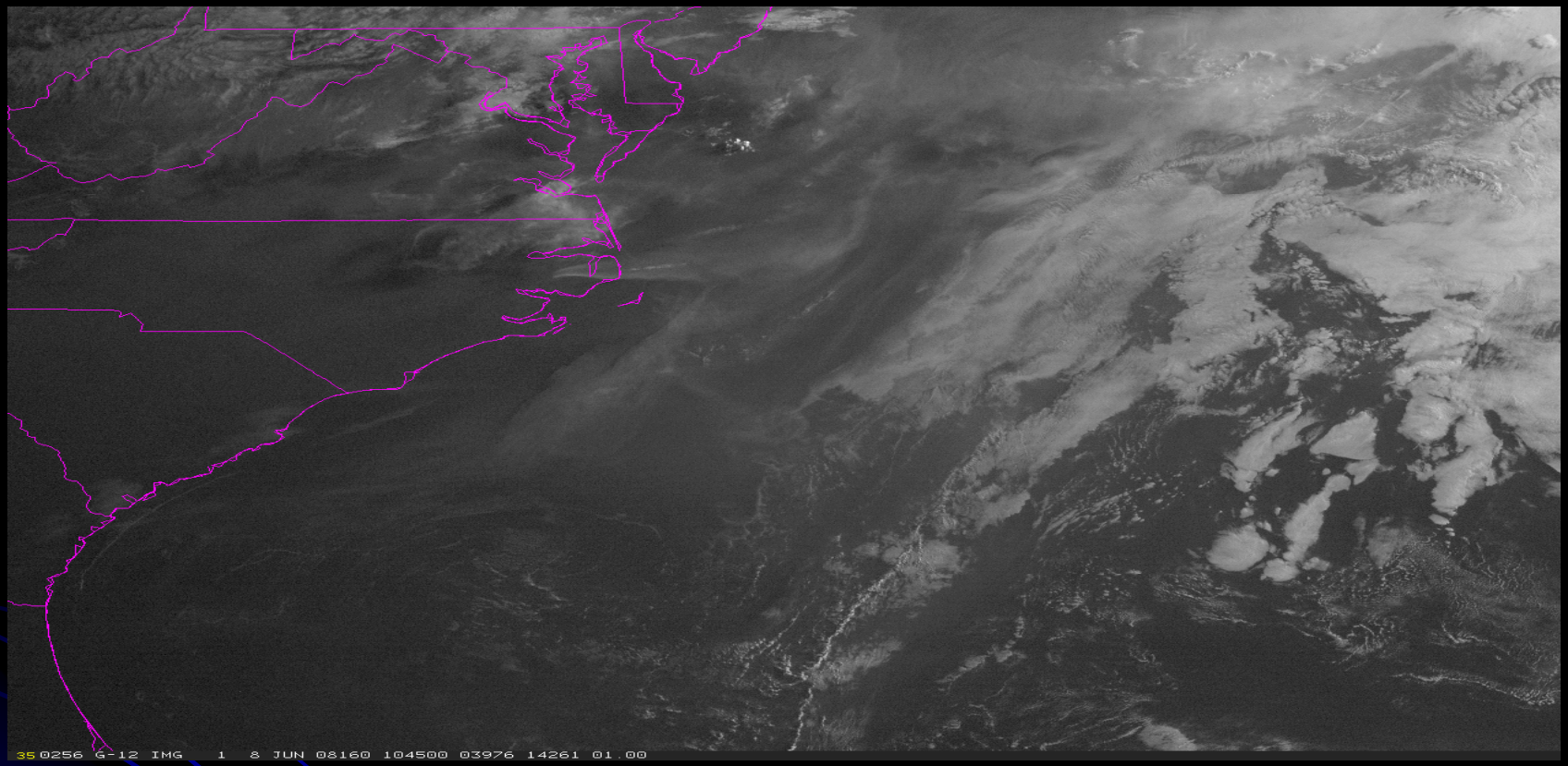
Wildland Fire Monitoring Using NOAA Satellites



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Presented by: Jamie Kibler
Contributors: Mark Ruminski
April 12, 2013

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Outline

- Overview of the Fire and Smoke Program
- GOES vs. POES
- Forecasting smoke from wildfires using NOAA satellites
- The monitoring of the Wallow Wildfire
- Product, website, Questions and Comments

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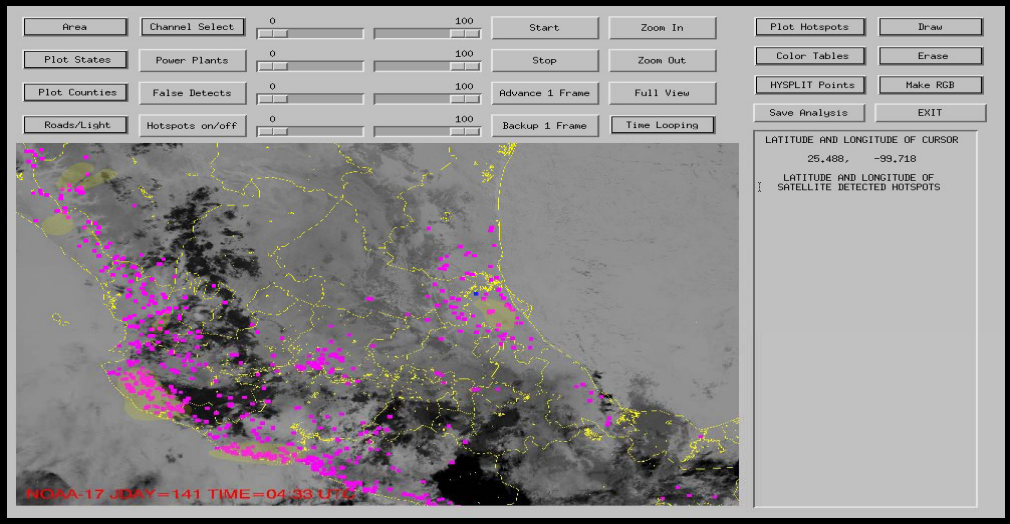
- **The Fire and Smoke Analysis is performed for the Continental US, Hawaii, Puerto Rico and Central America year around:**



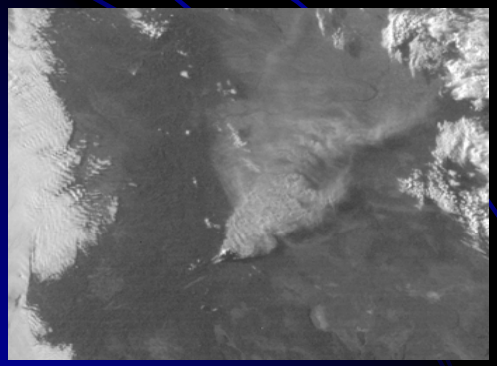
- **Seasonal analysis performed for Alaska and Canada from May through November**

NOAA SATELLITES CURRENTLY USED FOR FIRE AND SMOKE DETECTION

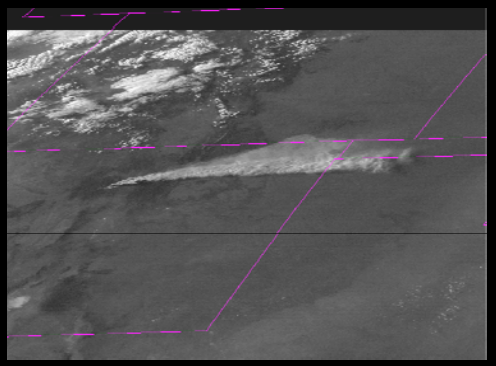
- **GOES 13 and GOES 15**
- **NOAA 15, 18 and 19 and METOP-A and B (NPP soon)**
- **MODIS Aqua and Terra**

Over 200 looks per day in areas of GOES-East and GOES-West overlap.

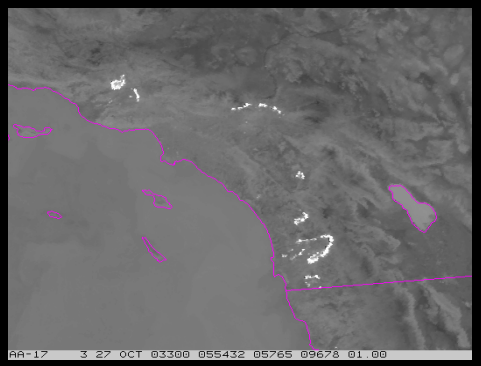
Two looks per satellite per day with Polar spacecraft in mid latitudes – more at high latitudes Future – GOES-R/JPSS !!



GOES-WEST



GOES-EAST



NOAA-AVHRR

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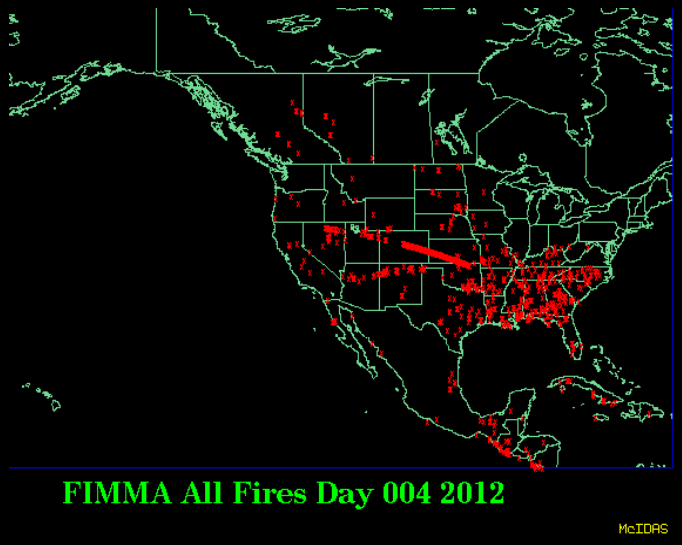

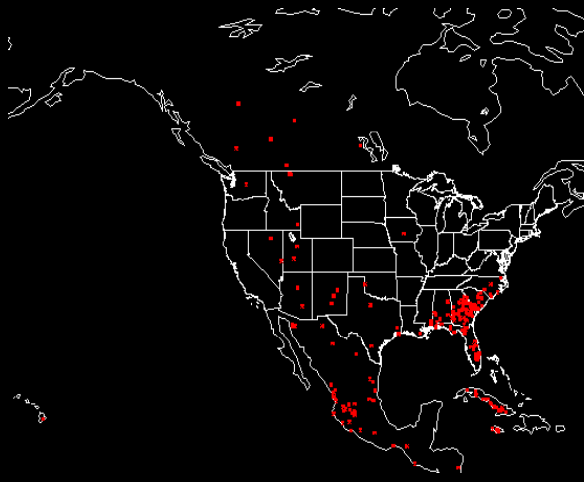

Automated fire detection algorithms are employed for each of the sensors:

- WildFire Automated Biomass Burning Algorithm (WF-ABBA) for GOES
- Fire Identification Mapping and Monitoring Algorithm (FIMMA) for AVHRR
- MOD14 product for MODIS

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THE SMOKE AND FIRE ANALYST

THEIR JOB

- **Quality checks fire points produced by the ABBA, FIMMA, and MODIS algorithms by looking at the associated satellite data. Adds fire the algorithms have not detected (can be substantial).**
- **Draws in the smoke produced by the fires. The analyst can identify the smoke as thin, moderately dense or dense with an assigned numerical value (5, 16 and 27 ug/m^3) for each plume.**
- **Provides locations of significant smoke producing fires as input to the Hybrid Single-Particle Lagrangian Integrated Trajectory (HYSPLIT) model which provides a 48 hour forecast movement of the smoke that is used in NWS AQ forecast.**

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The Advantages of GOES vs. POES

- **The temporal resolution of GOES vs. POES (15/30 min vs. 2 views a day per satellite)**
- **The spatial resolution of POES vs. GOES for locating wildfires or any other type of fires (1 km vs. 4 km)**

NPP – 375m resolution and much wider swath

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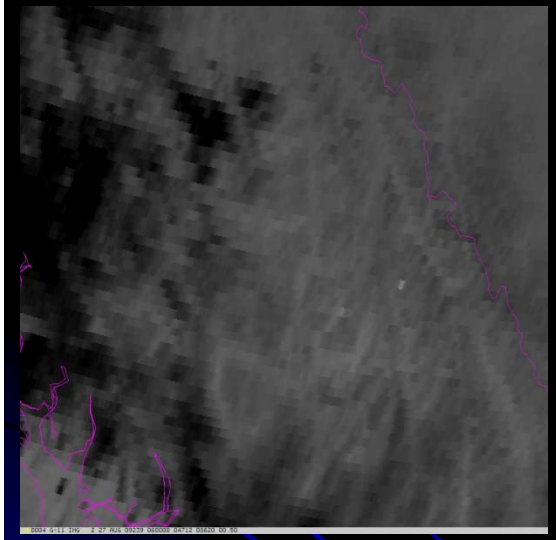
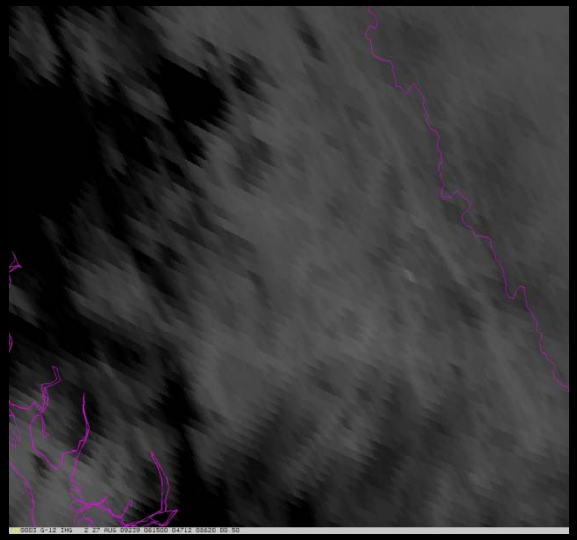
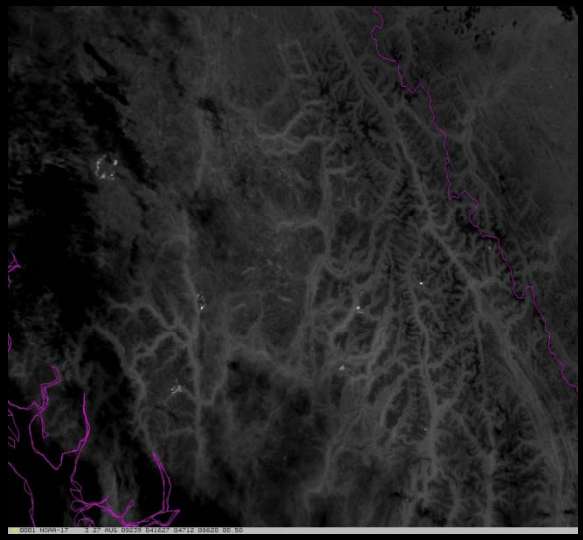


GOES-11 0600z



GOES-12 0615z



NOAA-18 0416z

The spatial resolution of NOAA-17 allowed the analyst to detect cooler and smaller fires when compared to GOES imagery

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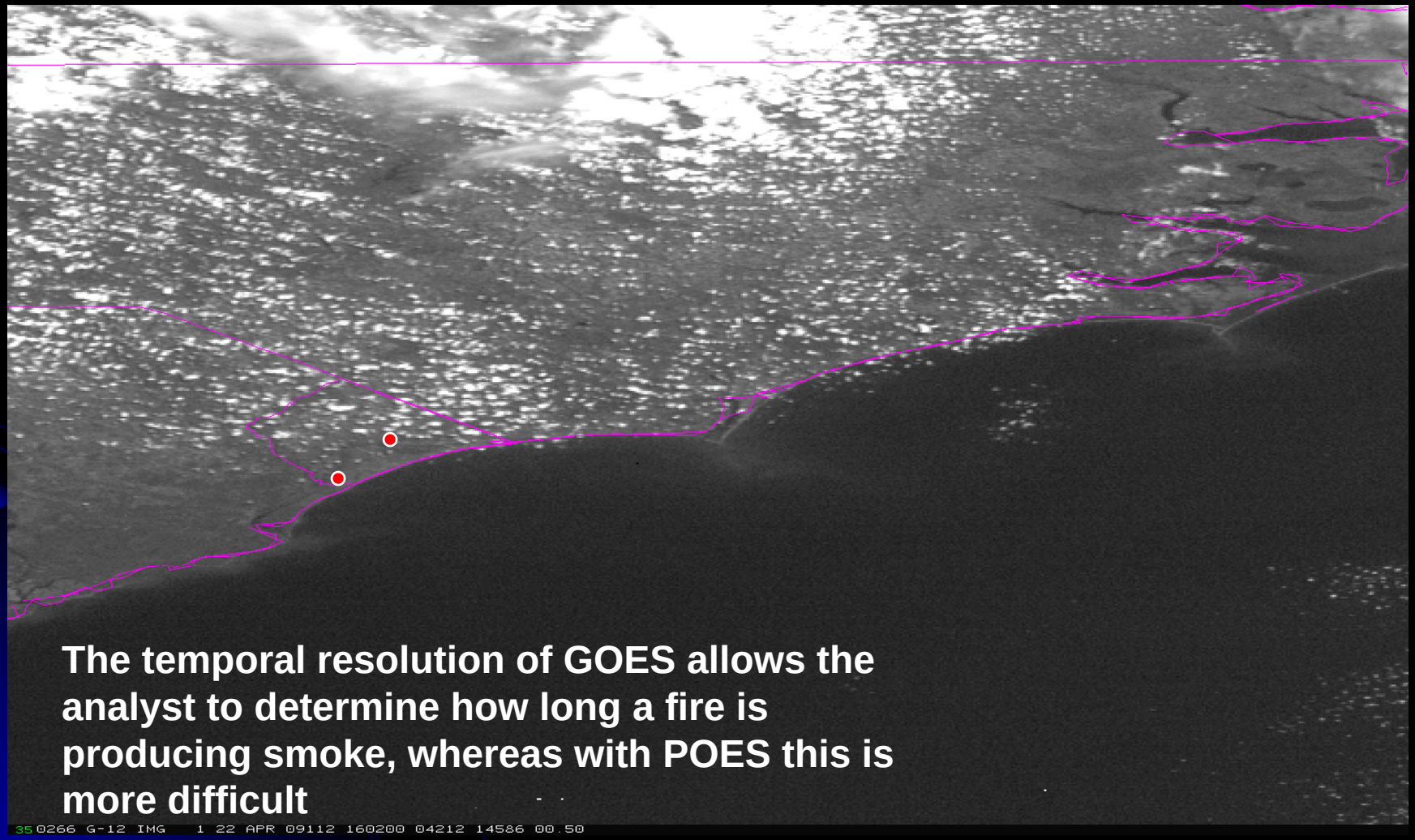
2009 Horry County Wildfire in Eastern South Carolina



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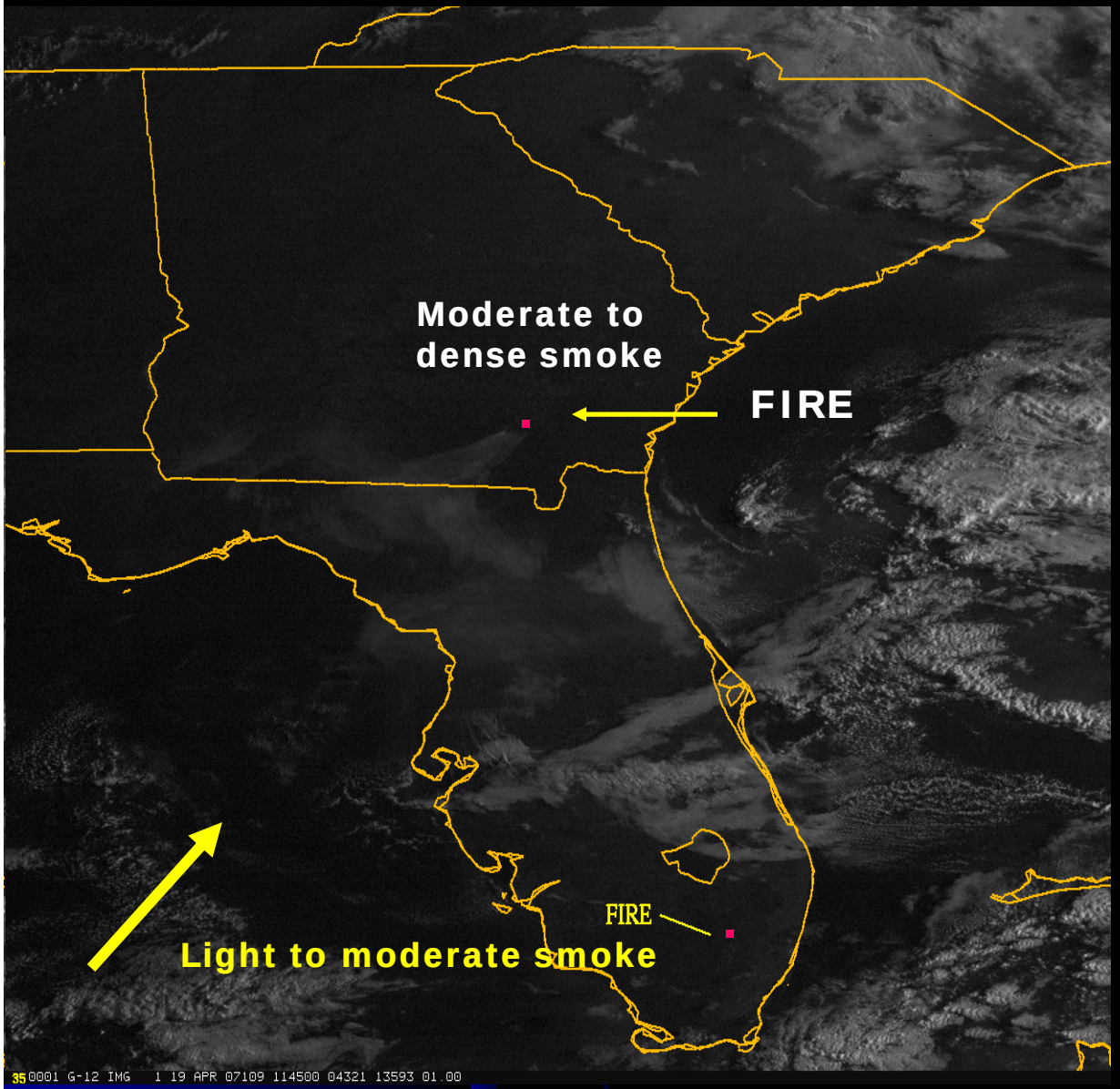

These are easily identified as wildfires. However, sea breezes and shifting winds present challenges. The temporal resolution of GOES helps the analyst see the changes whereas POES may not show these changes as easily

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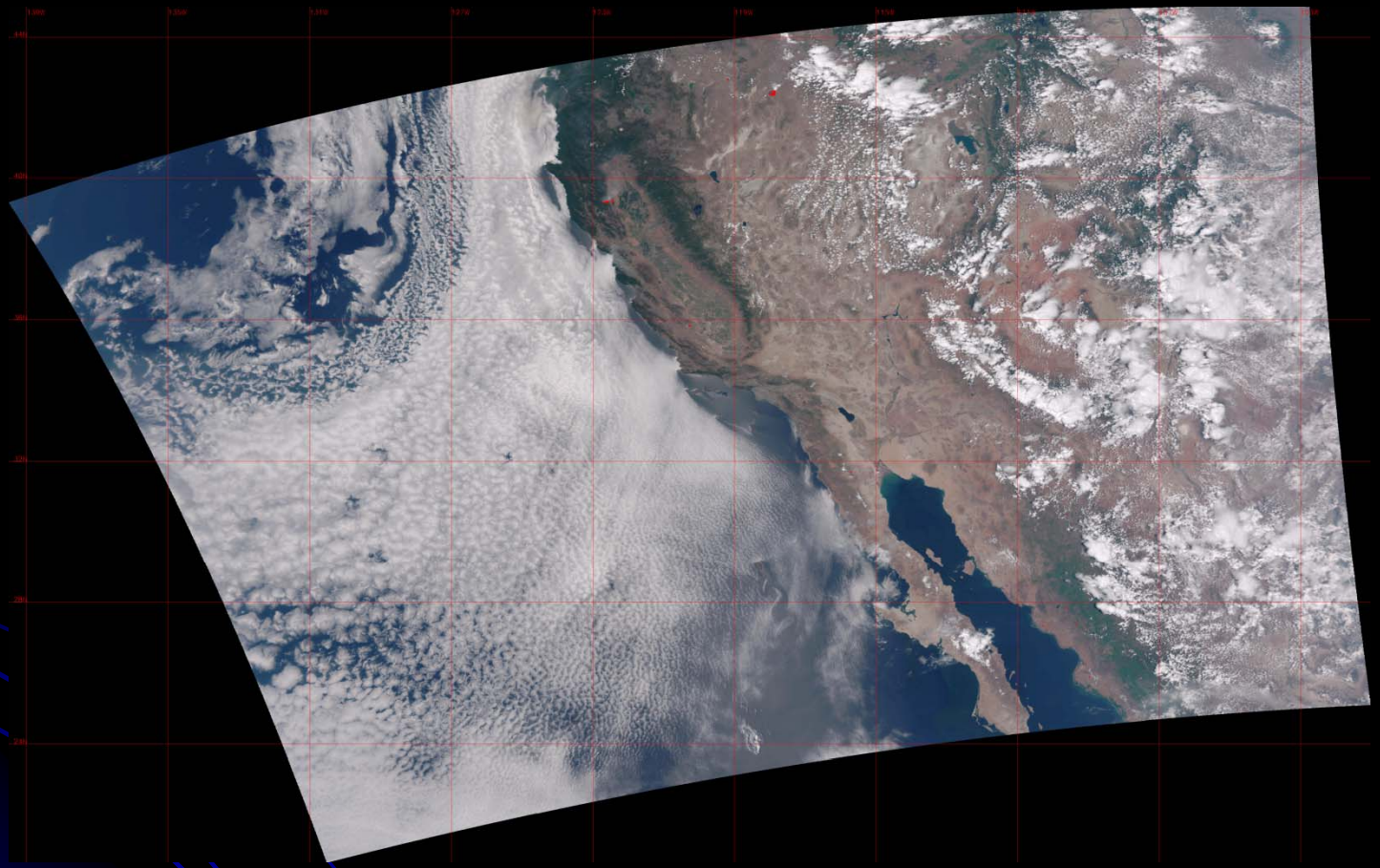

NPP data

Better spatial resolution for picking up small and cooler burning fires when compared to GOES and even the current POES series

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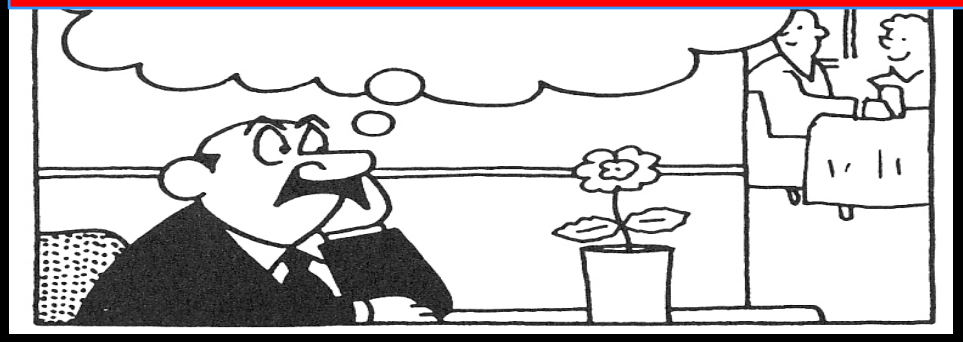
Forecasting Smoke

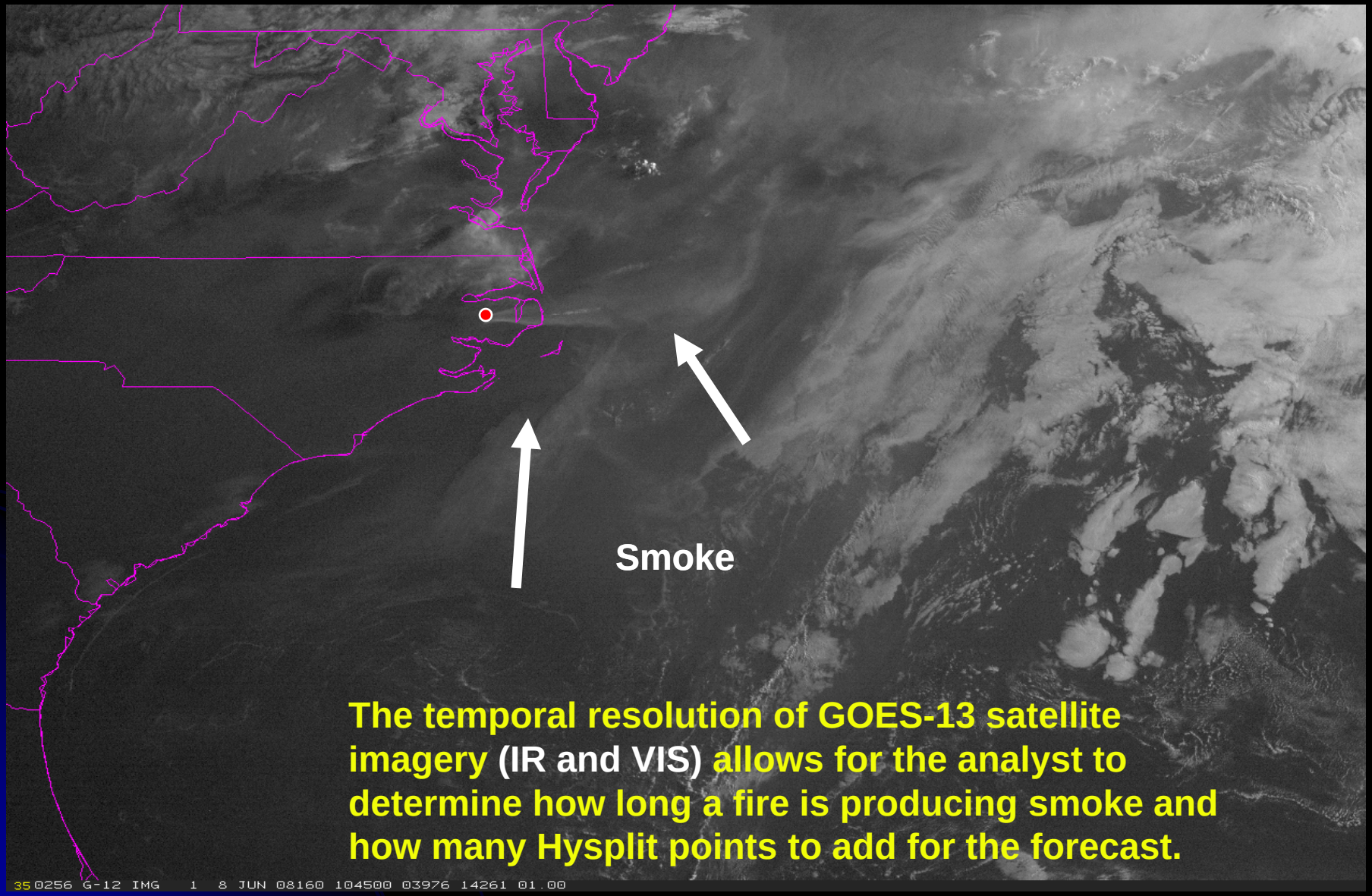
Analyst input to the HYbrid Single-Particle Lagrangian Integrated Trajectory (HYSPLIT) Model which is used in the National Weather Service (NWS) Air Quality Forecast:

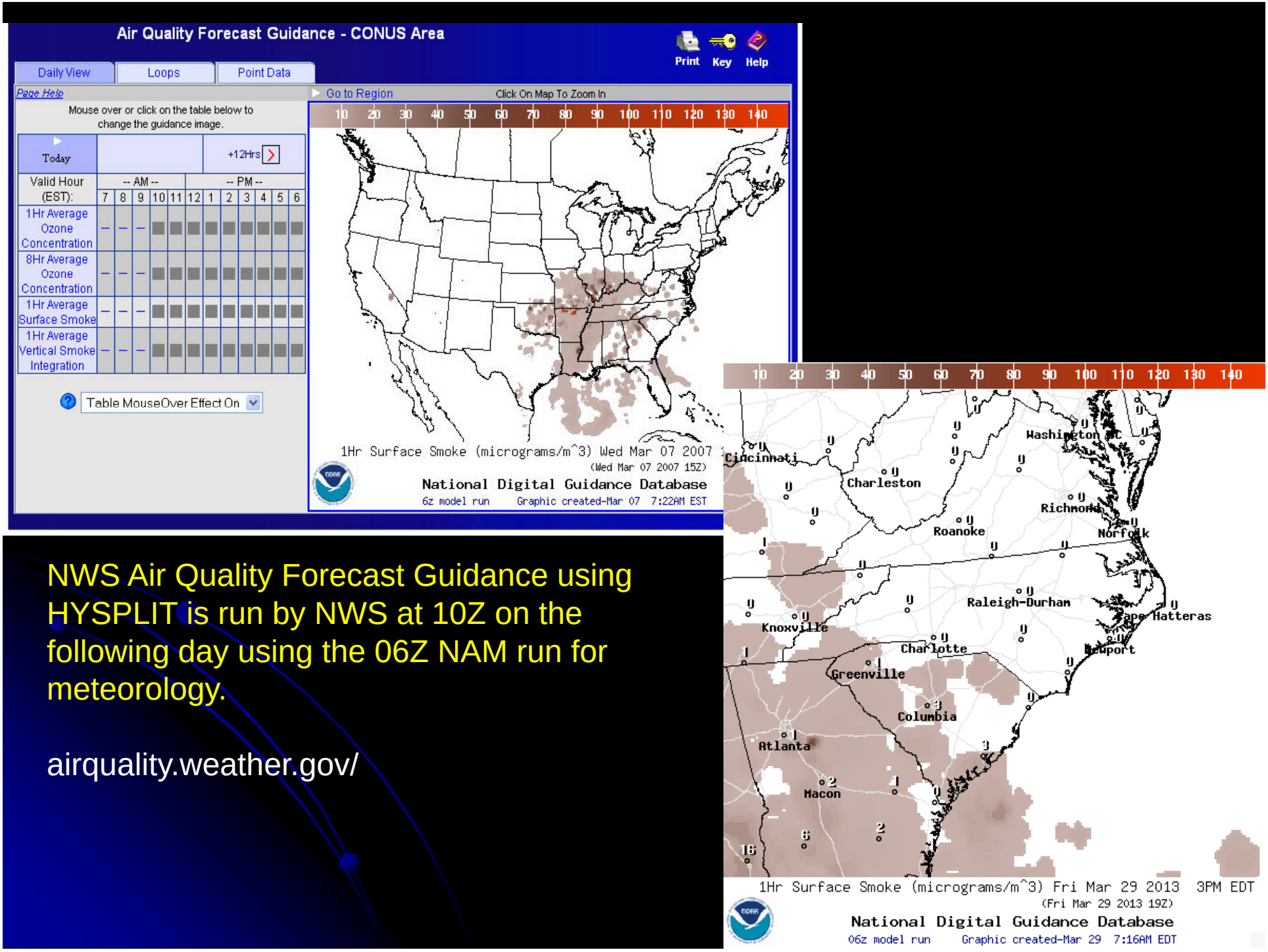
- Locations of smoke emitting fires
- Each point represents 1 square km
- Start time and duration of smoke emissions

Is this fire a prescribe burn or a wildfire? How long has it been producing smoke?



Evans Fire in Eastern North Carolina





NWS Air Quality Forecast Guidance using HYSPLIT is run by NWS at 10Z on the following day using the 06Z NAM run for meteorology.

airquality.weather.gov/

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The Arizona Wallow Wildfire: Monitoring Its Progress, Extreme Behavior and Long Range Smoke Transport from Multiple Satellite Platforms

Corresponding Author: Mark Rumins

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Fire Statistics

- **Largest wildfire in Arizona's history; 538,000 acres**
- **High winds, dry conditions, and a surplus of fuel directly contributed to the size and duration of the wildfire**
- **Beat out the Rodeo-Chediski wildfire (2002; 467,000 acres) as Arizona's largest and bumped the Cave Creek Complex (2005; 244,000) to third**
- **Started on May 29th, 2011**
- **Destroyed 32 residences**
- **Reached 100% containment on July 8th, 2011**
- **PyroCBs generated on 6 consecutive days (June 1-6)**

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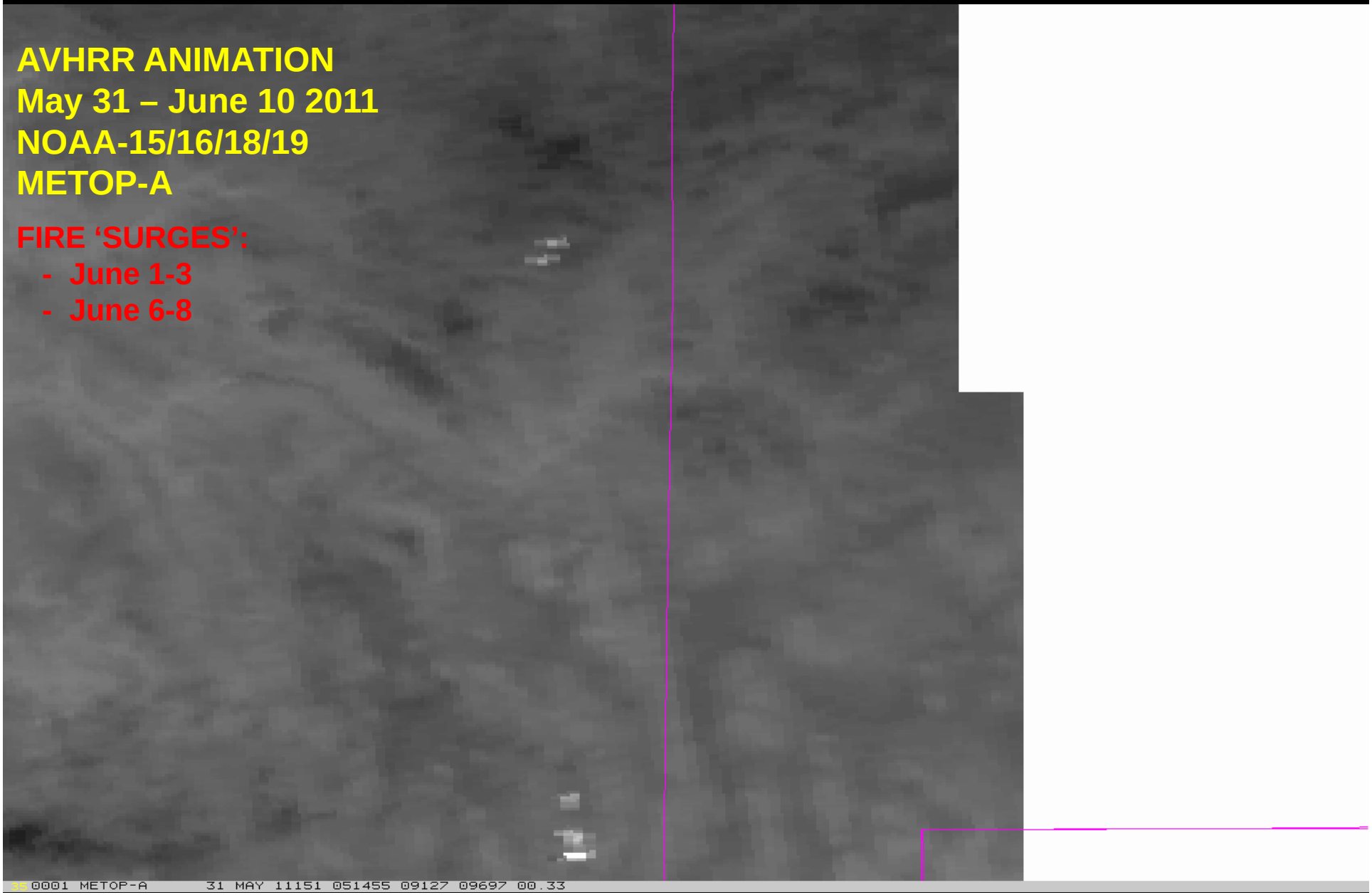

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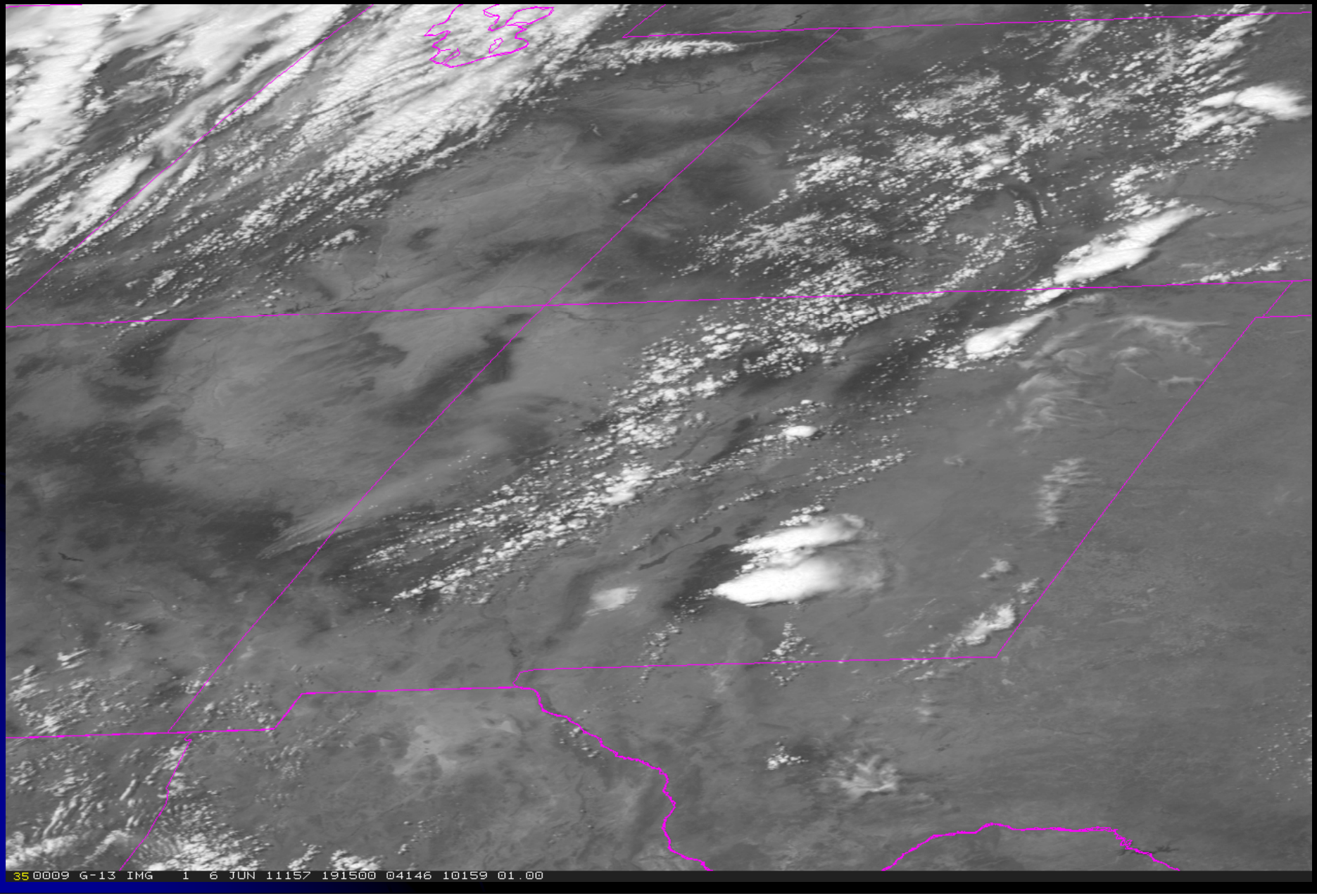

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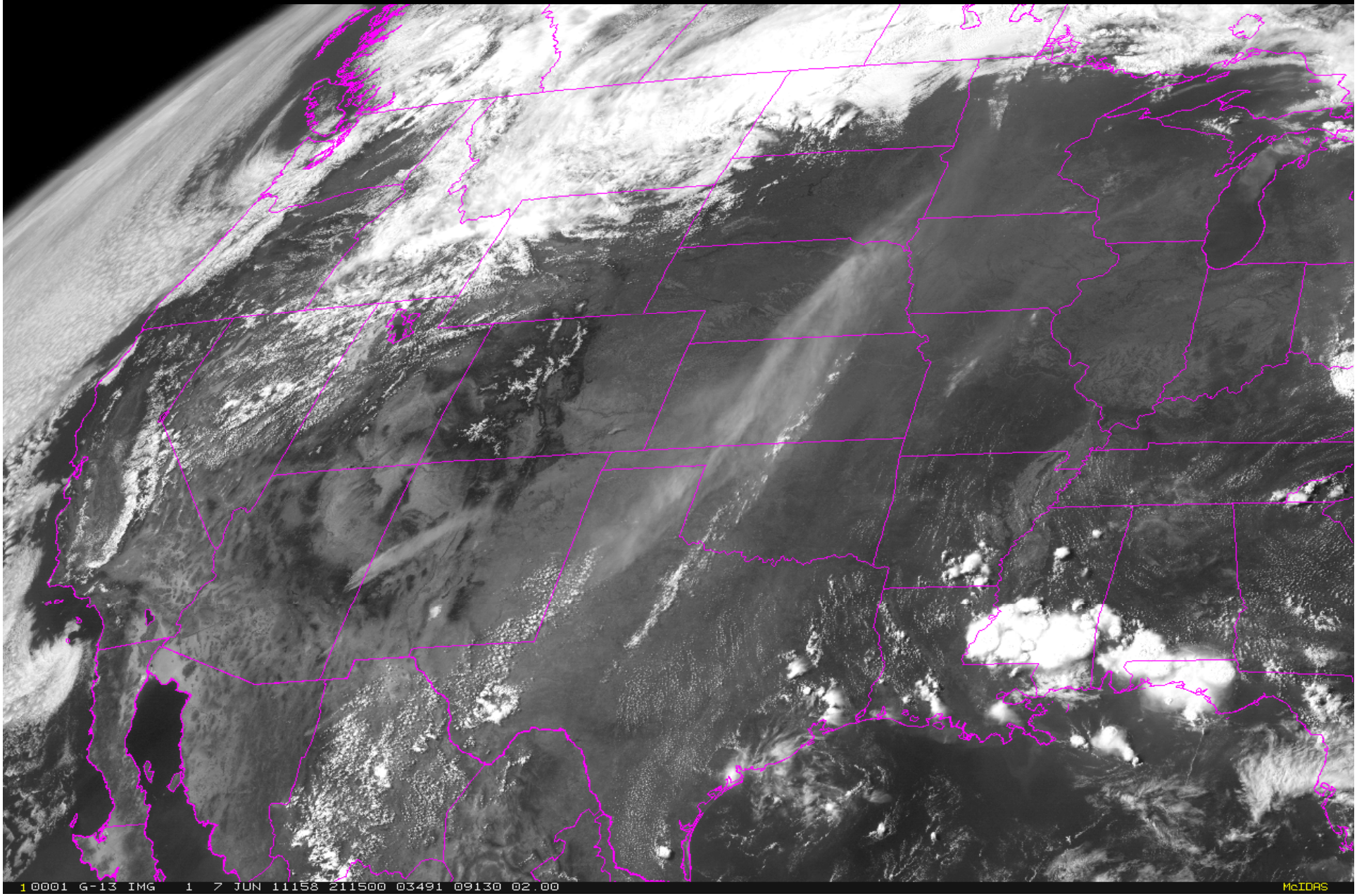
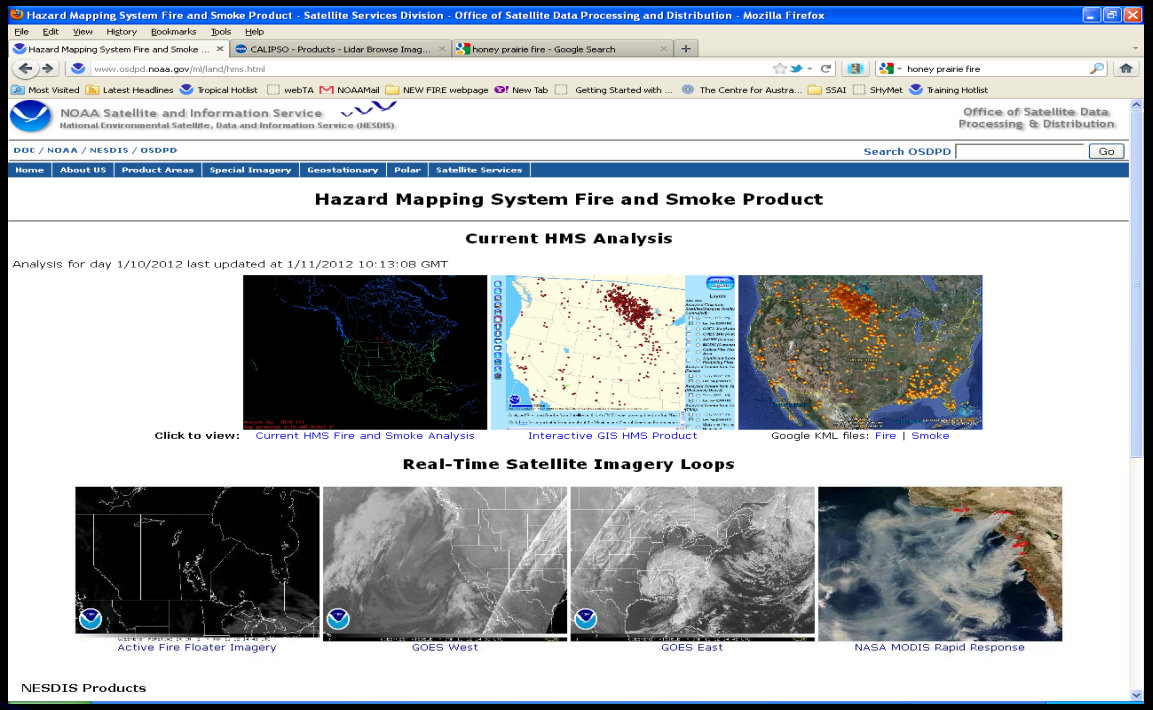
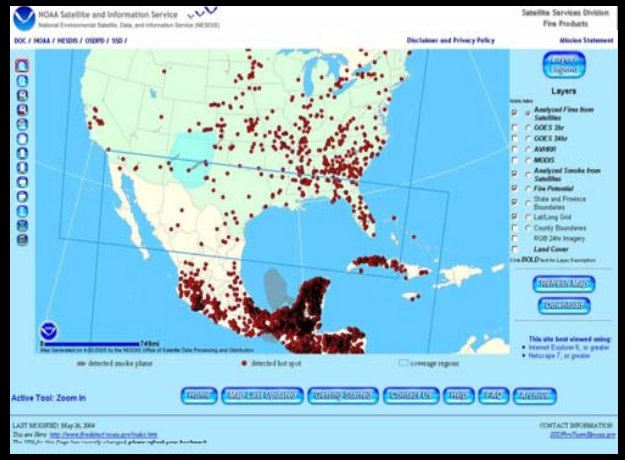


PRODUCT ACCESS





www.osdpd.noaa.gov/ml/land/hms.html

- Includes links to

archived products

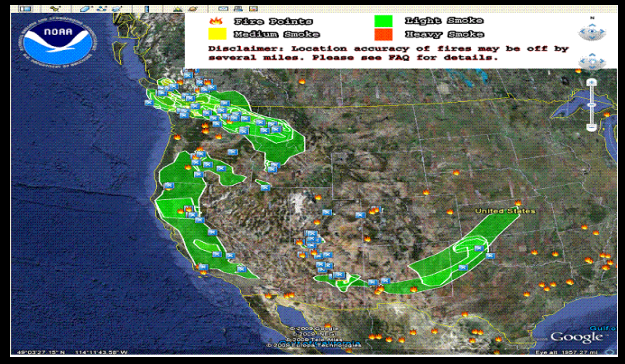
GIS page

near real time imagery

automated algorithms

smoke forecasts

manual quality controlled analysis



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THANK YOU

QUESTIONS OR COMMENTS?

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