



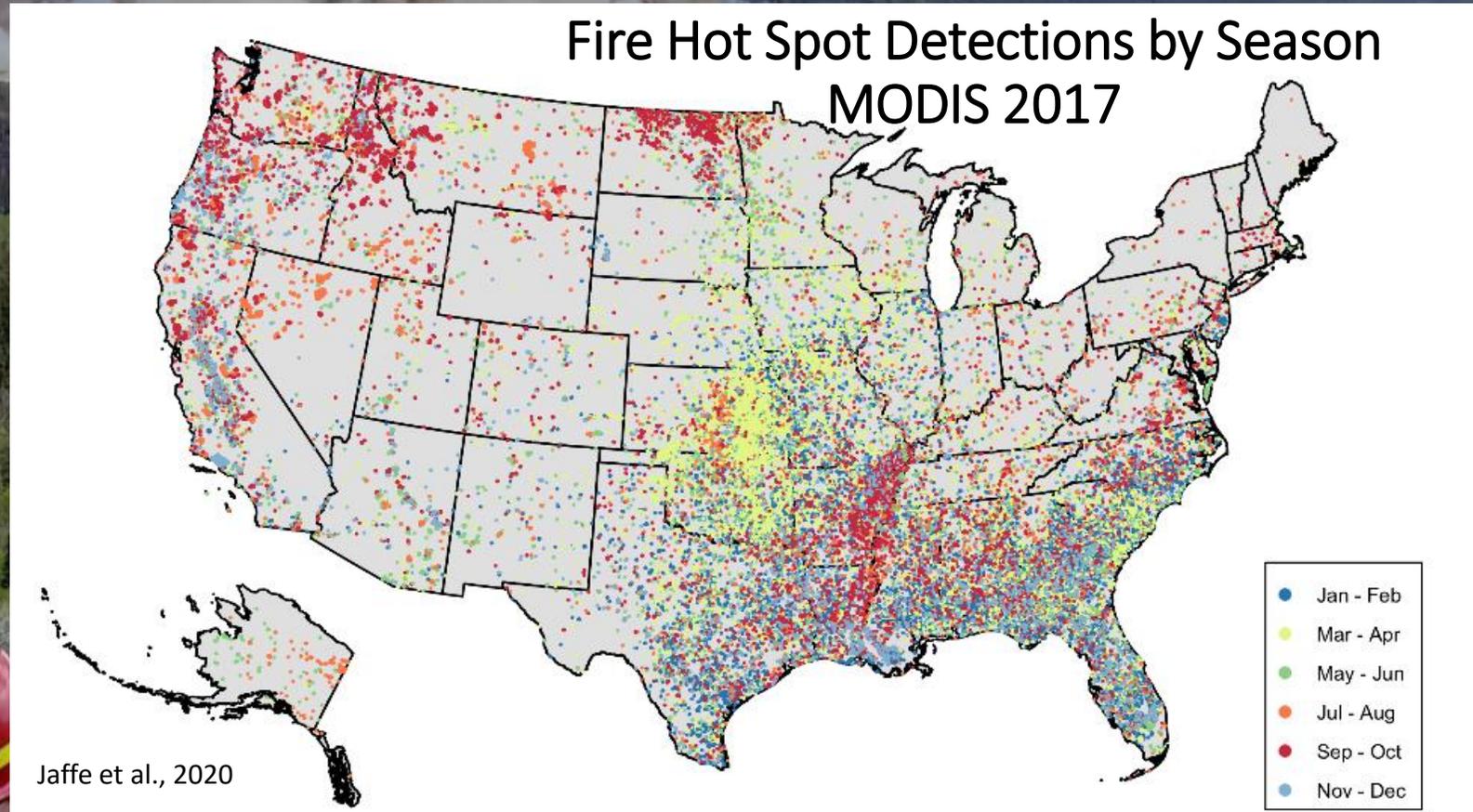
Panel 3: Smoke from Wildland, Prescribed, and Agricultural Fires

Susan M. O'Neill

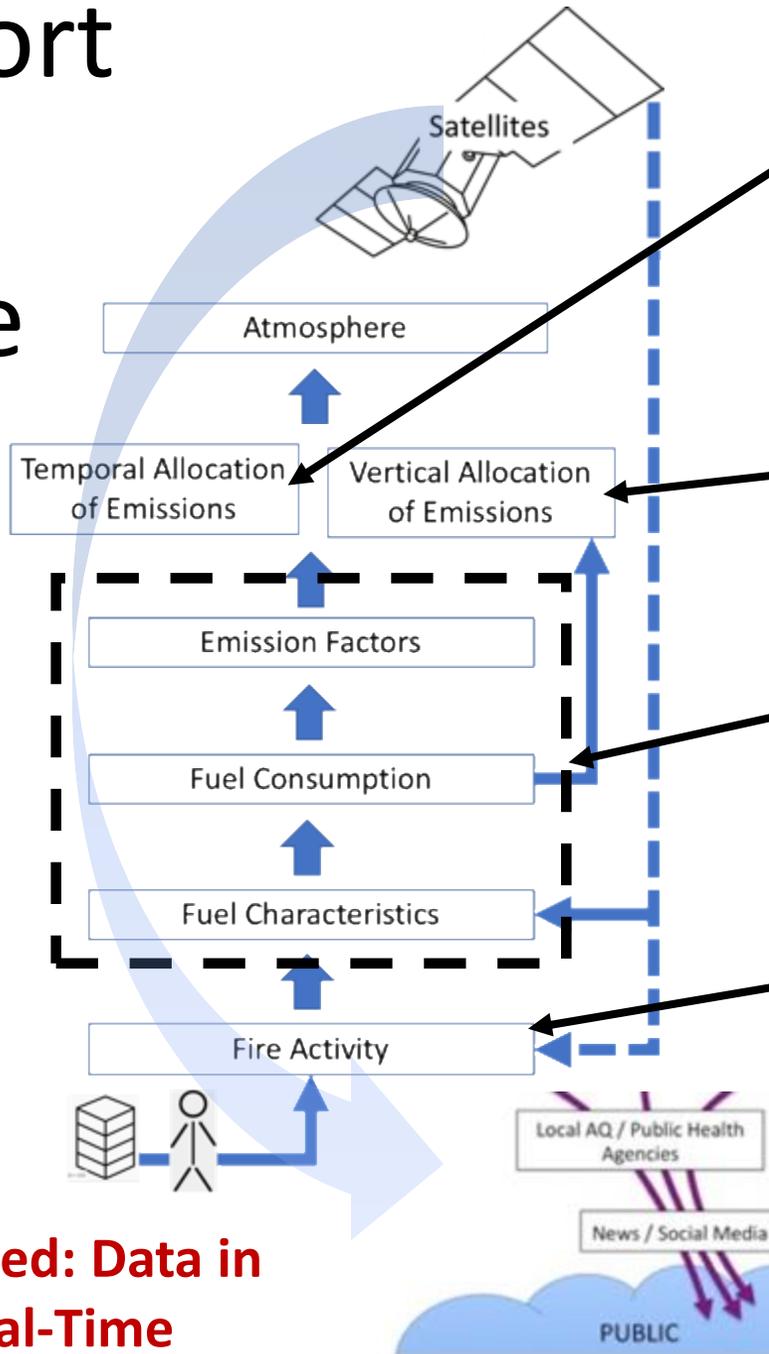
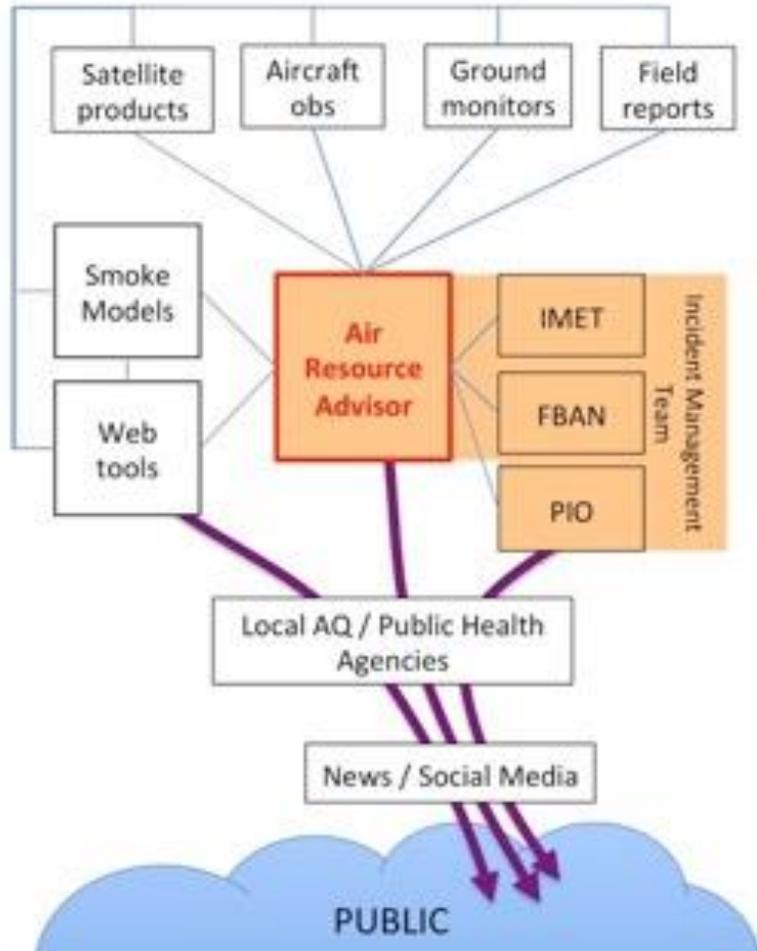
USDA Forest Service, Pacific Northwest Research Station

NASA Aerosol, Cloud, Convection and Precipitation Workshop

March 2021



Decision Support Tools for Wildland Fire



Need: Data in Real-Time

GOES-16 FDC, FRP

- Product: GOES Fire and Smoke Tool (GoFAST), Fire Behavior
- Custom Modeling for Air Resource Advisors
- Li et al. 2019

CALIPSO, CATS, MAIAC, MISR FRP, Plume Rise Methods

- **Vertical Allocation (!)**
- Support Aviation, Visibility

Ground-based versus satellite-based emissions calculations

- NASA FEER Algorithm

MODIS, VIIRS, GOES-16/17

- Product: 2018 CA Fire EI
- Persistence Assumption
- **Source (Smoke) Apportionment**

Mueller et al. 2020

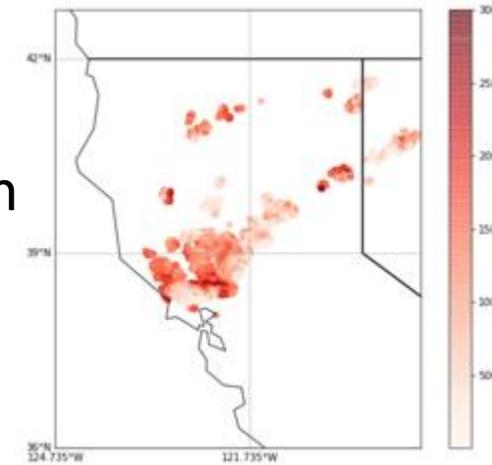
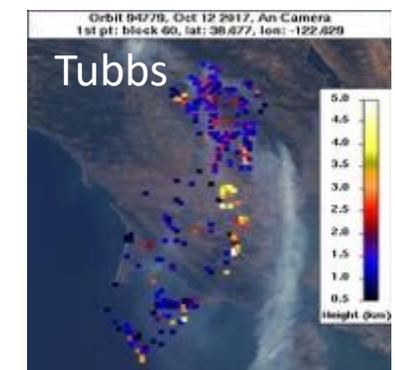
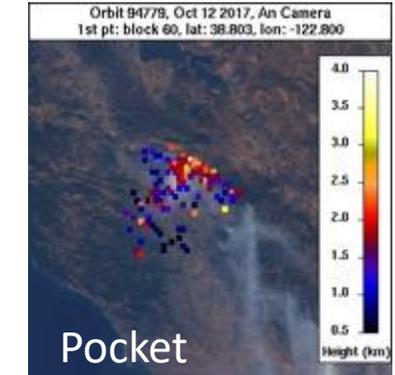
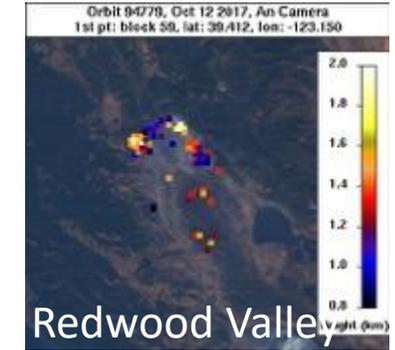
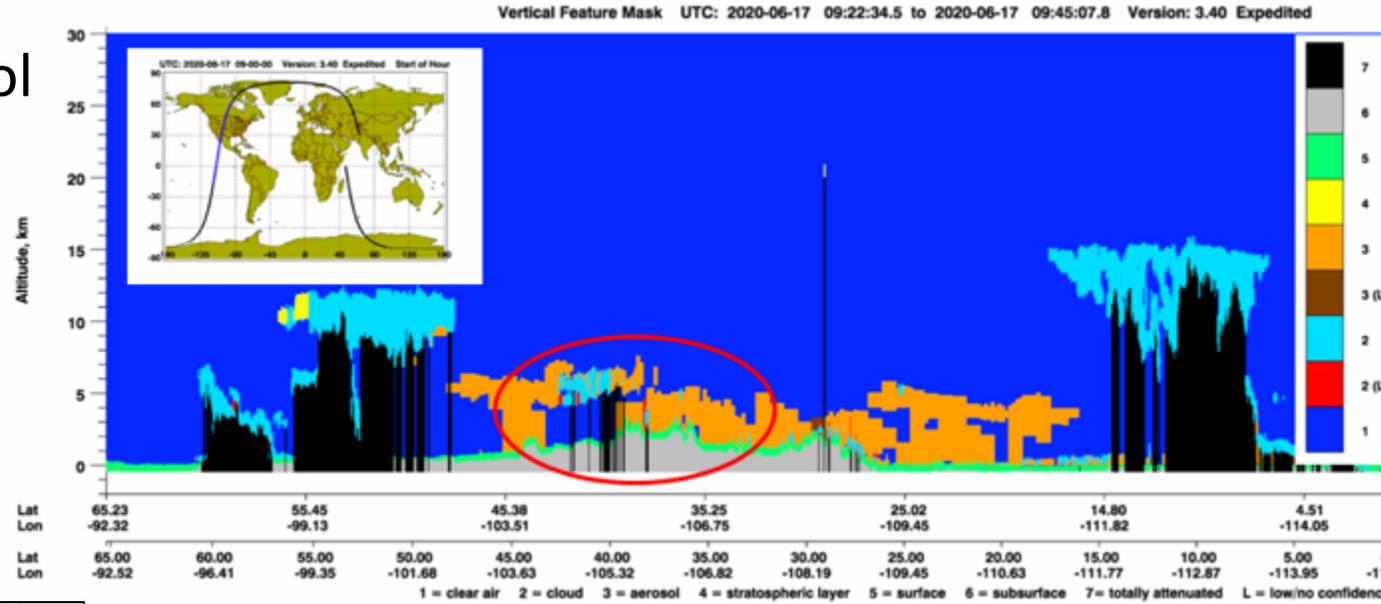
Data Fusion

- AOD, AQ Model, Surface Obs
- Health Impact Analyses

Remote-Sensing: Plume Top, Vertical Plume Extent

Multi-angle Imaging SpectroRadiometer (MISR)

Cloud-Aerosol LiDAR with Orthogonal Polarization (CALIOP)



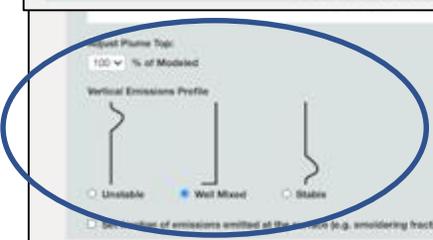
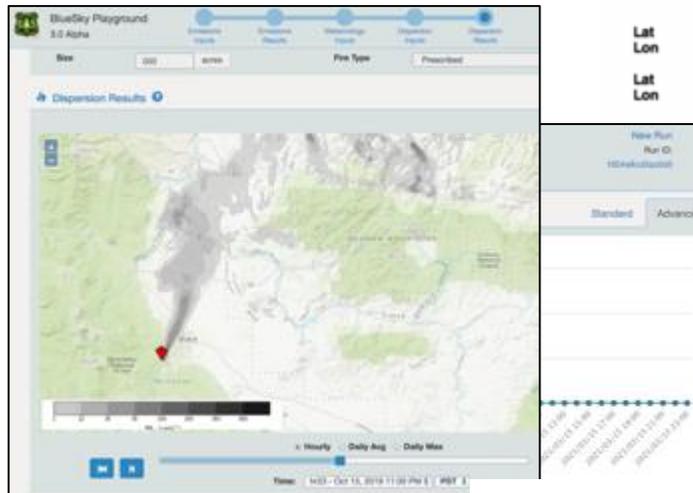
Mohammad Al-Hamden, NASA

Mika Tosca, NASA, School of the Art Inst. of Chicago

Multi- Angle Implementation of Atmospheric Correction (MAIAC) MODIS Collection 6

Mallia et al. 2018 – Gaussian Vertical Distribution

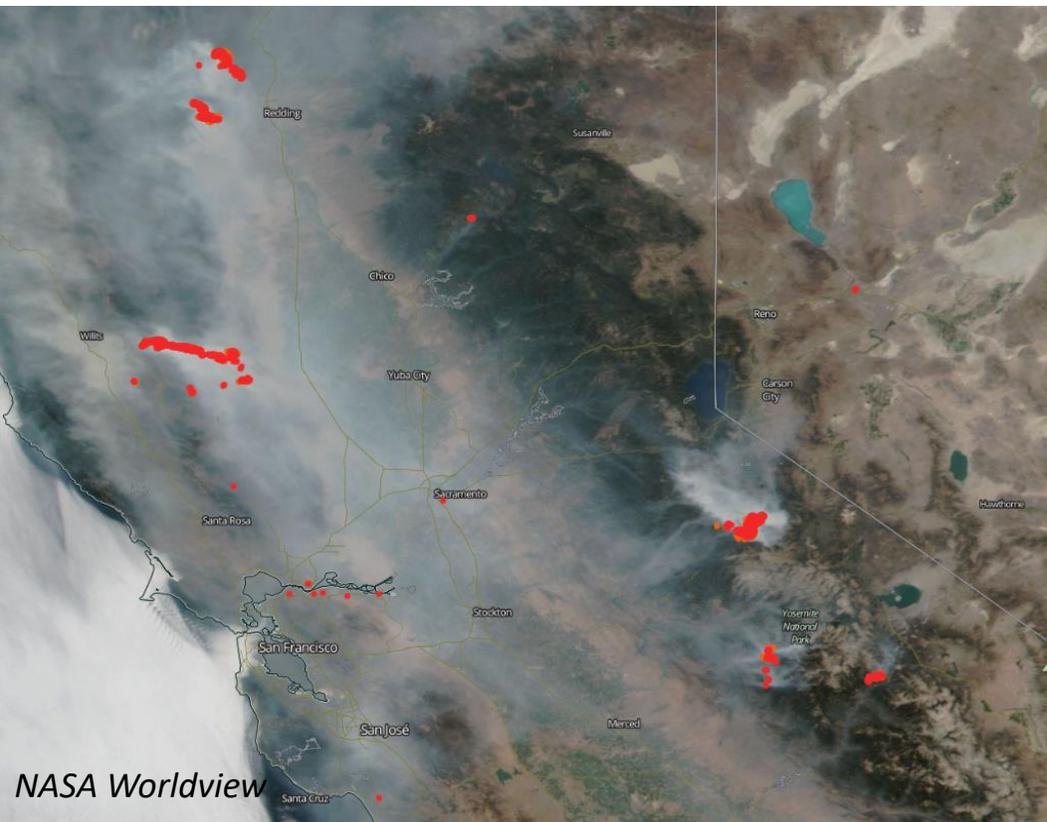
Hands-on Smoke Modeling (BlueSky Playground v3)



Smoke Source Apportionment

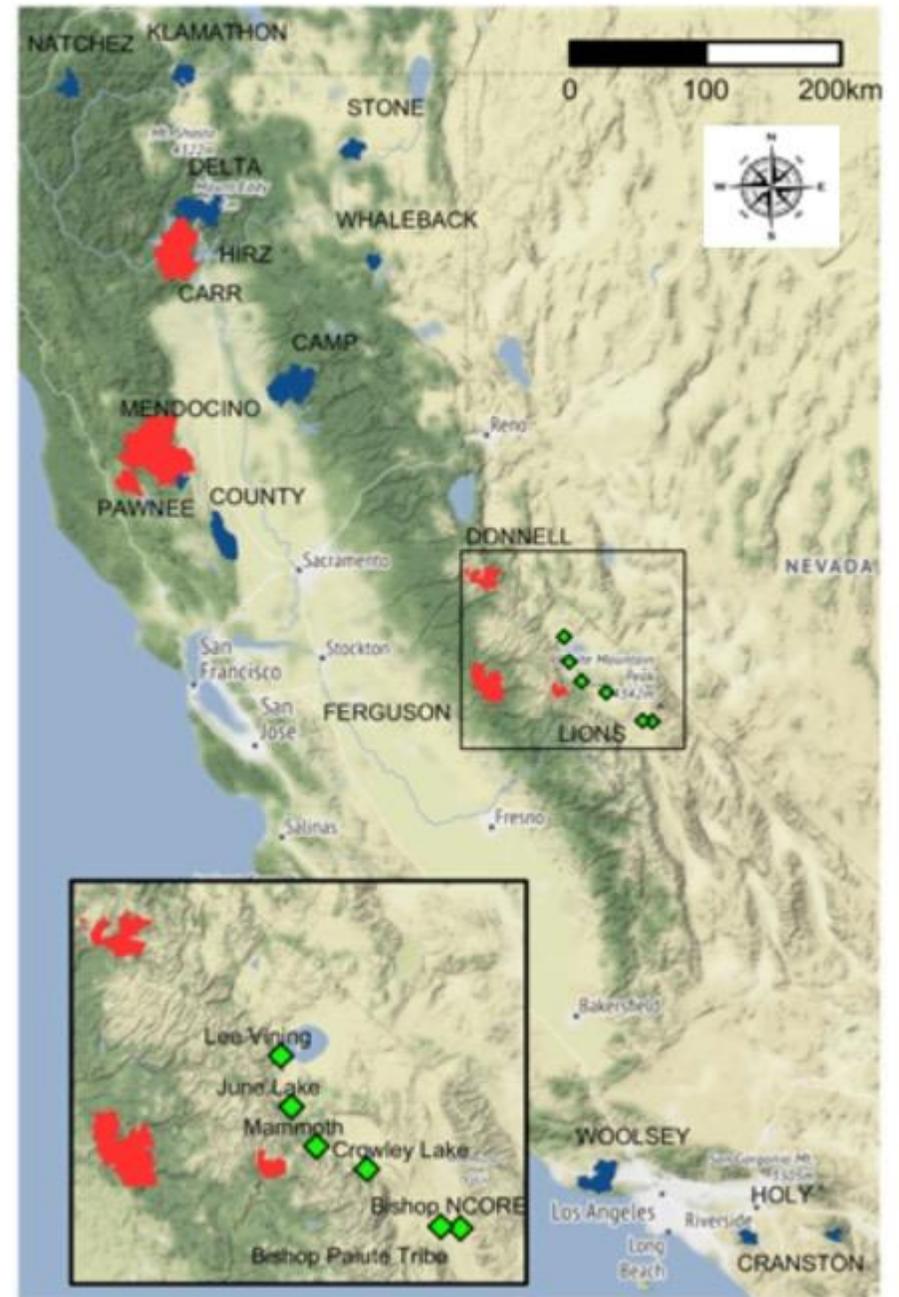
Supporting wildfire management for resource benefit

- Satellite Data Need: Information about the aerosol type – new or fresh smoke?.



- MODIS & VIIRS for fires < 12K acres
- GOES-16 for 18 Wildfires > 12K acres

Mueller et al. 2020



Online Training Videos

Satellite Data for Smoke and Fire

<https://www.airfire.org/projects/haqast/2017NorthernCAWildfiresTT/training>

Part 1: The Basics of Satellite Data for Smoke and Fire

Part 2: The Basics of Satellite Data for Smoke and Fire

Summary Table of Satellites, Satellite Instruments, and Products for Smoke and Fire

(discussed at the end of video Part 2)

Year	Instrument	Platform	Resolution	Swath Width	Repeat Cycle	Cloud Top	Cloud Optical Depth	Cloud Microphysics	Cloud Vertical Structure											
2002	MODIS	Terra	250m	2330km	1 day	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
2002	MODIS	Aqua	250m	2330km	1 day	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
2002	MODIS	Terra	250m	2330km	1 day	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
2002	MODIS	Aqua	250m	2330km	1 day	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
2002	MODIS	Terra	250m	2330km	1 day	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
2002	MODIS	Aqua	250m	2330km	1 day	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
2002	MODIS	Terra	250m	2330km	1 day	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
2002	MODIS	Aqua	250m	2330km	1 day	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
2002	MODIS	Terra	250m	2330km	1 day	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
2002	MODIS	Aqua	250m	2330km	1 day	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes



View video [here](#) (6 min)



View video [here](#) (10 min)

Click [here](#) to enlarge image

NASA Worldview for Fire

Colorado State University CIRA RAMMB Slider

College of DuPage Satellite and Radar Tools



View video [here](#) (18 min)



View video [here](#) (9 min)



View video [here](#) (9 min)

What is a polar orbiting versus geostationary satellite?
 What are the instruments on commonly used satellites?
 What are the products from these instruments?



Thank you!
 Daegan Miller (University of Wisconsin),
 Mark Fitch (National Park Service),
 Pawan Gupta (NASA ARSET)
 NASA HAQAST

