

Smoke Monitoring from Space

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Satellite Remote Sensing of Dust, Fires, Smoke, and Air Quality, July 10-12, 2018

Learning Objectives

By the end of this presentation, you will be able to:

- describe existing satellite capabilities for smoke monitoring
- describe available smoke products and their applications



Fires in Pictures – Google Image Search



Forest Fires in Pictures - Google Image Search



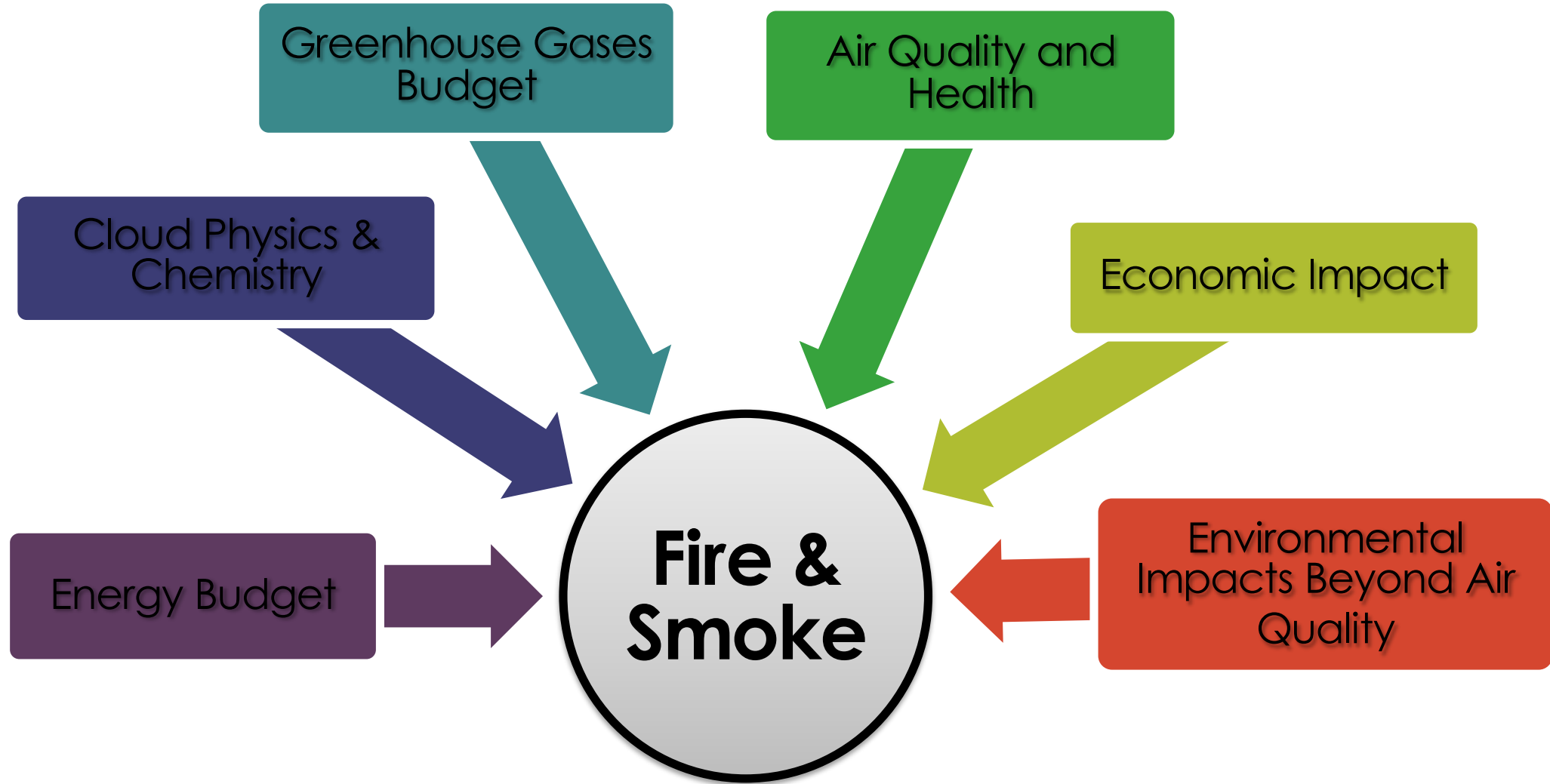
Agriculture Fires in Pictures - Google Image Search



Waste Burning in Pictures - Google Image Search

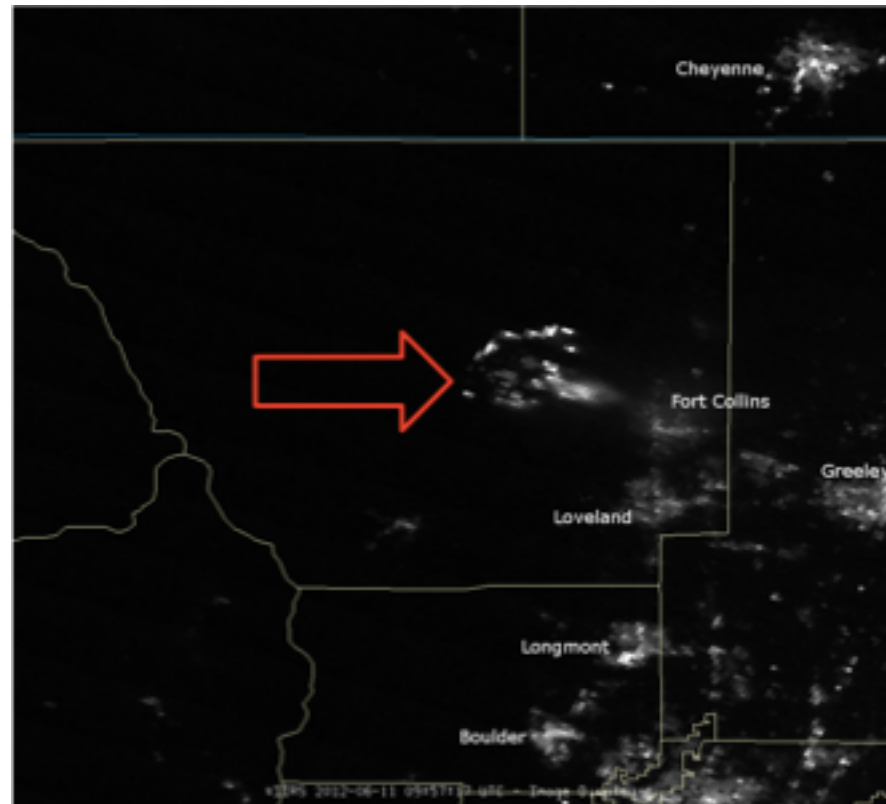


Importance of Smoke and Fire Monitoring

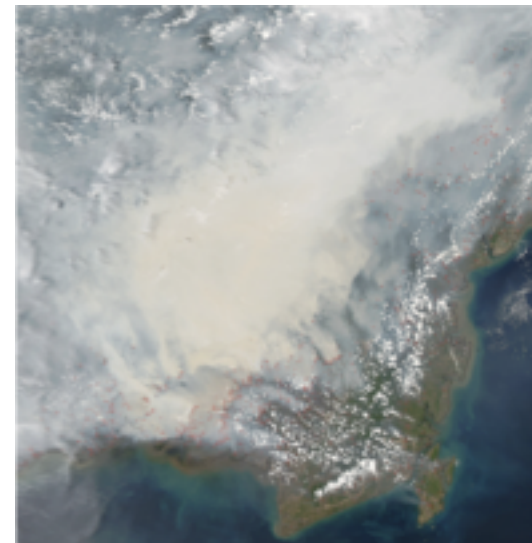
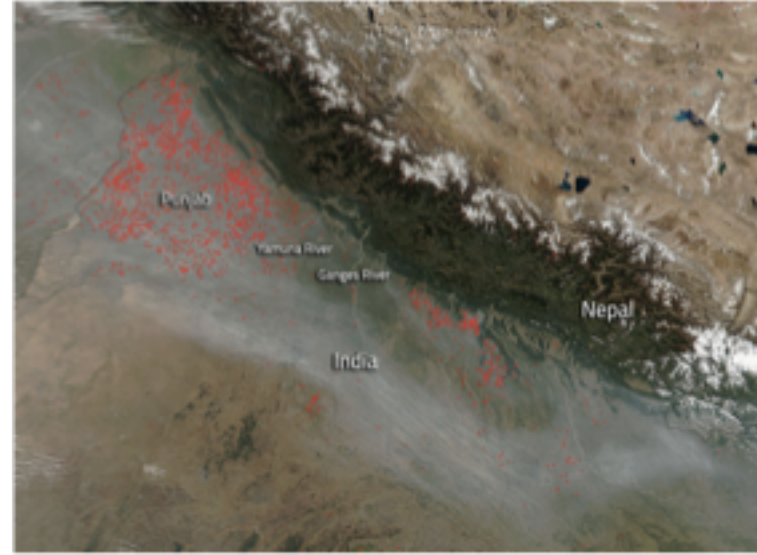


Fire Detection From Satellites

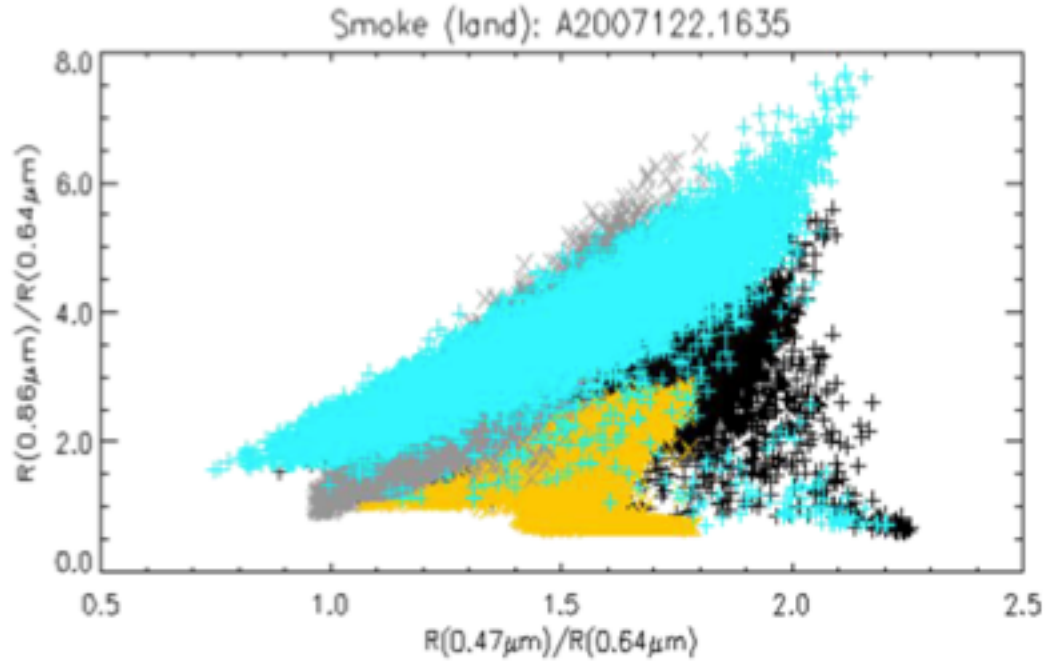
- By detecting smoke
- By detecting temperature anomalies
- By detecting light



Visible Smoke From Fires



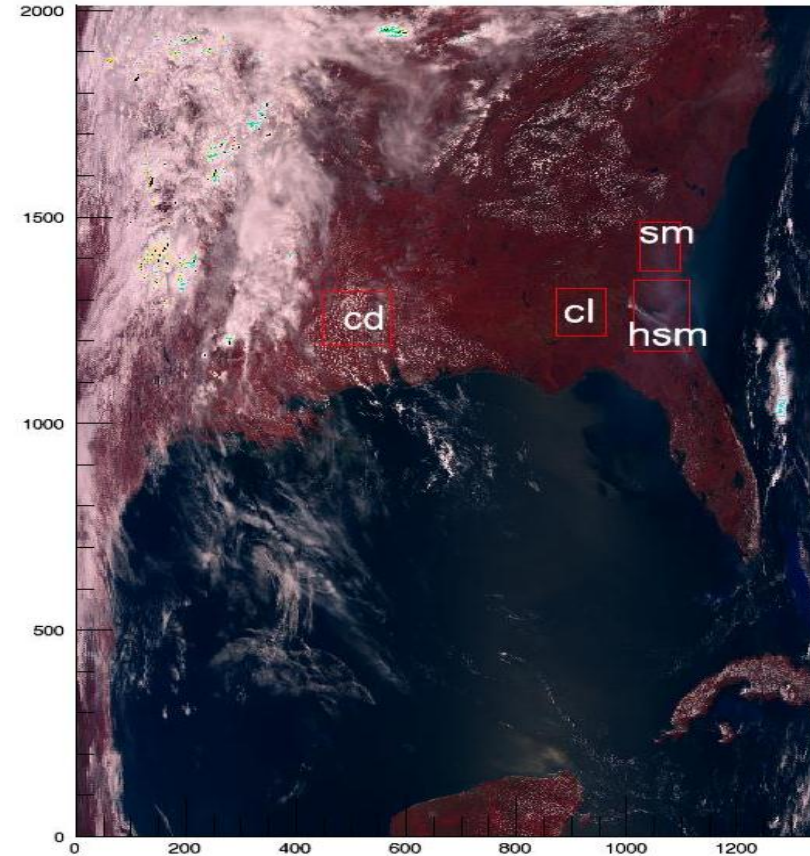
Spectral Signatures - Smoke Over Land



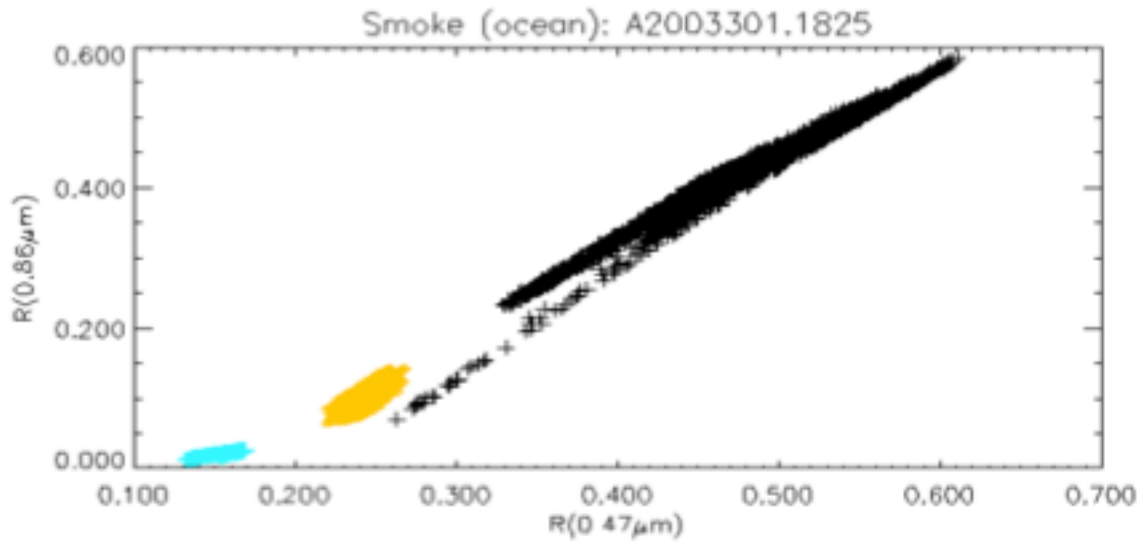
Clear sky
Smoke
Heavy smoke
Clouds

Smoke Case (May 2, 2007; 16:35UTC; Terra)

RGB (2007122.1635)

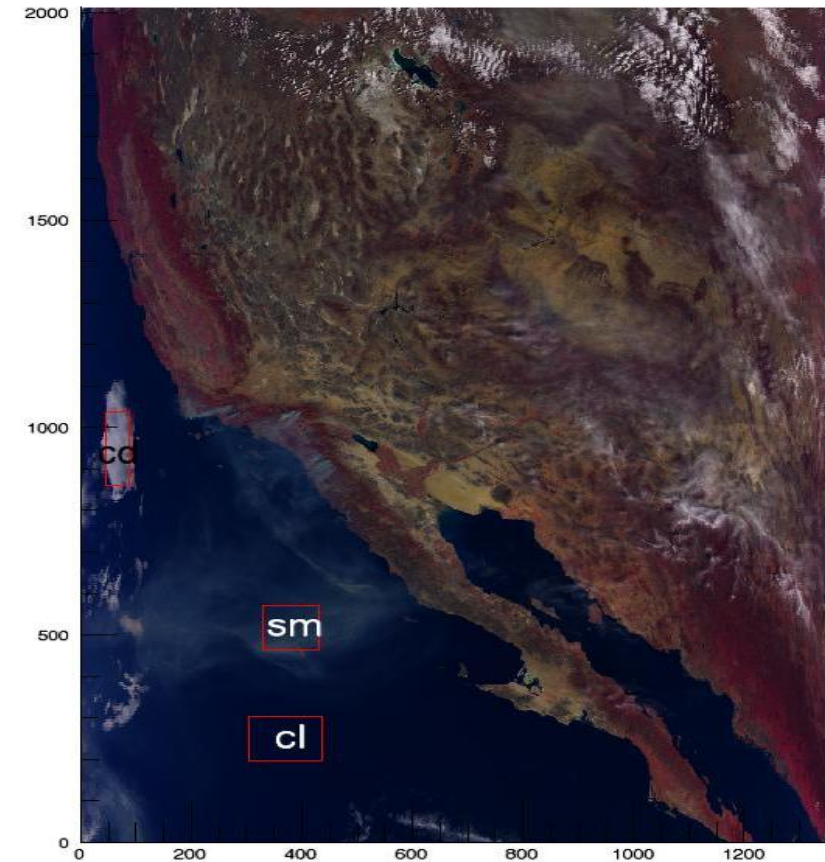


Spectral Signatures - Smoke Over Ocean

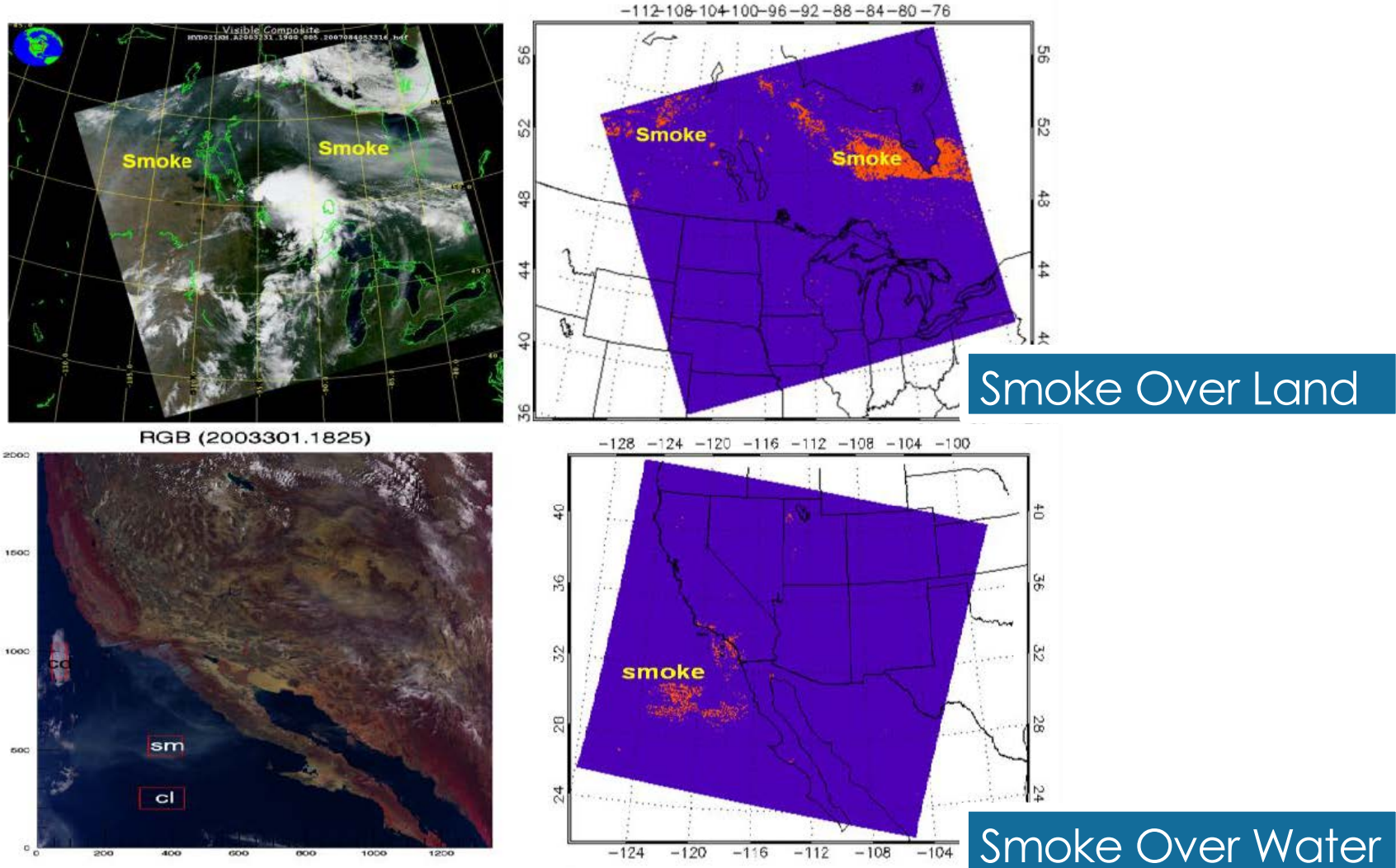


Clear sky
Cloud
Smoke

Smoke Case (Oct. 28, 2003; 18:25UTC; Terra)
RGB (2003301.1825)

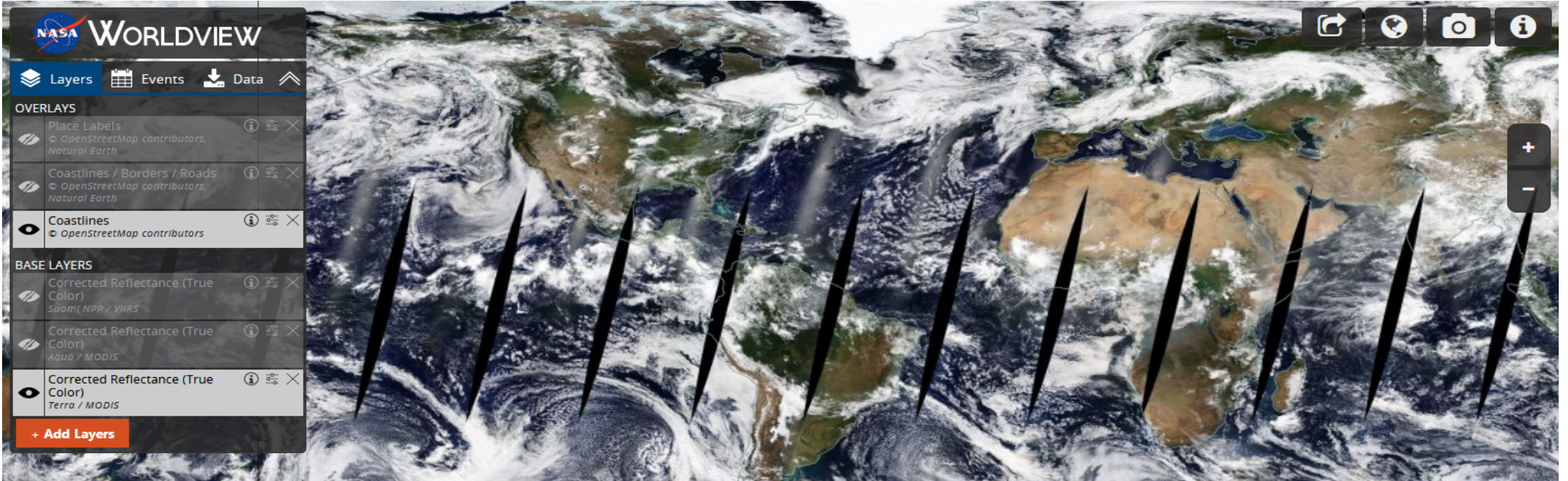


Smoke Detection Example (Zhao et al., 2010)



Smoke Monitoring Tools – Worldview

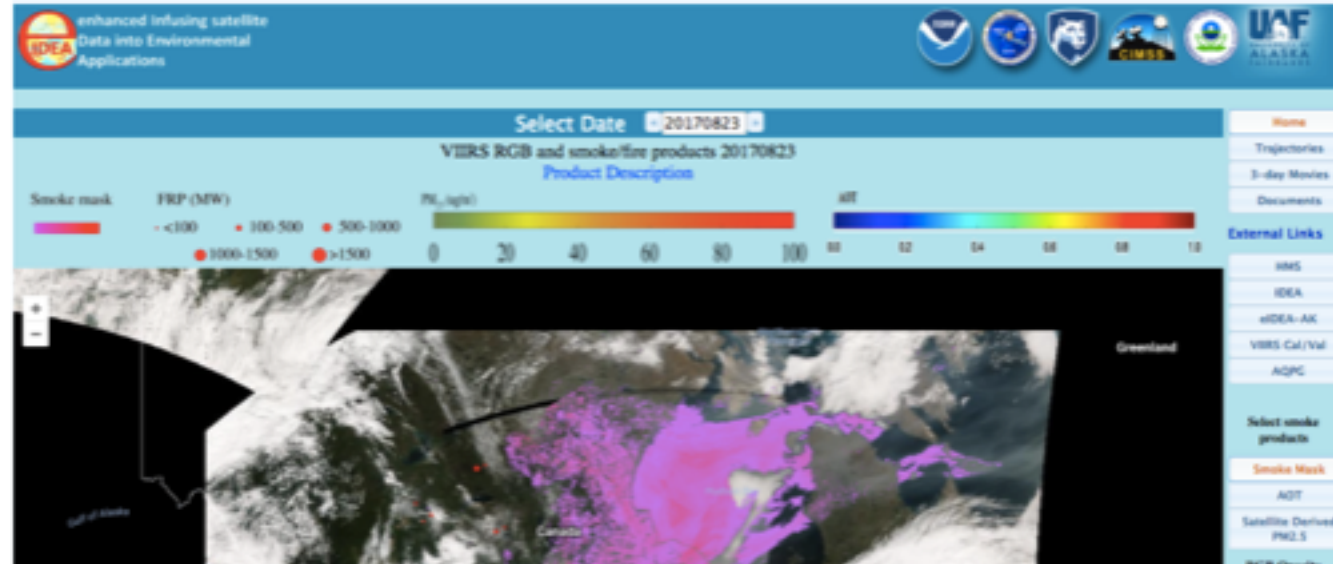
NRT Data & Image Access



- Visible Imagery (MODIS, VIIRS)
- Fire Detection (MODIS, VIIRS)
- Aerosol Optical Depth (MODIS, OMI, MISR)
- Aerosol Index (OMI)
- Day-Night Band (VIIRS)

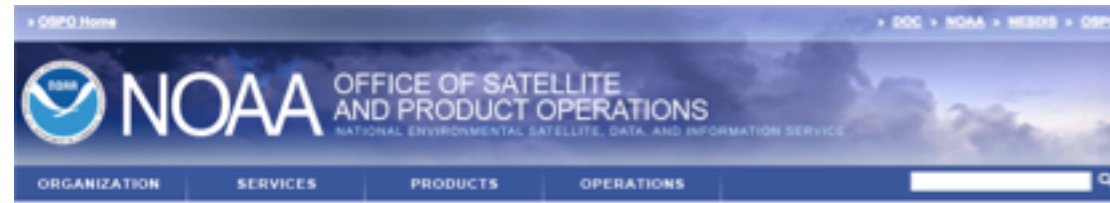


Smoke Monitoring Tools – eIDEA



- Visible Imagery (VIIRS, only US & Canada)
- Smoke Mask
- Aerosol Optical Depth
- AirNOW PM2.5
- Satellite derived PM2.5

NOAA's Hazard Mapping System



Hazard Mapping System Fire and Smoke Product

Current HMS Analysis

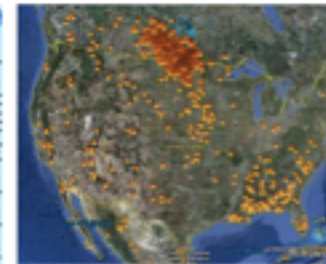
Analysis for day 8/23/2017 last updated at 8/23/2017 21:20:44 GMT



Current HMS Fire and Smoke Analysis

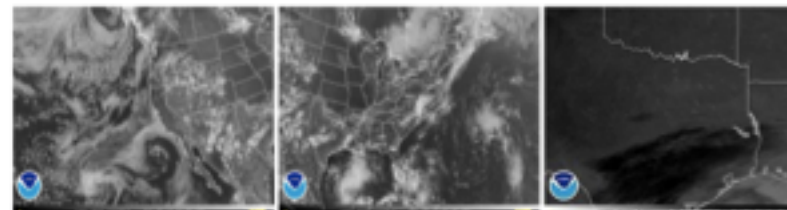


Download GIS files from <http://hatespace.noaa.gov/FIRE/HMSGIS/>



Google KML files: [Fire](#) | [Smoke](#) | [Hotell](#)

Real-Time Satellite Imagery



GOES West

GOES East

Active Fire Product Imagery

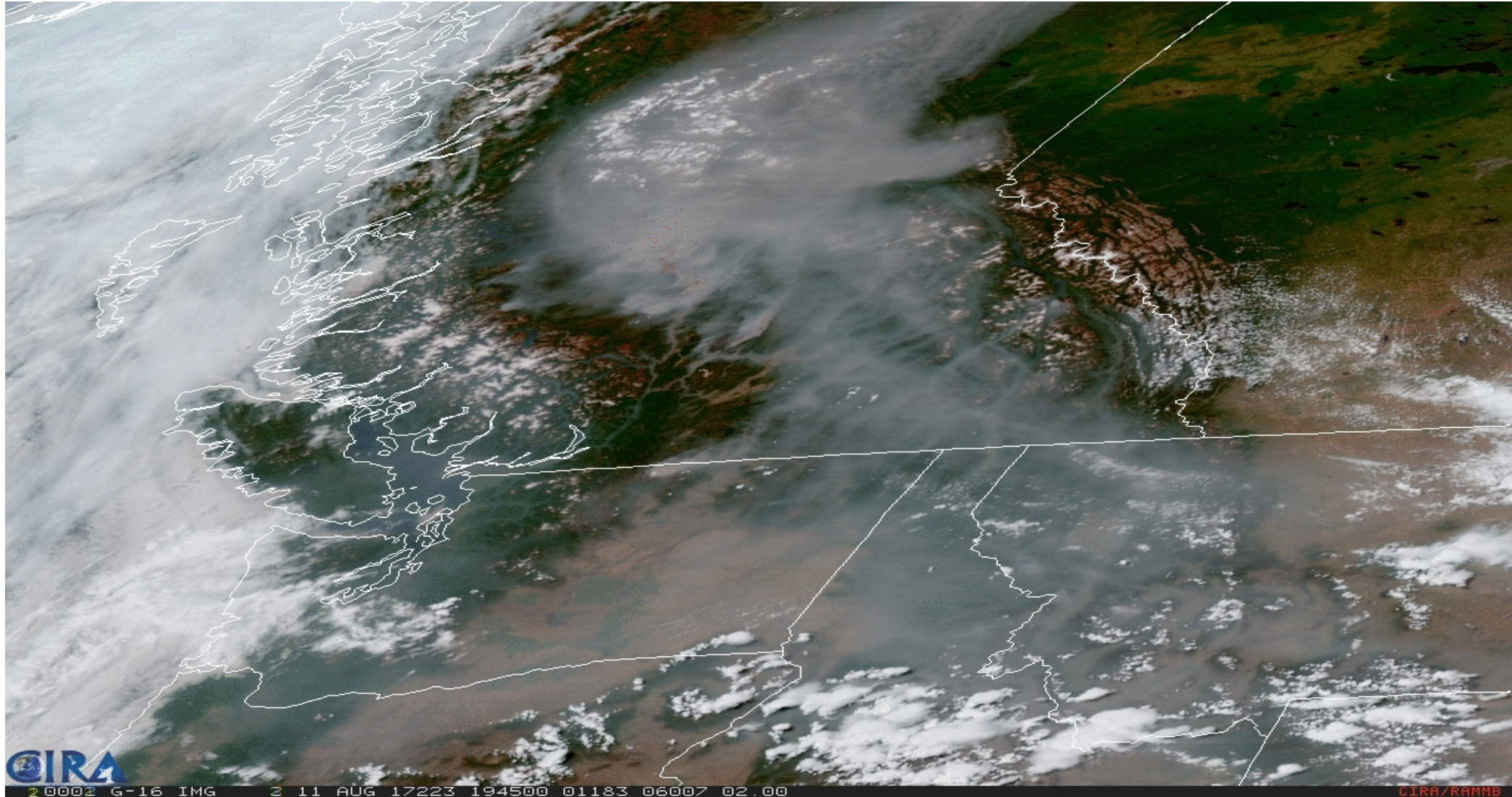
<http://www.ospo.noaa.gov/Products/land/hms.html>

Smoke Monitoring Tools – MISR Plume Height

<https://mISR.jpl.nasa.gov/aetData/accessData/MisrMinxPlumes2/>

The screenshot displays the MISR Plume Height Project 2 website. At the top, the NASA logo and Jet Propulsion Laboratory (California Institute of Technology) branding are visible. A navigation menu includes links for JPL HOME, EARTH, SOLAR SYSTEM, STARS & GALAXIES, and SCIENCE & TECHNOLOGY. The main header features the MISR logo and the text "Multi-angle Imaging SpectroRadiometer". A search bar is located on the left side of the page. The central content area is titled "ACCESS DATA" and "MISR Plume Height Project 2". Below this, the "MISR Plume Height Project" is introduced, listing the project team: David Nelson, Sebastian Val, Ralph Kahn, Ernest Koeberlein, Mike Tosca, David Diner, and Cecelia Lawshe. A note indicates that data is digitized with earlier versions of MINX. Three radio buttons allow users to filter by "Wildfire smoke plumes" (selected), "Volcanic plumes", and "Dust plumes". A "Search" button is provided. Below the search options, a section titled "Fast Search for All Plumes in a Clicked Region" features a world map with color-coded regions: North America (green), South America (yellow), Europe (purple), Africa (blue), and Asia (red).

GOES-R or GOES-16



Smoke Monitoring Tools – MISR Plume Height

<https://mISR.jpl.nasa.gov/getData/accessData/MisrMinxPlumes2/>

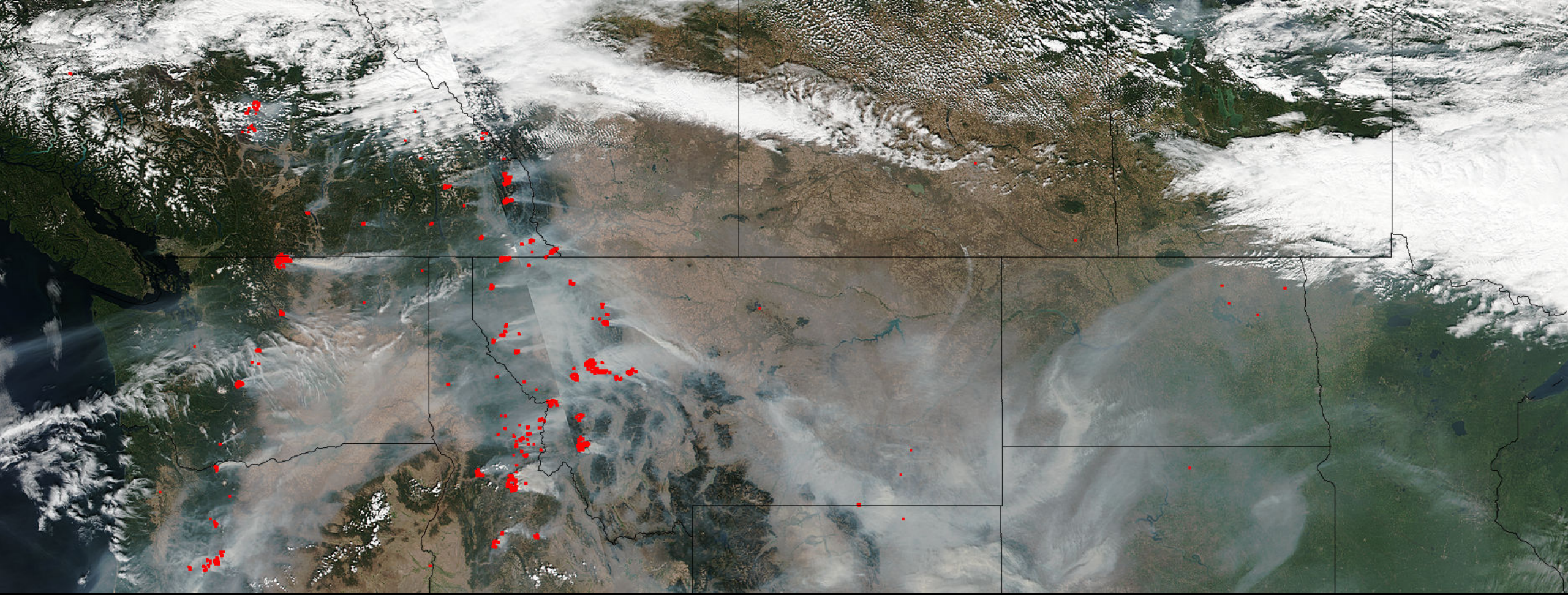
The screenshot displays the NASA Jet Propulsion Laboratory website for the MISR Plume Height Project 2. The header includes the NASA logo, the text "Jet Propulsion Laboratory California Institute of Technology", and navigation links for "JPL HOME", "EARTH", "SOLAR SYSTEM", "STARS & GALAXIES", and "SCIENCE & TECHNOLOGY". Below the header is a banner for "MISR Multi-angle Imaging SpectroRadiometer" with a satellite image. A left sidebar menu contains links for "Home", "Mission", "Get Data" (with sub-links for "Access Data", "MISR Plume Height Project", "MISR Plume Height Project 2", "MISR Data System", "Product Maturity Levels", and "Local Mode Data"), "Gallery", "News and Events", "Publications", "FAQs", "Ask a Question", "About Us", "Other Resources", and "Internal". The main content area is titled "ACCESS DATA" and "MISR Plume Height Project 2". It lists project members: "David Nelson, Sebastian Val, Ralph Kahn, Ernest Koerberlein, Mike Tosca, David Diner, Cecilia Lawshe" and includes a "July, 2015 - see what's changed" notice. Below this is a section for "Access data digitized with earlier versions of MINX" with radio buttons for "Wildfire smoke plumes" (selected), "Volcanic plumes", and "Dust plumes". A "Search" button is present, followed by the text "Fast Search for All Plumes in a Clicked Region" and a world map with color-coded regions: North America (yellow), South America (orange), Europe (purple), Africa (blue), and Asia (green).



Other Tools

- NASA's GEOS-5 Aerosol Forecasts: https://portal.nccs.nasa.gov/cgi-bin/fo/fo_2d_chem.cgi
 - Click on the 7-SEAS region
- NRL Forecasts: <https://www.nrlmry.navy.mil/aerosol/#currentaerosolmodeling>





Questions?