and actionable information
- Example goal: improve the timeliness of the response to a new fire ignition

NOAA Service Delivery Framework





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Build: NOAA Fire Weather Customers / Partners

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<u>Gather</u>: Identifying Critical Gaps

NWCG Satellite Data Task Team



Wildland Urban Interface Fire **Operational Requirements and Capability Analysis**

Report of Findings

May 31, 2019



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Homeland Security Science and Technology



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Report on Satellite Technology Requirements for Wildland Fire Services in the CONUS

August 19, 2020

Lindley, T. T., C. M. Gravelle, S. M. O'Neill, D. C. Daily, W. Schroeder, S. Triplett, C. Belognie, B. Gardunio, and C. Thompson, 2020: Report on satellite technology requirements for wildland fire services in the CONUS. Satellite Data Task Team, Fire Environment Committee, National Wildfire Coordinating Group

NWCG Satellite Data Task Team

Report on Satellite Technology Requirements for Wildland Fire Services in the CONUS

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GEO-XO User Engagement Workshop

NOAA

Fire Workshop Initial Findings

Vanessa M Escobar, Lead Scientist for GEO-XO User Engagement GEO-XO User Engagement Team and the GEO-XO Program June 3-5, 2020

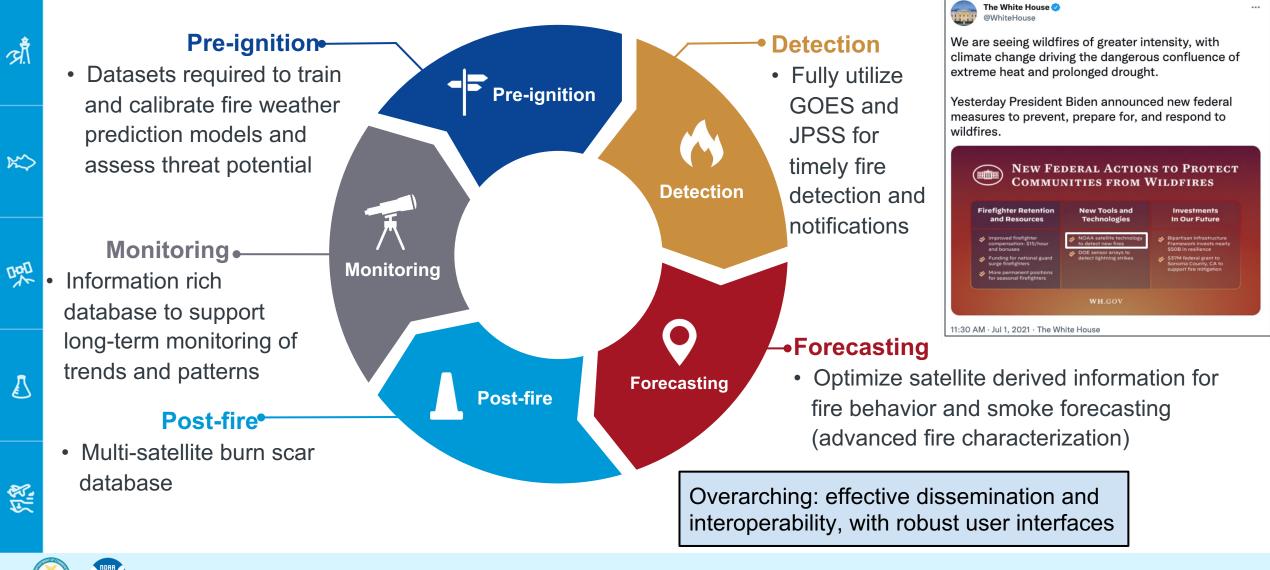




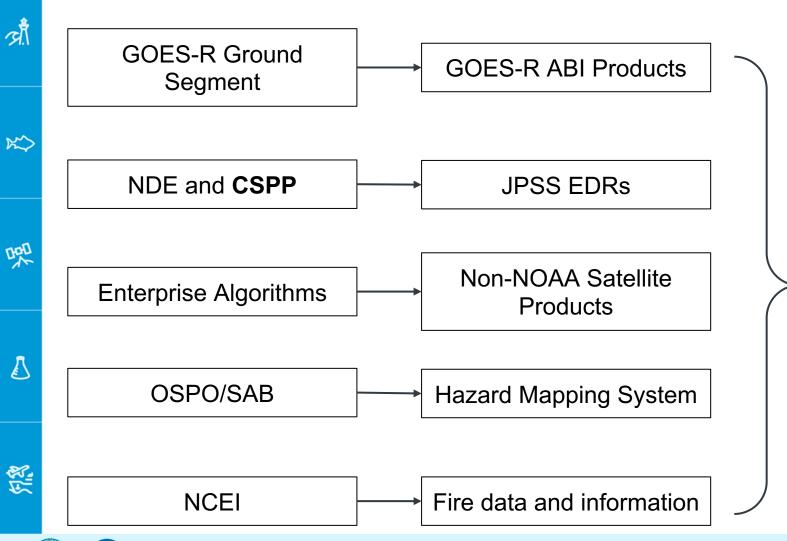




Translate/Assess: High Priority NESDIS Activities



Assess: Current NESDIS Fire Product & Services

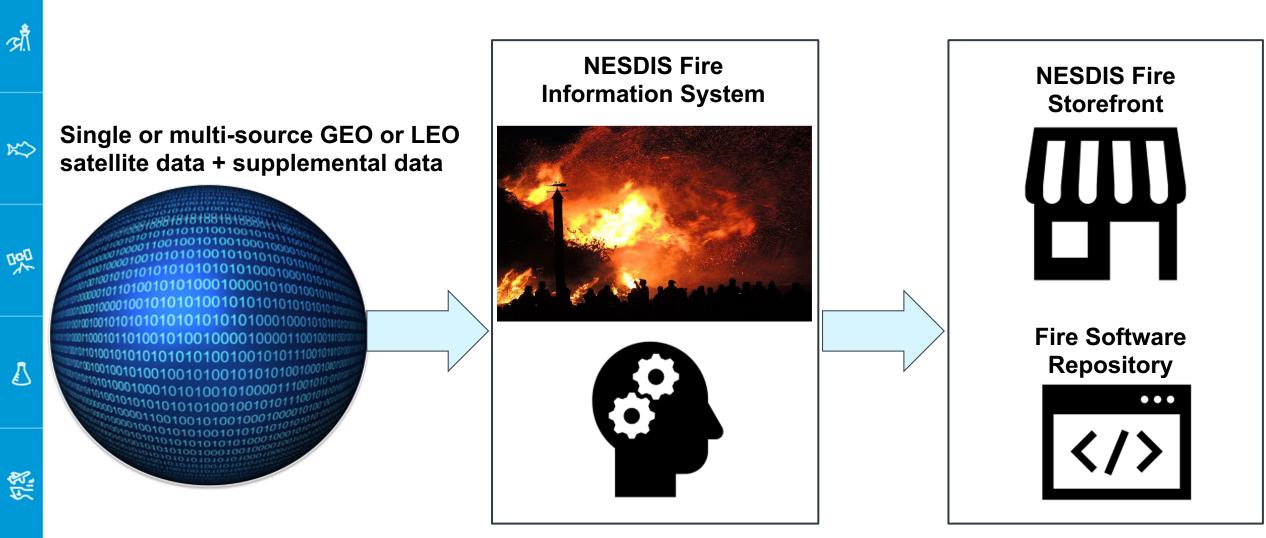


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Assembly required!

Address: Dedicated Fire Information System





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Progress on Address/Deliver/Evaluate: The NESDIS Fire Pilot Project

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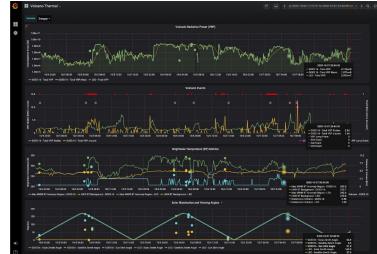
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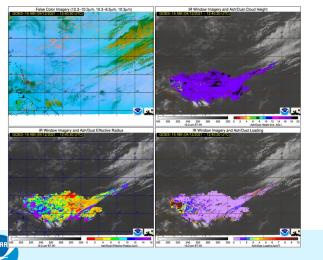


The VOLcanic Cloud Analysis Toolkit (VOLCAT)

Thermal Monitoring

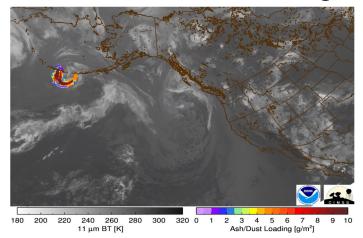


Volcanic Cloud Characterization

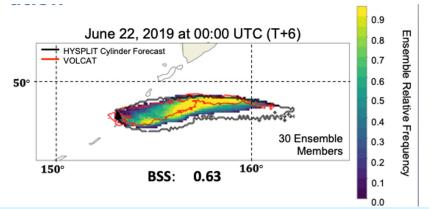


Eruption Alerts AT&T 4G 2:58 PM (410) 000-308 Edit Messag...(2) FaceTime Add Contact Cal Feb 21, 2013 1:25 PM FRM:mpav@ssec.wisc.edu SUBJ:NOAA/CIMSS Volcanic Cloud Alert MSG: 1 ASH ALERT(S) http://volcano.ssec.wisc.e du/alert/report/465 Send

Volcanic Cloud Tracking



Dispersion & Transport Forecasting



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VOLCAT Software Practices

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Automation

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Containerization

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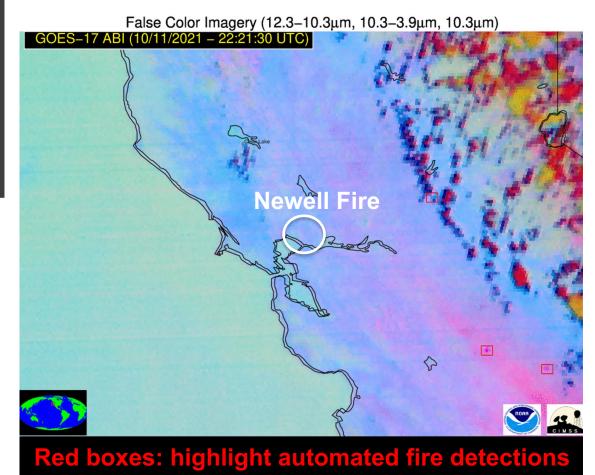
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New experimental automated fire alerting system

Last updated: 01:32:00 UTC		VOLCAT - Wildfire Event Dashboard		0
Fluvanna County, Virginia	Country: USA	NWS WFO Wakefield VA	Most Recent: 43 minutes ago	× 🔺
Garfield County, Oklahoma	Country: USA	NWS WFO Norman OK	Most Recent: 12 minutes ago	× v
Event Age: 12 minutes ago	E	vent Type: Nominal Risk (GOES-16 ABI)	Alert Detail	Imagery
Harper County, Kansas	Country: USA	NWS WFO Wichita KS	Most Recent: 33 minutes ago	× 🔺
Jefferson County, Idaho	Country: USA	NWS WFO Pocatello ID	Most Recent: 23 minutes ago	x 🔻
Event Age: 23 minutes ago		vent Type: Nominal Risk and Fire Weather Watch (GOES-17 ABI)	Alert Detail	Imagery
Modoc County, California	Country: USA	NWS WFO Medford OR	Most Recent: 53 minutes ago	× •
Event Age: 53 minutes ago		vent Type: Elevated SPC Risk and Red Flag Warning (GOES-17 ABI)	Alert Detail	Imagery
Winkler County, Texas	Country: USA	NWS WFO Midland/Odessa TX	Most Recent: 58 minutes ago	× v
Event Age: 58 minutes ago	E	ivent Type: Oil/gas (GOES-16 ABI)	Alert Detail	Imagery

- User configurable web dashboard displays newly detected fire events as a function of NWS fire weather products (e.g. red flag warnings, SPC outlook, etc.)
- Powered by an improved satellite fire detection algorithm

The Newell Fire in Napa, County, CA was detected by the improved NESDIS detection algorithm at 6:12pm PDT on 11 Oct 2021 (fire was first reported at 6:30pm PDT)



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Value of Low Latency Satellite Data

Wildfire Alert Report

Date:	2022-06-07	
Time:	22:55:30	
Production Date and Time:	2022-06-07 22:56:45 UTC	
Primary Instrument:	GOES-17 ABI	
Wmo Spacecraft Id:	664	
Location/orbit:	GEO	
L1 File:	OR_ABI-L1b-RadM1-M6C14_G17_s20221582255256_e20221582255313_c20221582255364.nc	
L1 File(s) - Temporal	OR_ABI-L1b-RadM1-M6C14_G17_s20221582254256_e20221582254313_c20221582254366.nc	
Number Of Thermal Anomaly Alerts:	1	

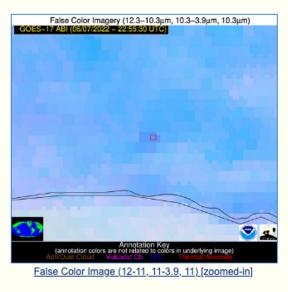
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Basic Information	
State/Province(s)	California
Country/Countries	USA
County/Locality(s)	Santa Barbara County, California
NWS WFO	Los Angeles/Oxnard CA
Identification Method	Enhanced Contextual (Clear)
Mean Object Date/Time	2022-06-07 22:55:30UTC
Radiative Center (Lat, Lon):	34.600°, -120.060°
Nearby Counties (meeting alert criteria):	Santa Barbara County (0.00 km)
Total Radiative Power Anomaly	n/a
Total Radiative Power	30.30 MW
Show More 🔺	View all event imagery »

Fire alerts from 1minute GOES-R GRB data are generated within 90 seconds of acquisition

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Satellite Sensor Agnostic Detection Solution

Higher spatial resolution = Detection of smaller fires



False Color Imagery (12.0–10.8μm, 10.8–3.7μm, 10.8μm) S-NPP VIIRS (07/08/2013 – 04:23:43 UTC)

JPSS VIIRS Data

5 km

Detection of small bonfire near Rio de Janeiro

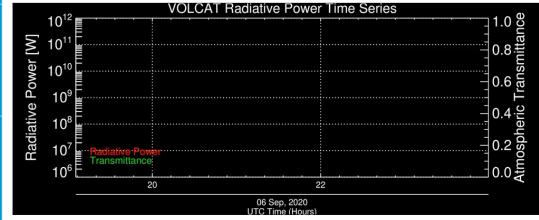
Stock photo

GOES-17 ABI (09/06/2020 - 19:05:30 UTC)

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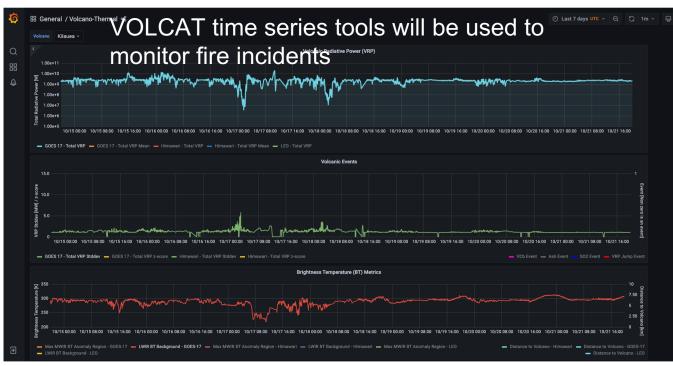
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Near continuous fire intensity monitoring

By tracking fire detections over time and correcting for atmospheric attenuation (including clouds), fire radiative power (FRP) can be monitored in a near continuous manner from GEO satellites





Current GEO:

GOES-16 ABI GOES-17 ABI GOES-18 ABI Meteosat-11 SEVIRI Meteosat-8/9/10 SEVIRI Himawari-8/9 AHI GEO-KOMPSAT-2A AMI

Current LEO: SNPP VIIRS NOAA-20 VIIRS Terra-MODIS Aqua-MODIS Metop-B AVHRR Metop-C AVHRR Sentinel-3a SLSTR Sentinel-3b SLSTR

Upcoming: GOES-U ABI MTG-I1 FCI JPSS-2 VIIRS Metop-SG A1 - Metimage WildfireSat

Currently supported Will be supported in the future

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Next Step: Kickoff transformation projects

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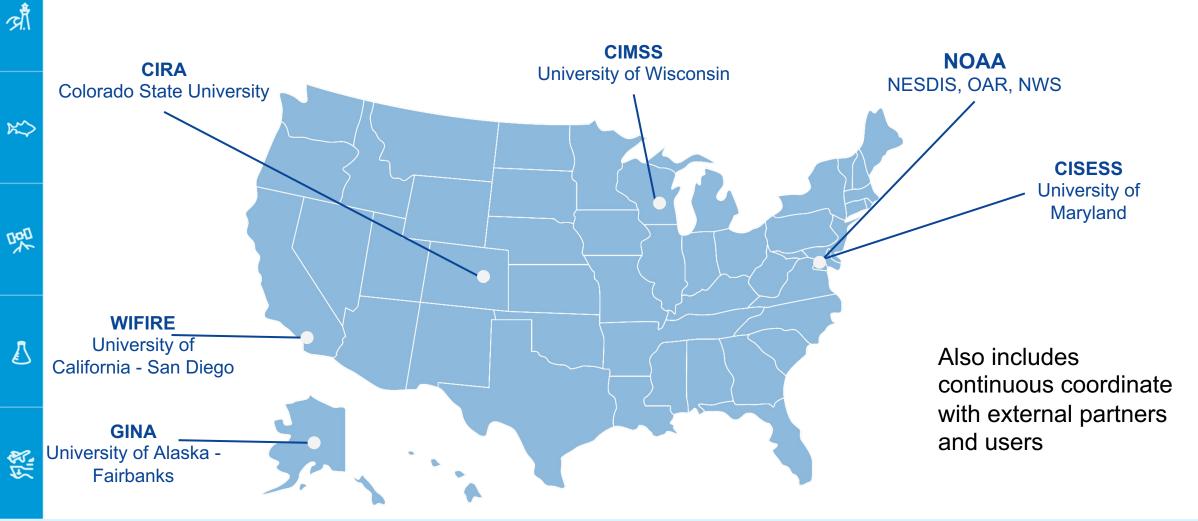
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Disaster Relief Supplemental Act (2022-2024) Infrastructure Investment & Jobs Act (2022-2025)



Fire Product & Services Transformation Team

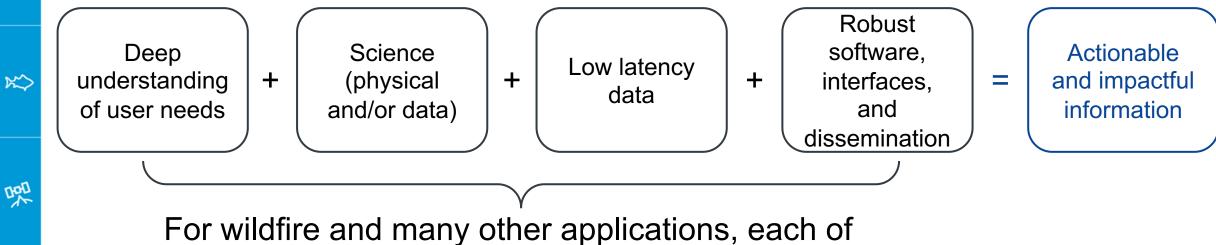






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Impactful Service Delivery for Time Sensitive Applications:



these must be in place to achieve impact goals

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Processing at direct readout sites should be part of the equation in order to realize the full potential of satellite assets



Extra Slides

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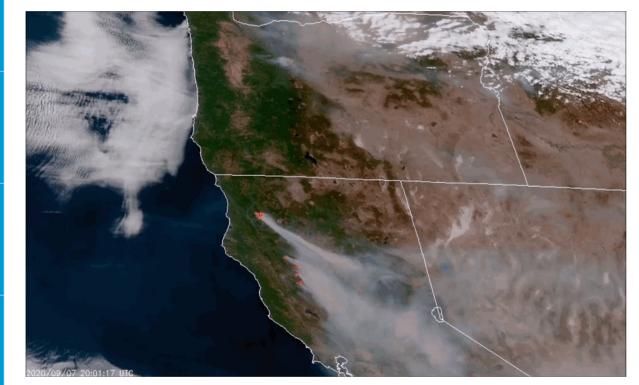
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Translate: NOAA Satellite Capabilities

GOES-R Series - Geostationary

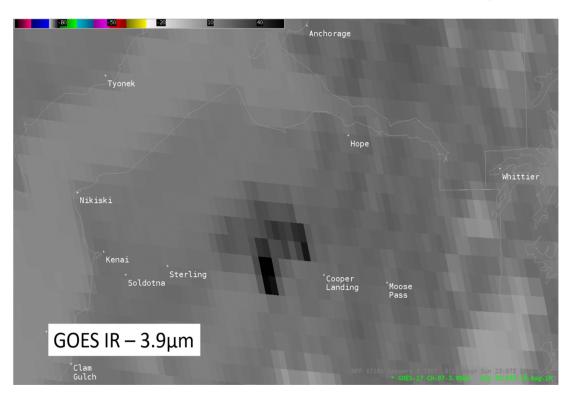


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Oregon and California Fires, September 7 – 9, 2020 GOES-East and West provides nearly continuous observations of fires at a 2-3 km resolution (function of latitude ~6 km in central Alaska)

JPSS Series - Polar orbiting



Spatial resolution is important - JPSS polar orbiting satellites are particularly critical for higher latitudes -Next generation GEO-XO will improve GOES-R spatial resolution by 4X



Value of Low Latency Satellite Data

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FireGuard Detection - California /Santa Barbara County

1 message

donotreply@eros.nwcg.gov <donotreply@eros.nwcg.gov> To: Mike.Pavolonis@noaa.gov

Tue, Jun 7, 2022 at 6:05 PM

The GOES-R based fire ignition alerts often precede independent alerts from the DoD-based FireGuard system by 5-15 minutes

Hello, this email is to inform you that FireGuard has detected heat in an area where you expressed ir ****PLEASE DO NOT RESPOND TO THIS EMAIL!!!!

GACC	OSCC
Dispatch	Santa Barbara Dispatch Center
County	Santa Barbara
State	California
Coordinates	Lon: -120.0743, Lat: 34.5934
DPA/Jurisdiction	STATE
Heat Detection Acres	2.72
Temperature	77
Relative Humidity	41
Wind Speed	4.63
Wind Direction	W

Wildfire Alert Report

Date:	2022-06-07
Time:	22:55:30
Production Date and Time:	2022-06-07 22:56:45 UTC 5:57 PM
Primary Instrument:	GOES-17 ABI
Wmo Spacecraft Id:	664
Location/orbit:	GEO
L1 File:	OR_ABI-L1b-RadM1-M6C14_G17_s20221582255256_e20221582255313_c202215822553564.nc
L1 File(s) - Temporal	OR_ABI-L1b-RadM1-M6C14_G17_s20221582254256_e20221582254313_c20221582254366.nc
Number Of Thermal Anomaly Alerts:	1
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NESDIS Value Proposition

- Deep knowledge of satellite data and a long history of fire product development
- Operational mission
 - Trusted source of environmental intelligence (including transparency)
 - Ability to scale capabilities
 - Strong partnerships and user engagement
 - Critical piece of the coordinated NOAA contribution

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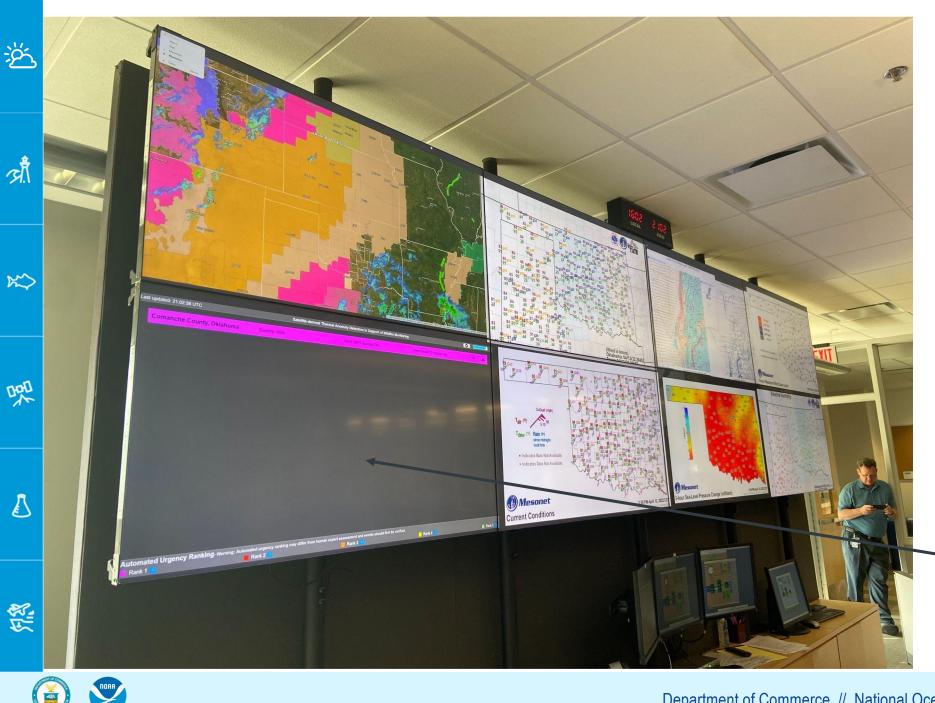
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Committed to codevelopment with user community

NRT demonstrations enable effective codevelopment

Prototype NESDIS fire ignition dashboard on the situational awareness wall at the NWS Norman, OK WFO during a wildfire outbreak day in April 2022

Product Centric Framework

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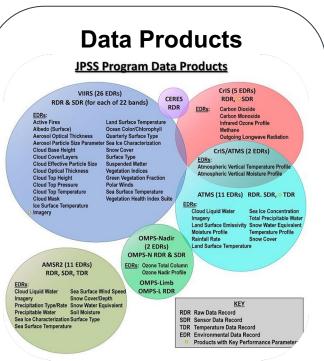
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Satellite Sensor and Ancillary Data



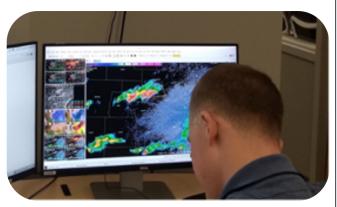
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Satellite and sensor requirements are based on stakeholder needs and support a large range of applications



Science algorithm development is primarily focused on geophysical data products with generic requirements

Product-side User Engagement



Integration of geophysical data products into user applications mainly occurs after algorithm development

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Cross-cutting Impact Goals

- Provide satellite-derived information that helps improve the timeliness of the response to a new fire incident
- Enhance fire monitoring and forecasting in support of incident management
- Enable the development of improved fire emission databases and smoke forecasting models
- Streamline fire product and information access
- Better understanding of long-term fire trends and patterns
 - More responsive to evolving user needs

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