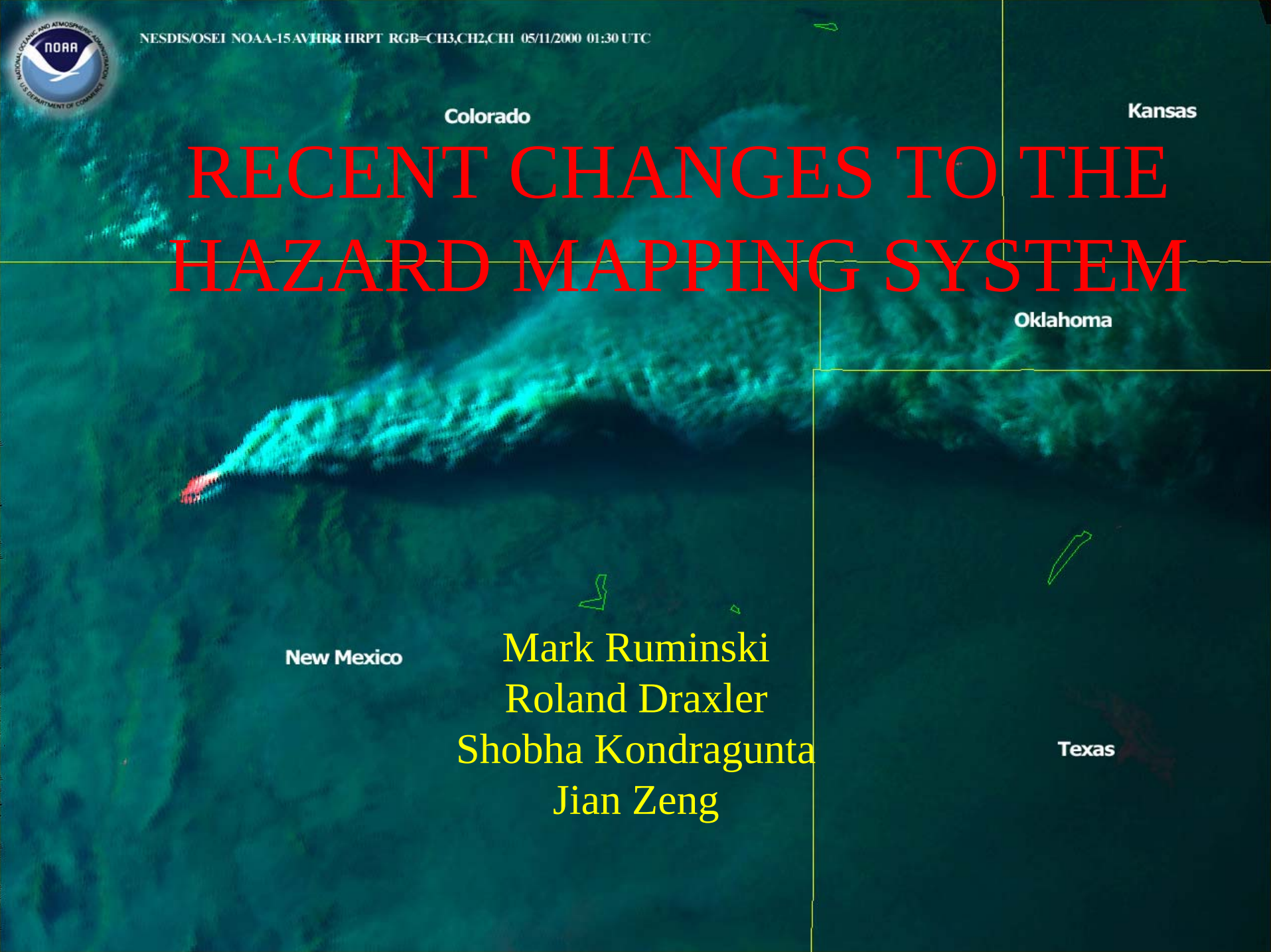
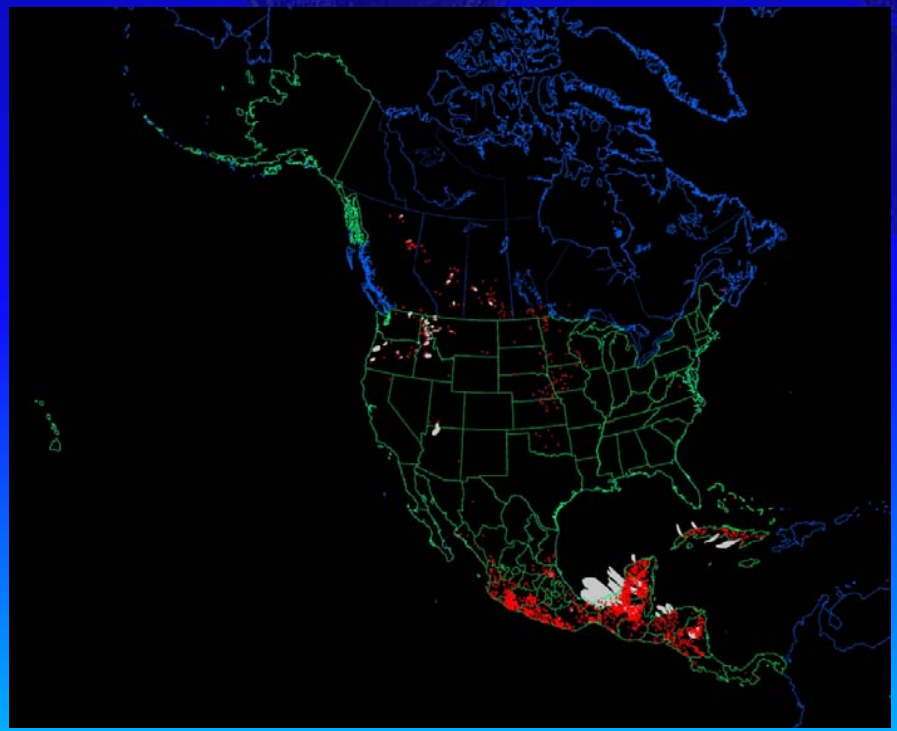


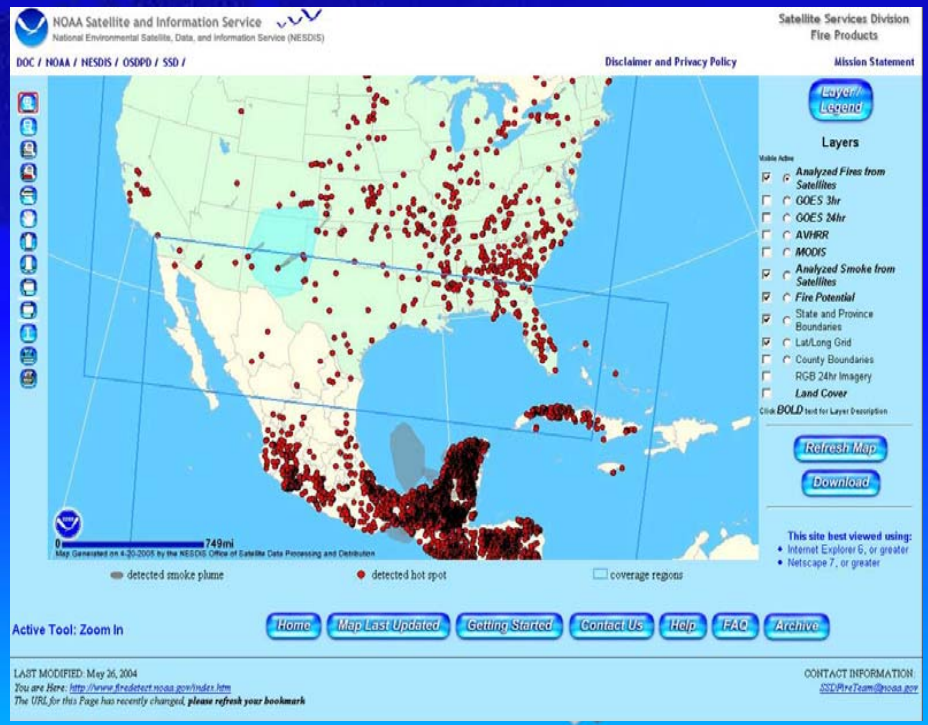

# RECENT CHANGES TO THE HAZARD MAPPING SYSTEM

Mark Ruminski
Roland Draxler
Shobha Kondragunta
Jian Zeng

# RECENT CHANGES TO THE HAZARD MAPPING SYSTEM

## HMS GRAPHICAL OUTPUT



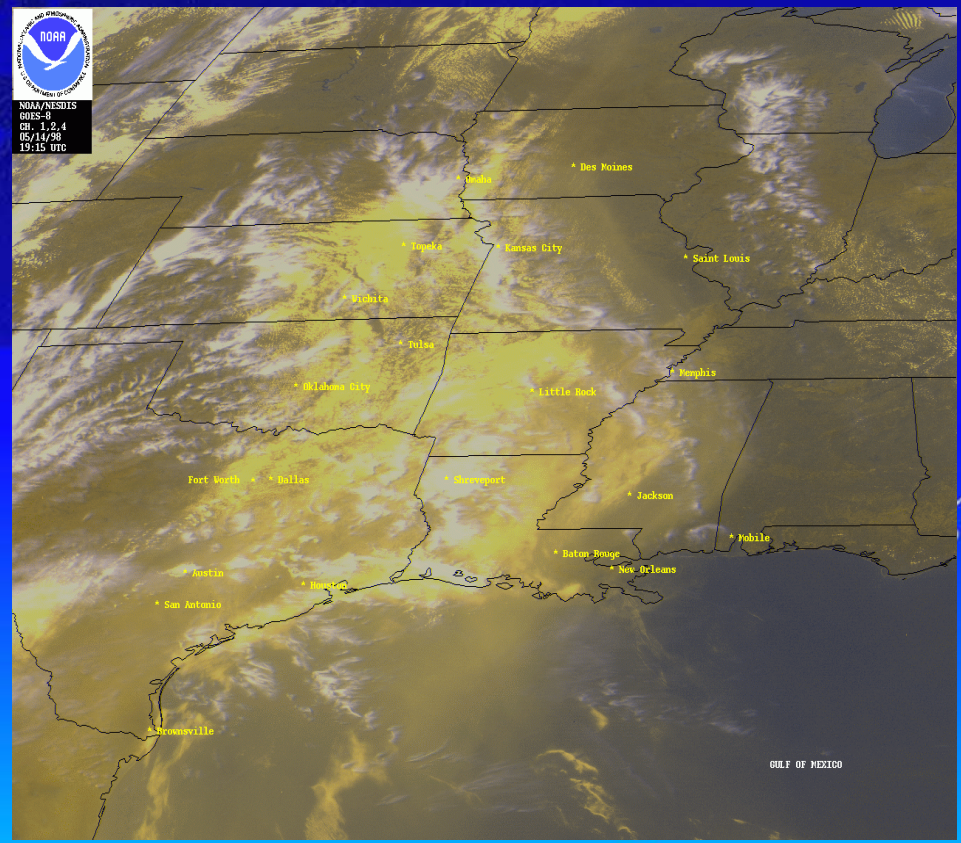


# RECENT CHANGES TO THE HAZARD MAPPING SYSTEM

NOAA/NESDIS began fire/smoke analysis in 1998

Massive smoke episodes have detrimental affect on health, transportation and industry

Large wildfires pose threat to life and property. Early detection and extinction saves money



# RECENT CHANGES TO THE HAZARD MAPPING SYSTEM

- HMS Incorporates 7 satellites – 2 geostationary and 5 polar orbiting
- Over 100 looks per day in areas of overlap
- POES spacecraft provide 2 orbits/day in mid latitudes, more frequent over Alaska/Canada

# RECENT CHANGES TO THE HAZARD MAPPING SYSTEM

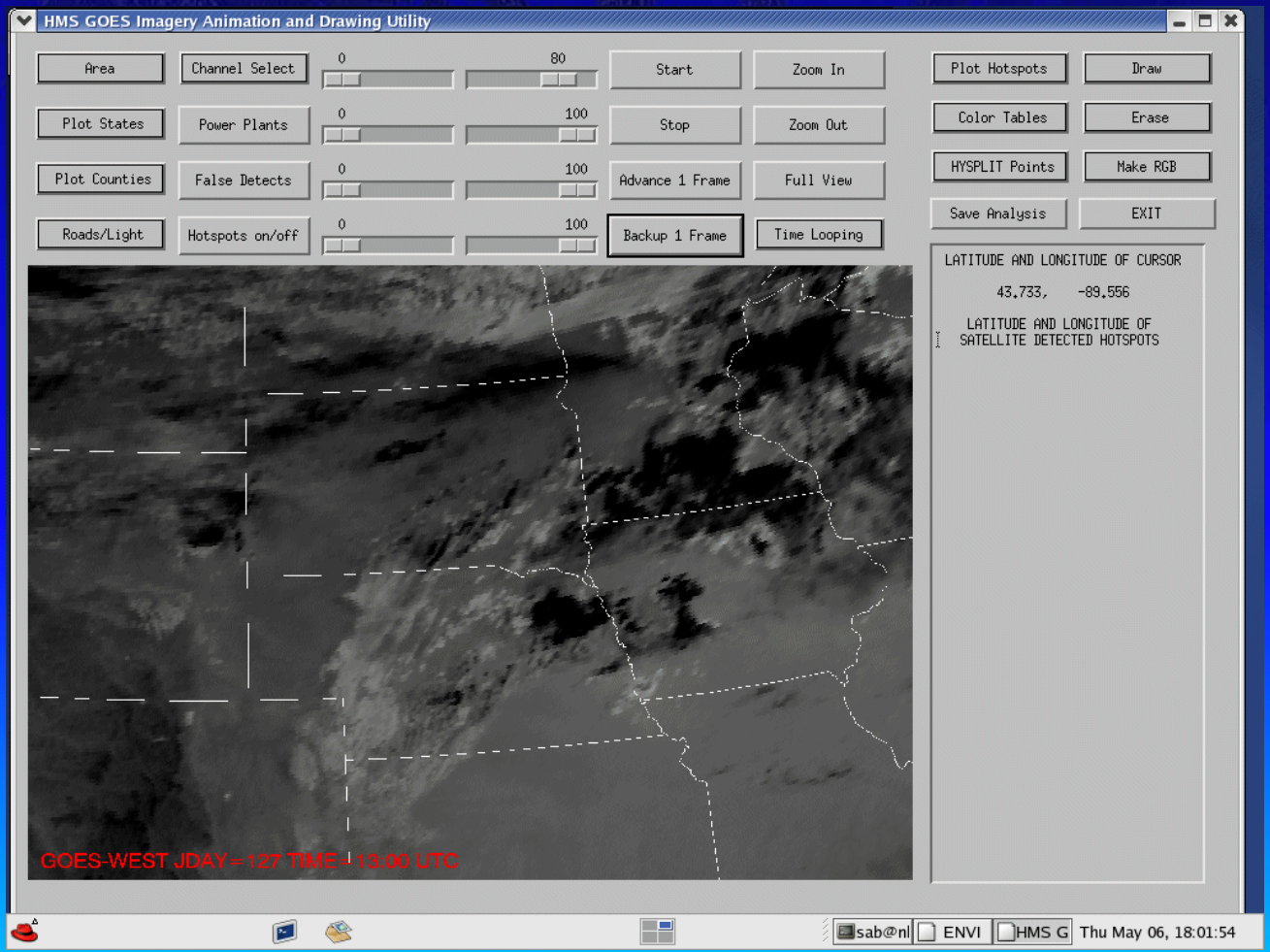
## AUTOMATED FIRE DETECTION ALGORITHMS USED

- **Wildfire – Automated Biomass Burning Algorithm (WF-ABBA) for GOES**
- **Fire Identification, Mapping and Monitoring Algorithm (FIMMA) for NOAA AVHRR**
- **MODIS MOD14 for MODIS (Terra and Aqua)**

# RECENT CHANGES TO THE HAZARD MAPPING SYSTEM

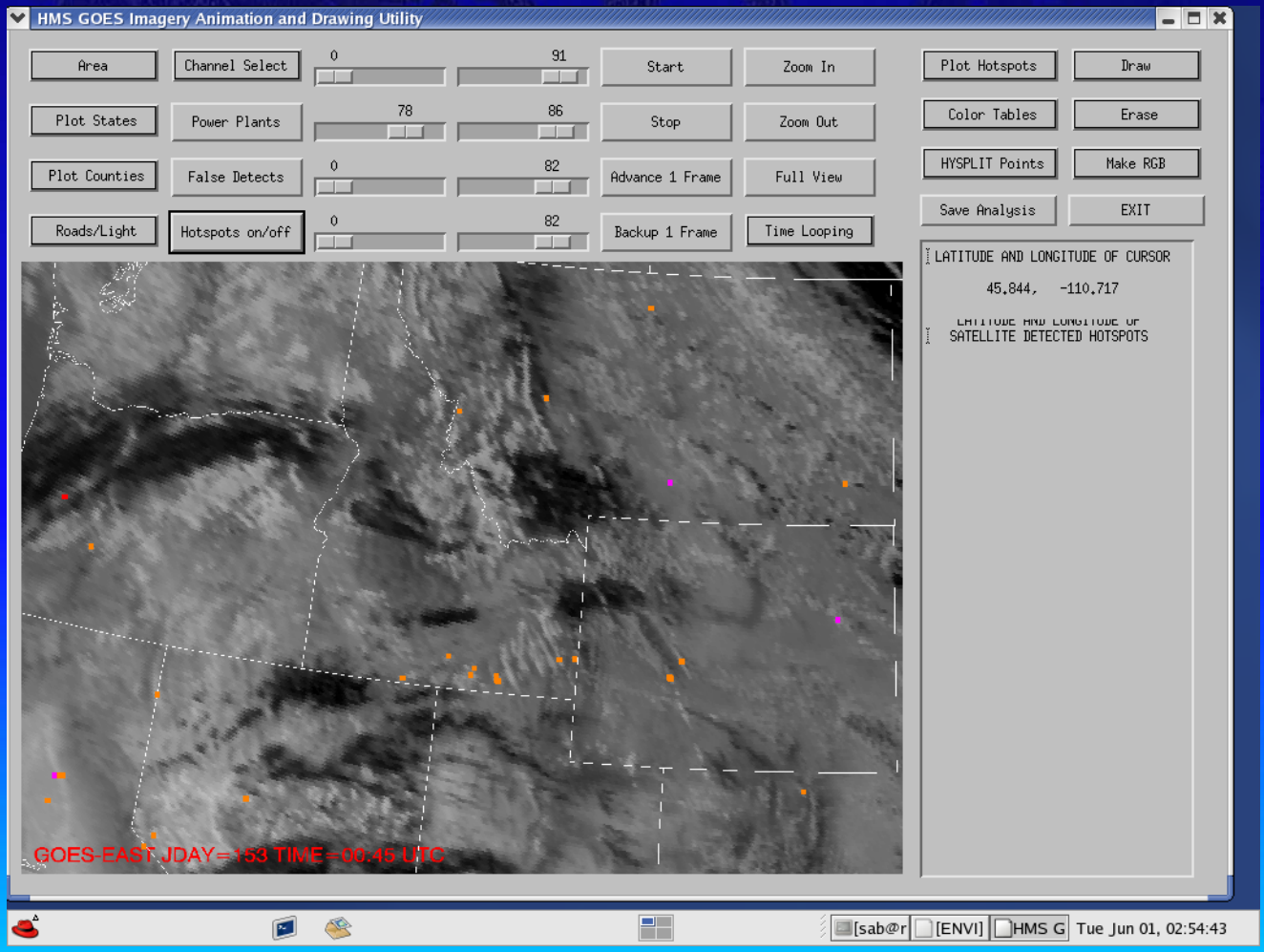
**Since we employ the automated algorithms why have an analyst in the loop?**

# RECENT CHANGES TO THE HAZARD MAPPING SYSTEM




**Algorithms can mistake highly reflective clouds for fires**

# RECENT CHANGES TO THE HAZARD MAPPING SYSTEM

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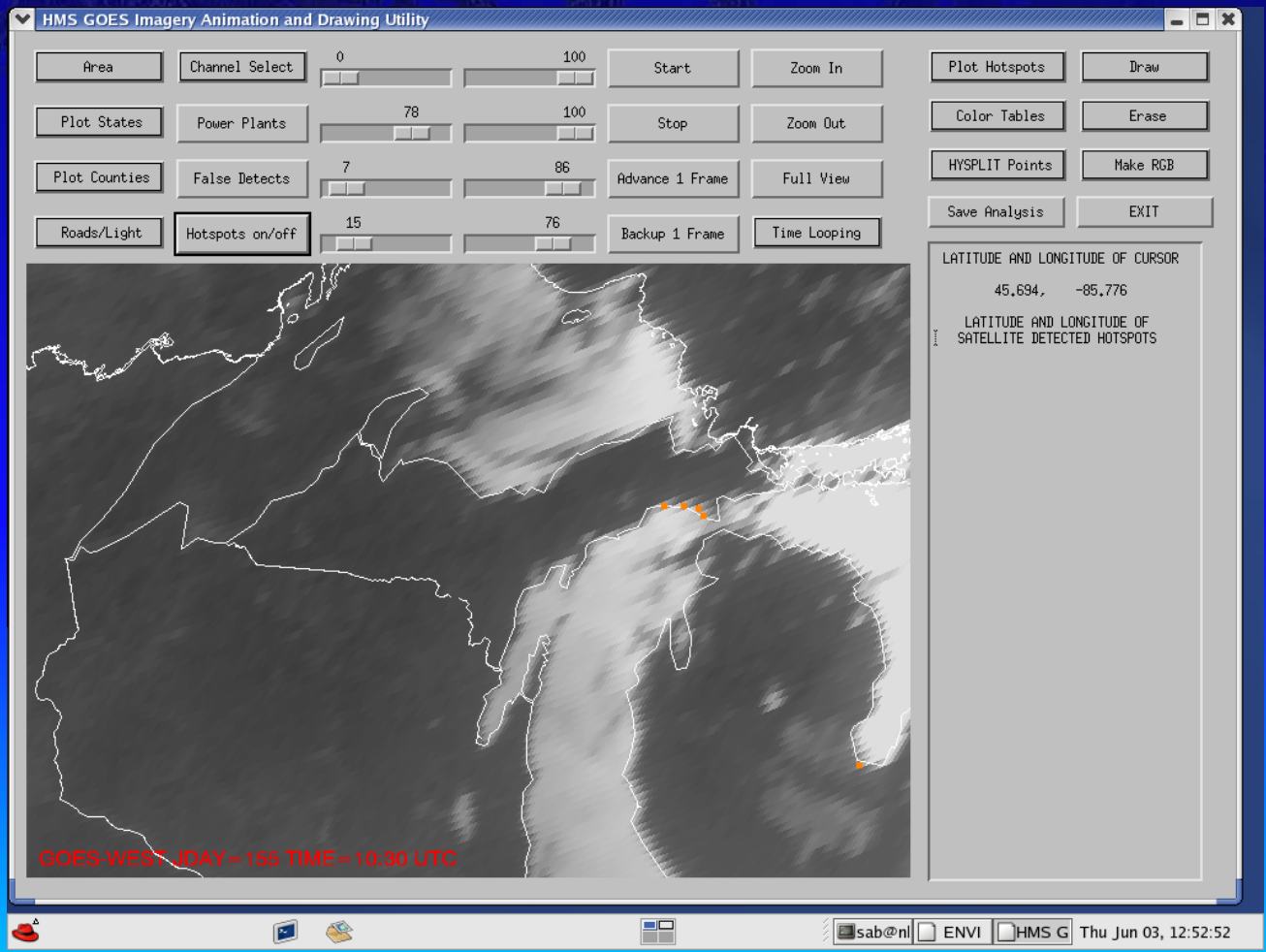
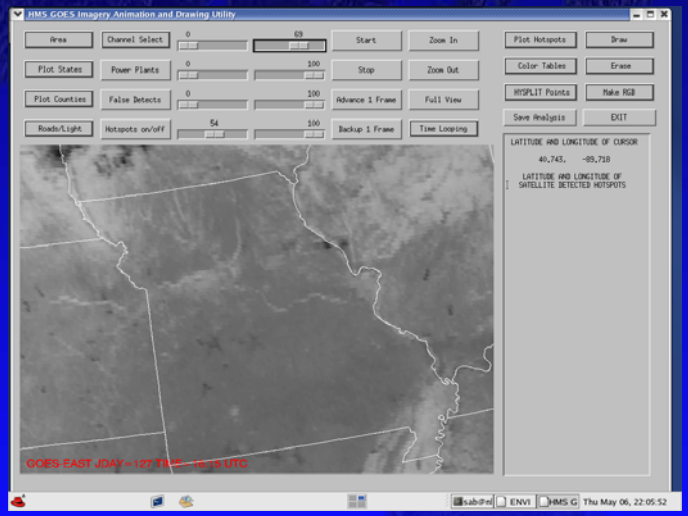
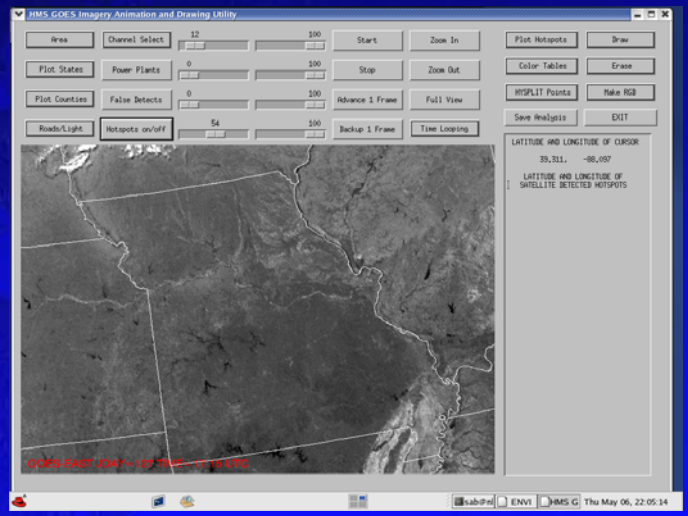
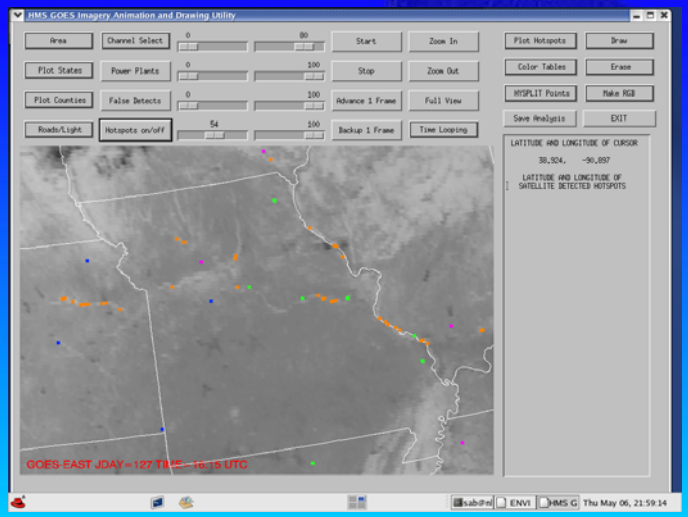



**Sunglint off water surfaces at high sun angles can generate false detects**

# RECENT CHANGES TO THE HAZARD MAPPING SYSTEM

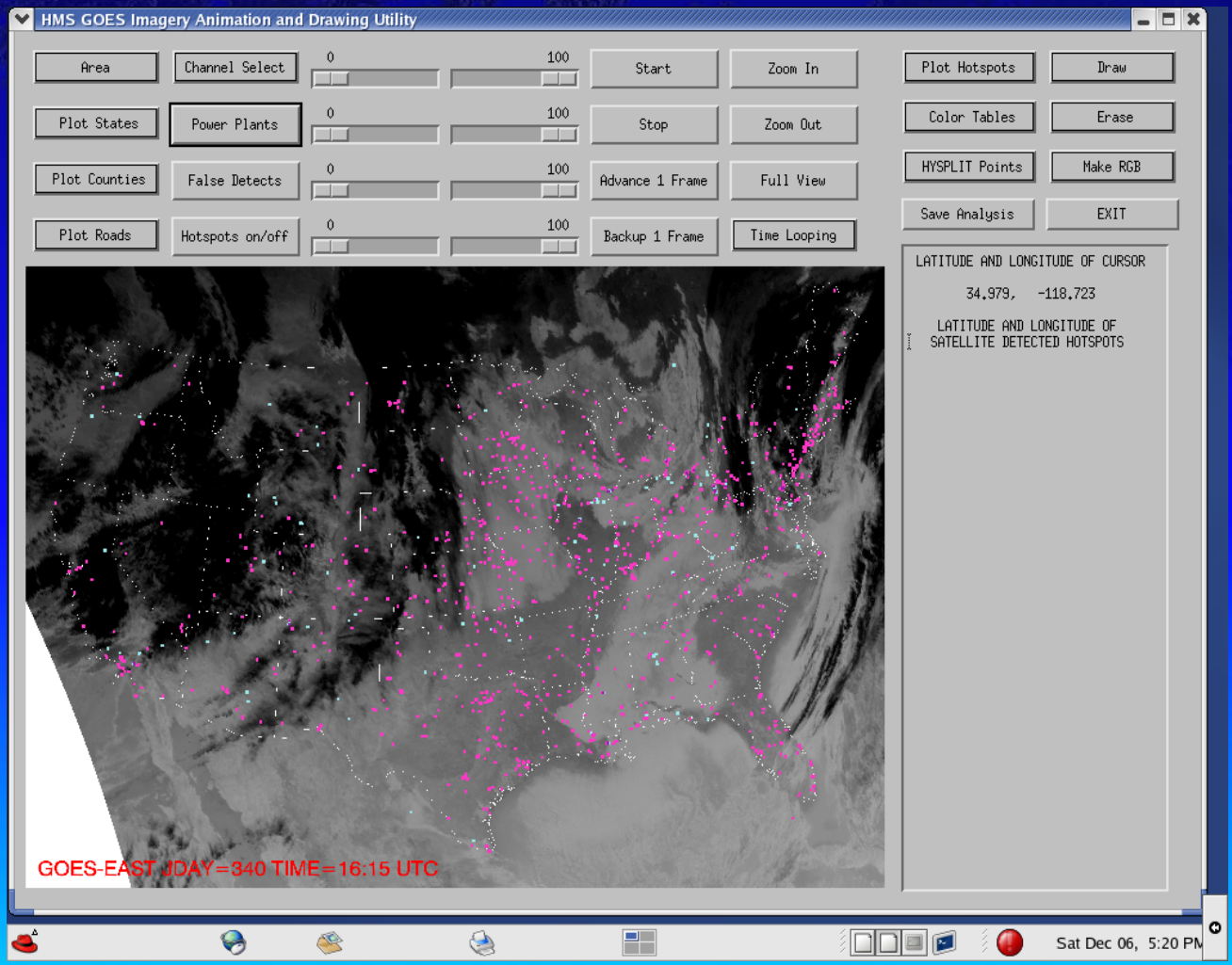



**Urban heat islands and land type can appear to be fires to the algorithms under proper conditions**

# RECENT CHANGES TO THE HAZARD MAPPING SYSTEM




**HMS GUI with power plants and known false alarm locations**

# RECENT CHANGES TO THE HAZARD MAPPING SYSTEM

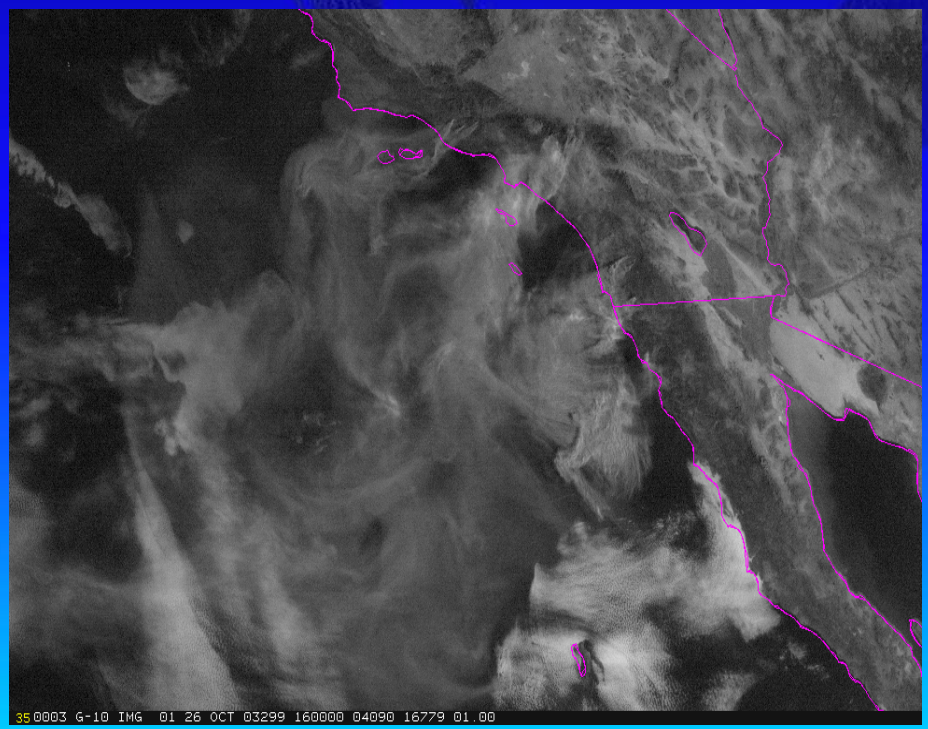
**Need to get a good handle on the fires to produce a good analysis of smoke emissions (where there's smoke there's fire!)**

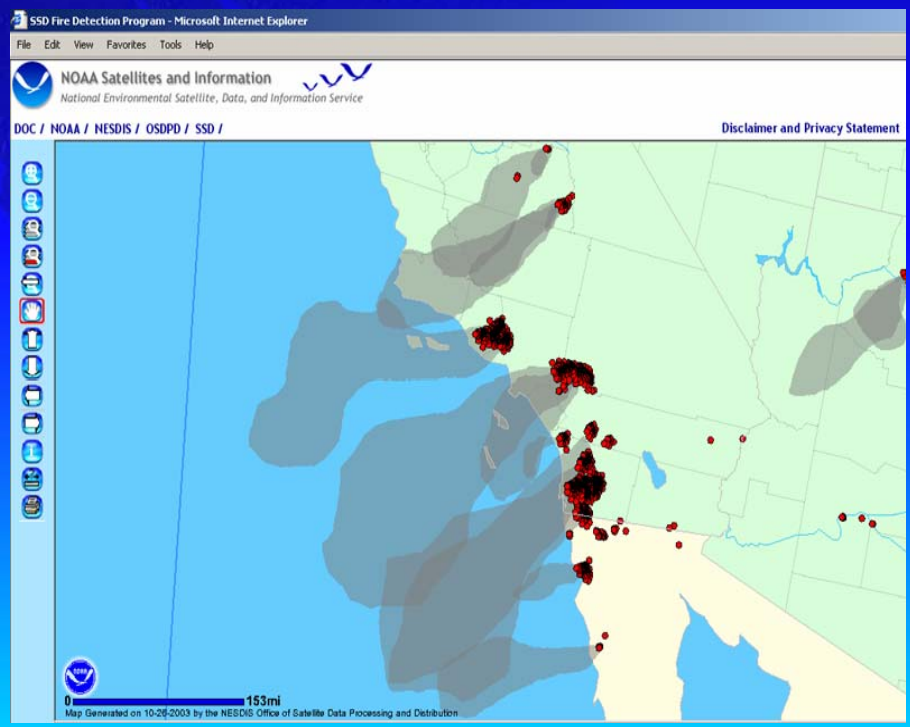
**Smoke analysis consists of:**

- **Graphic of smoke extent**
- **Input to dispersion and transport model**
- **Text product describing smoke and blowing dust**

# RECENT CHANGES TO THE HAZARD MAPPING SYSTEM

**Individual GIS smoke plume shapefiles are tagged with observation start/end times**



# RECENT CHANGES TO THE HAZARD MAPPING SYSTEM

**Analysts provide input to the HYbrid Single-Particle Lagrangian Integrated Trajectory (HYSPLIT) Model**

**Locations of smoke emitting fires are added to file**

**Each point represents 1 square km**

**Number of points selected determined by areal coverage of hotspots and/or amount of smoke observed**

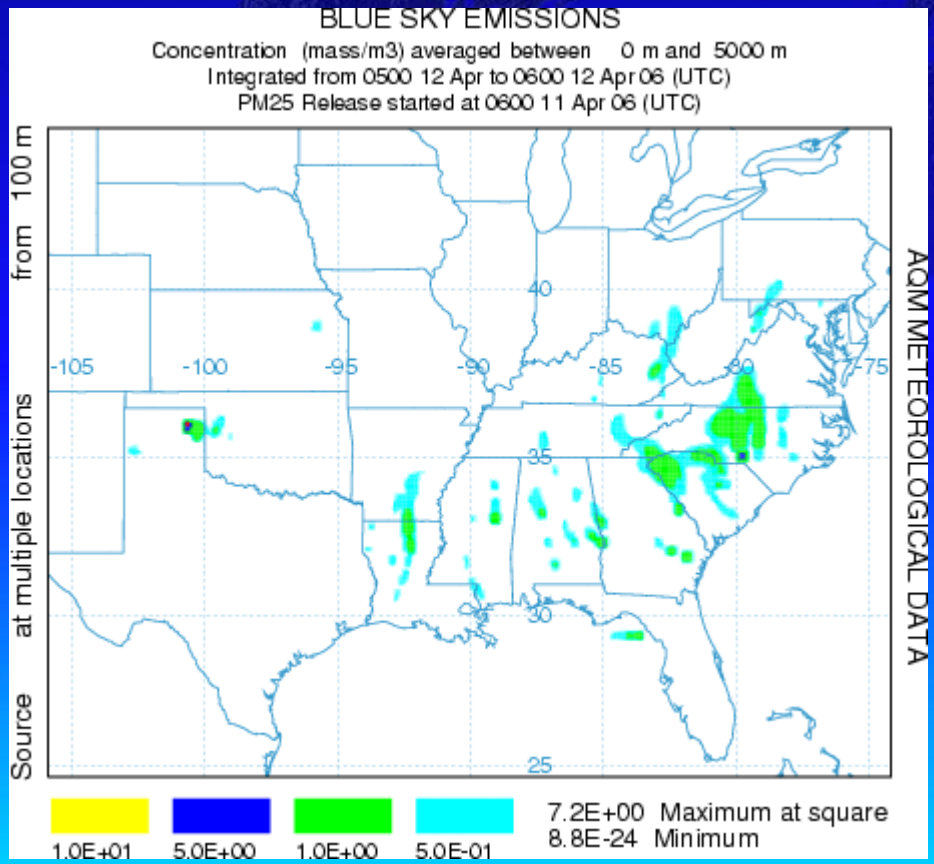
# RECENT CHANGES TO THE HAZARD MAPPING SYSTEM

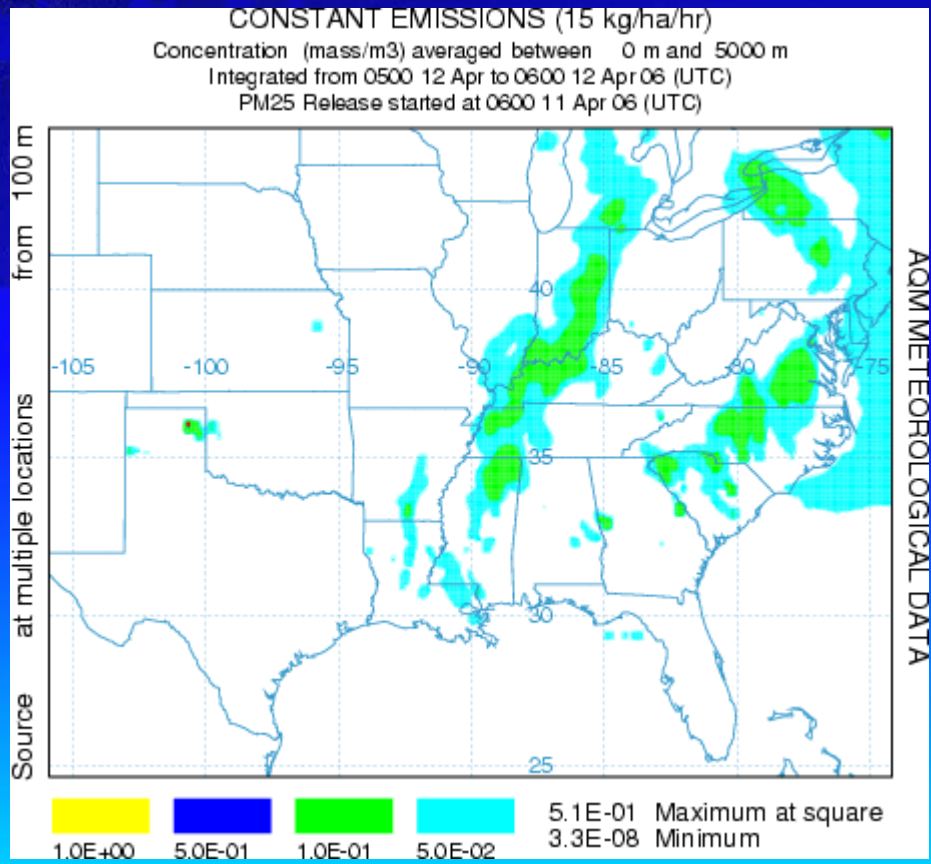
**HYSPLIT switched from using constant emission rate for all input locations to using BlueSky framework in 2005**

**Most recent constant emission rate used was 15 kg/ha/hr**

# RECENT CHANGES TO THE HAZARD MAPPING SYSTEM

**BlueSky emissions much larger than constant rates that HYSPLIT had been using**



# RECENT CHANGES TO THE HAZARD MAPPING SYSTEM

**Variable emission duration implemented in April 2006**

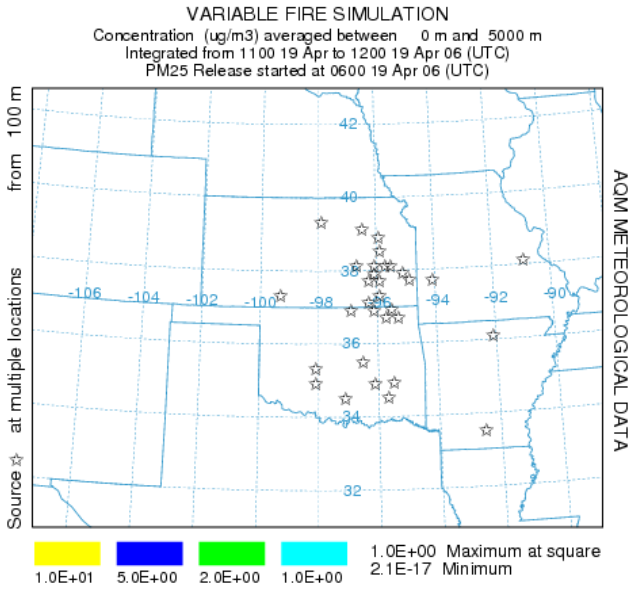
**Start/End time of emissions indicated by analyst**

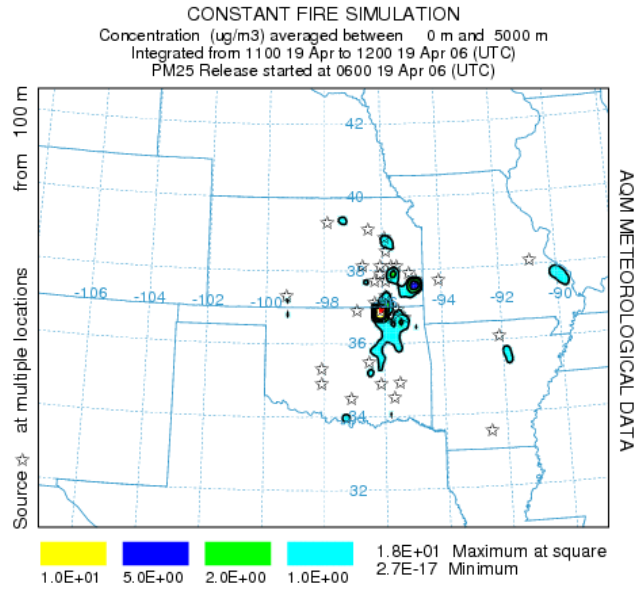
**Previous assumption was that fires were emitting for 24 hours with a decay rate of 75%/day**

**Majority of analyzed fires have no detectable smoke plume**

**The majority of fires that do have a smoke plume have a limited duration (much less than 24 hours)**

# RECENT CHANGES TO THE HAZARD MAPPING SYSTEM

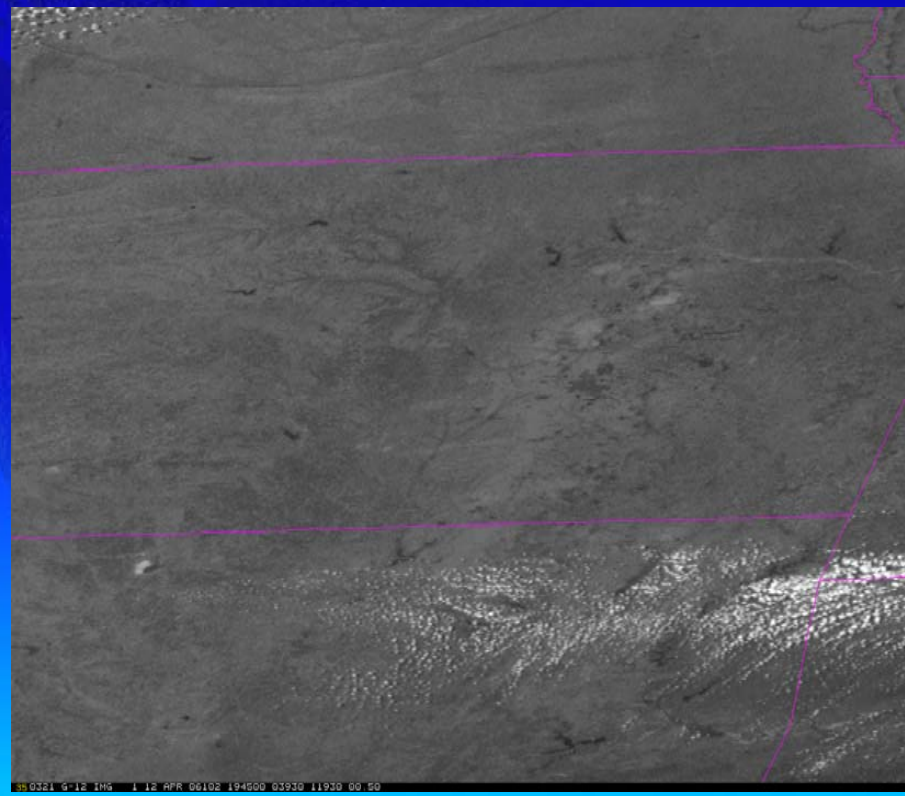


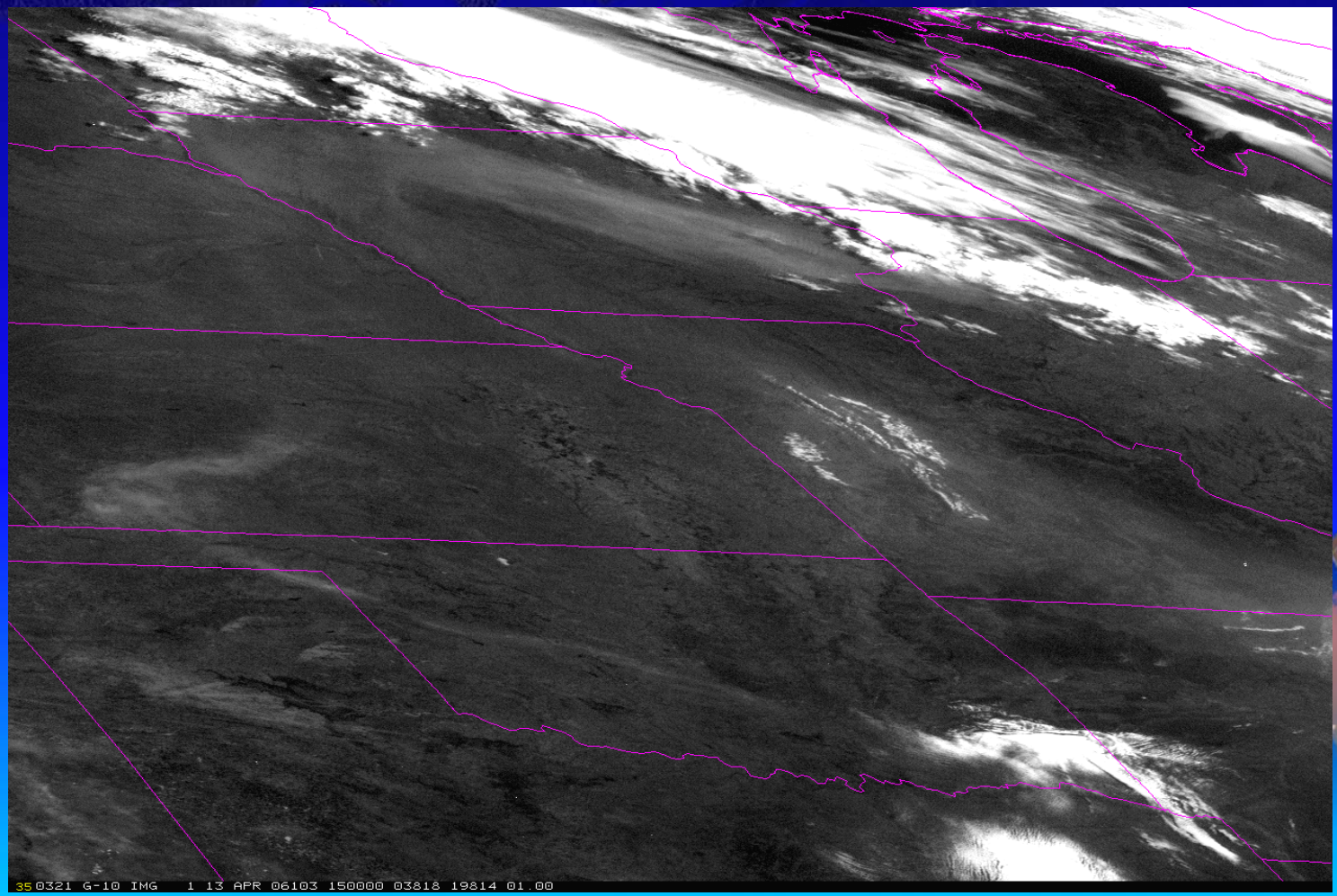
# RECENT CHANGES TO THE HAZARD MAPPING SYSTEM

**Even short duration fires with limited smoke can produce regionally significant emissions under the right atmospheric conditions and with a large number of fires**

# RECENT CHANGES TO THE HAZARD MAPPING SYSTEM



# RECENT CHANGES TO THE HAZARD MAPPING SYSTEM



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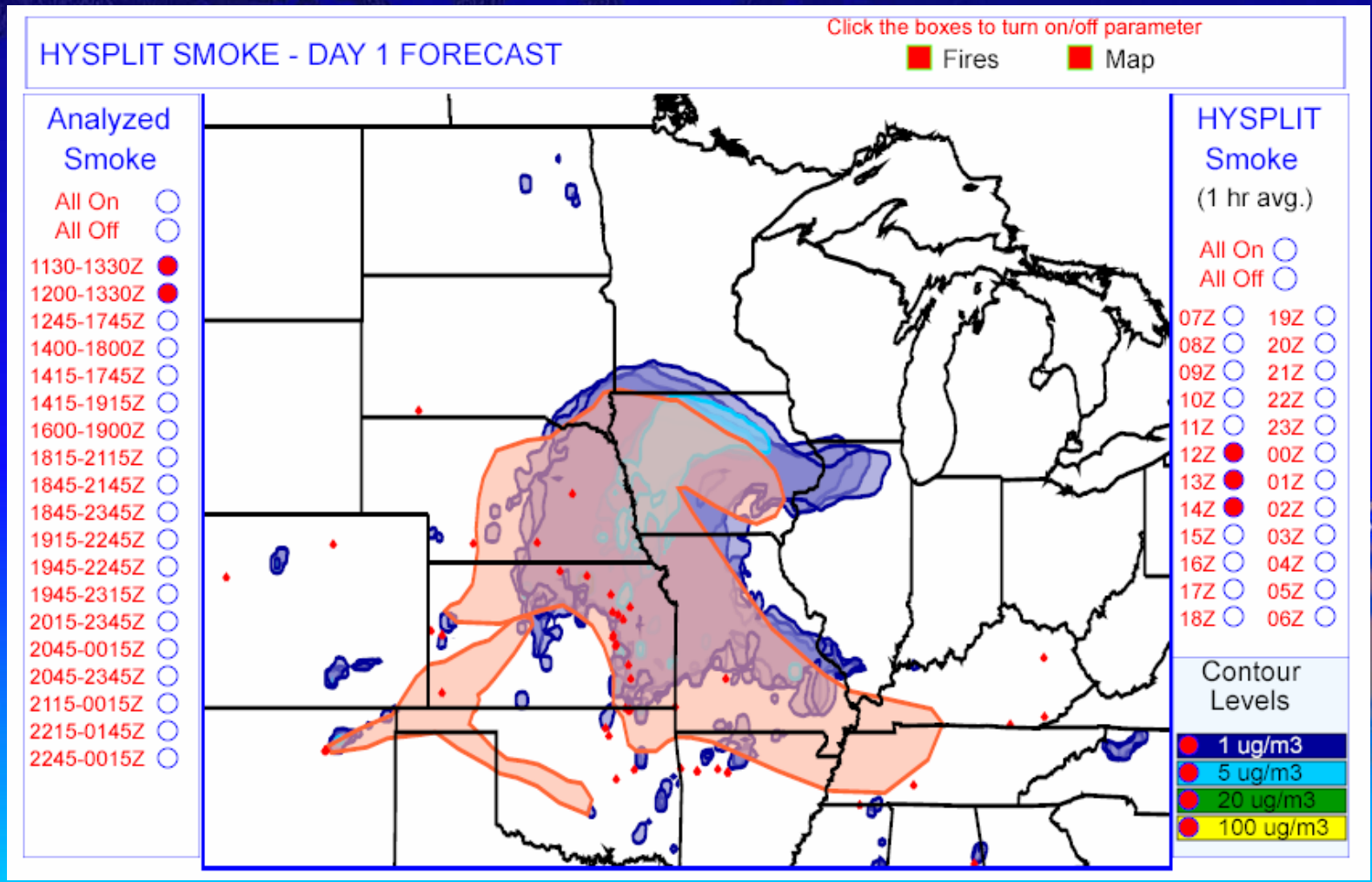


# RECENT CHANGES TO THE HAZARD MAPPING SYSTEM

**Long range transport of smoke does not adhere to political or geographic boundaries**

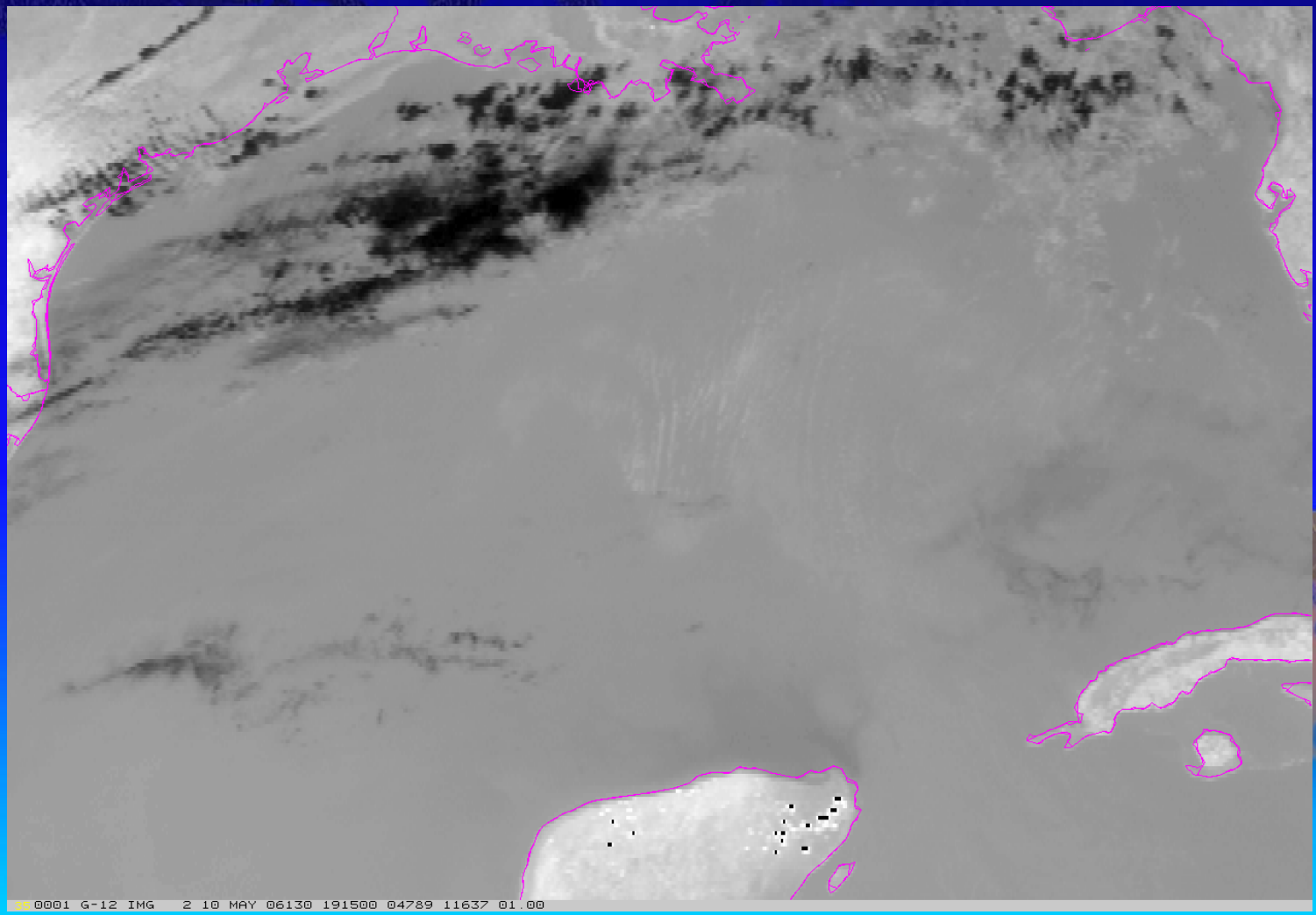
**HMS analysis includes Central America during the peak burn season in that region**

**Responsibility for Central American analysis has very recently been transferred to the Mexican National Weather Service**

# RECENT CHANGES TO THE HAZARD MAPPING SYSTEM

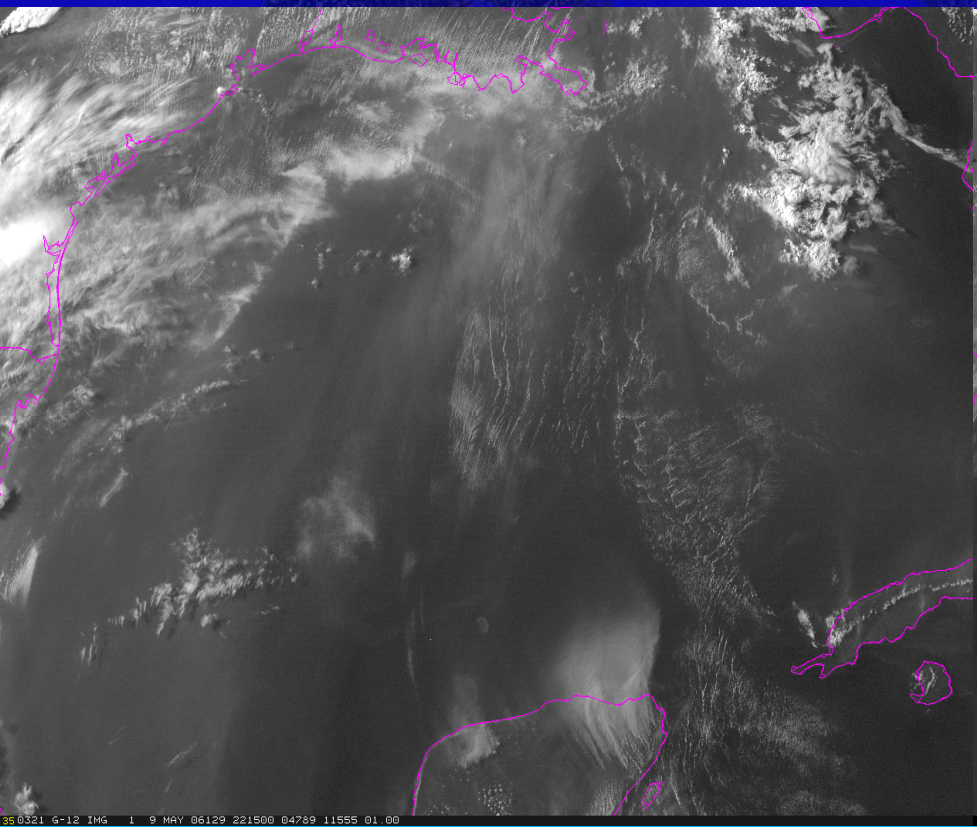
**Hurricane Wilma felled a vast number of trees and vegetation in the Yucatan producing fuel for potentially disastrous fires**

# RECENT CHANGES TO THE HAZARD MAPPING SYSTEM

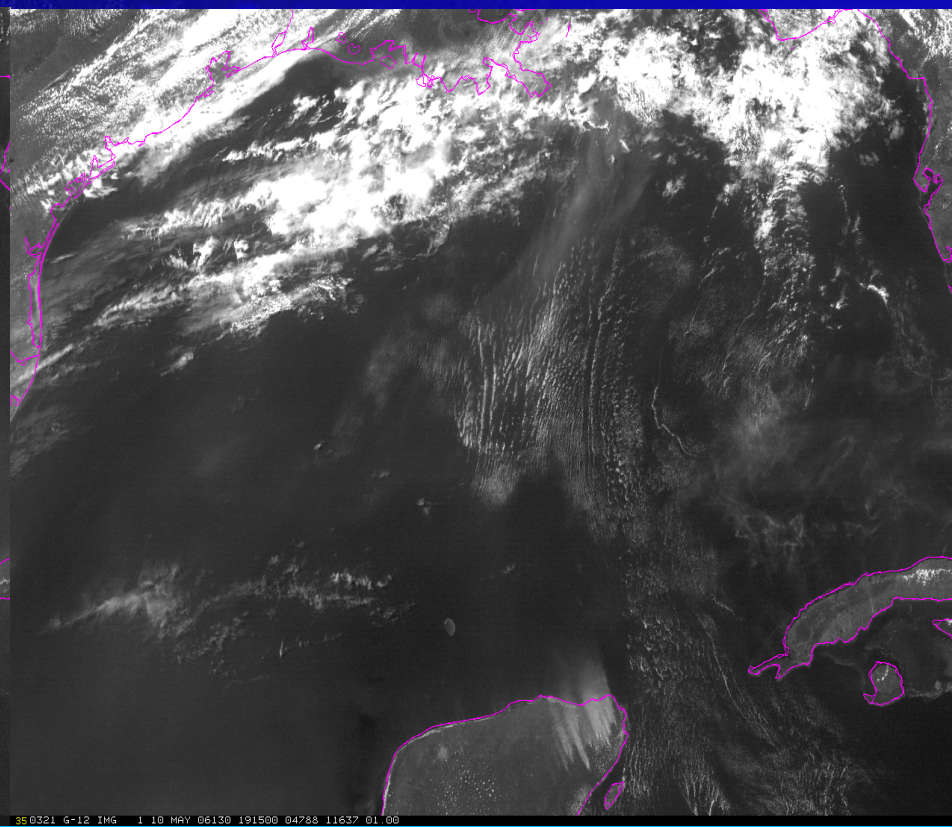


# RECENT CHANGES TO THE HAZARD MAPPING SYSTEM

## May 9, 2006




## May 10, 2006



# RECENT CHANGES TO THE HAZARD MAPPING SYSTEM

**Currently we are just drawing smoke outlines**

**Very soon we will begin drawing contours of smoke concentration**

**Contours will be largely influenced by the GOES Aerosol and Smoke Product (GASP)**

# RECENT CHANGES TO THE HAZARD MAPPING SYSTEM

## Properties of GASP:

Produced ½ hourly

Fully automated

Utilizes GOES visible band brightness values

Aerosol Optical Depth (AOD) is converted to concentration using a mass extinction coefficient of 7.9 +/- 4.5 m2/g

# RECENT CHANGES TO THE HAZARD MAPPING SYSTEM

## Limitations of GASP (and analyst drawn contours):

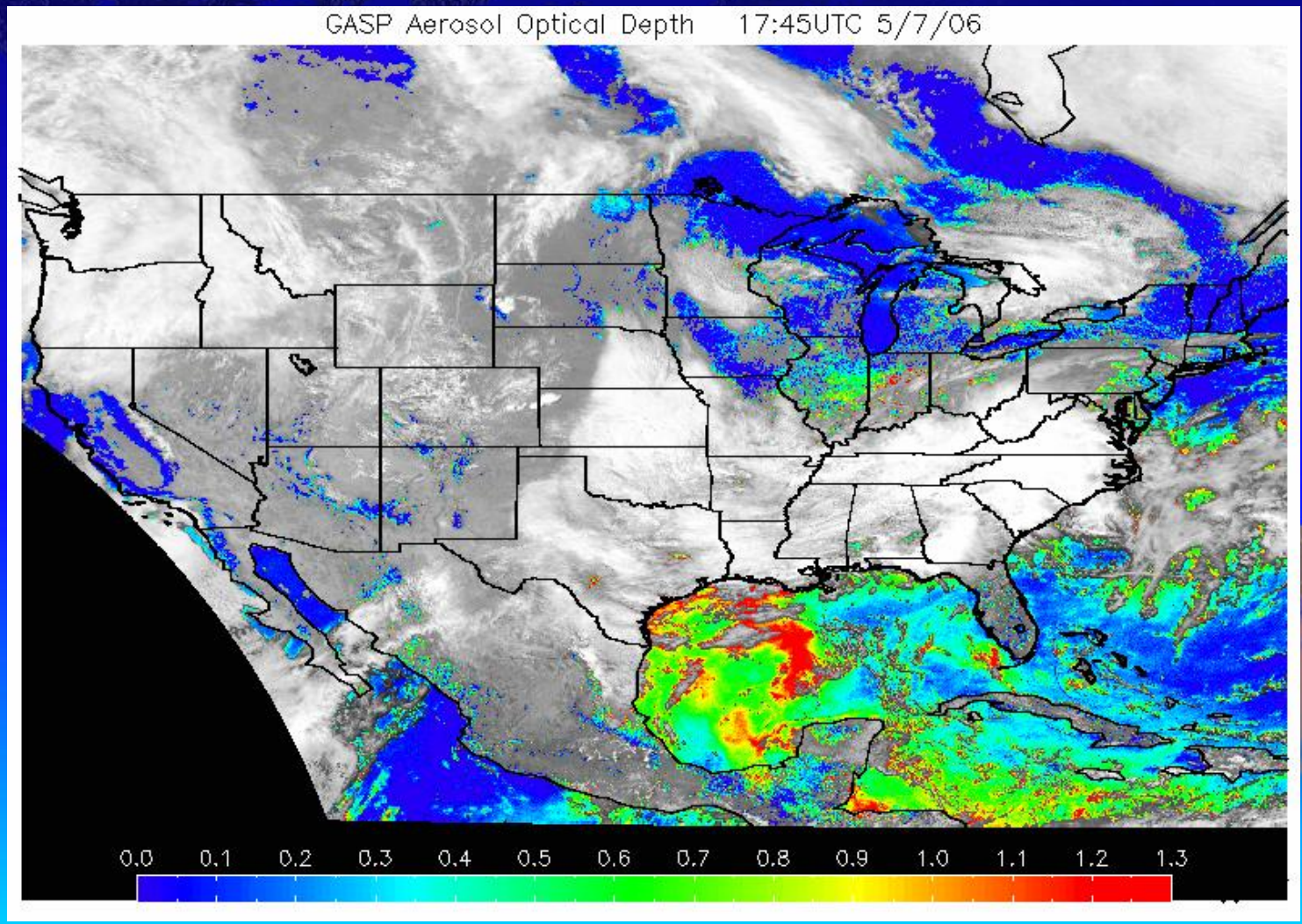
There is no vertical structure

Due to dependence on visible imagery, only available during daylight

Clouds hinder detection

GASP does not distinguish between aerosol types – analysts attempt to

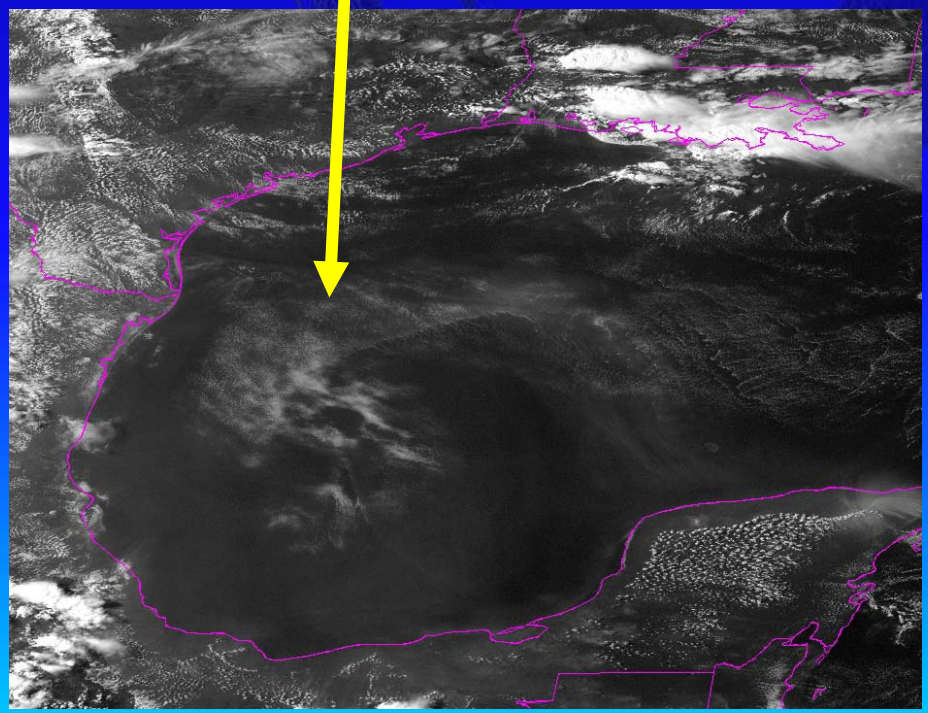
# RECENT CHANGES TO THE HAZARD MAPPING SYSTEM



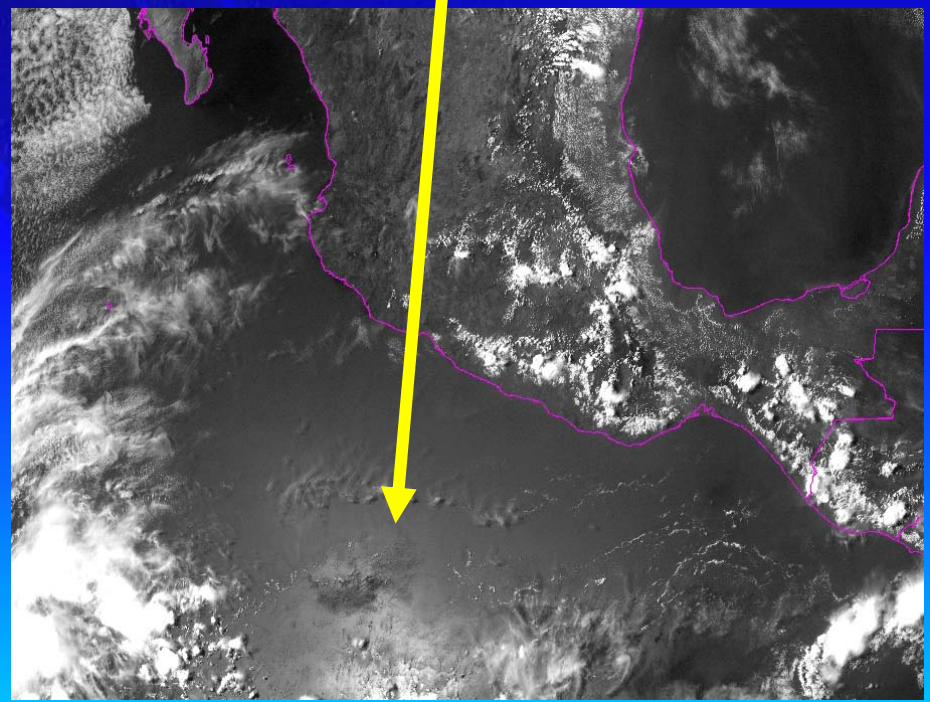
# RECENT CHANGES TO THE HAZARD MAPPING SYSTEM

## Clouds and sun glint are difficult for GASP to resolve

Clouds mixed with smoke



Sun glint



# RECENT CHANGES TO THE HAZARD MAPPING SYSTEM

- **All products available on the Web at:**
  **www.ssd.noaa.gov/PS/FIRE/**

- **Includes links to**
  - **archived products**
  - **automated algorithms**
  - **GIS page**
  - **HYSPLIT smoke forecasts**
  - **near real time imagery**
  - **manual quality controlled analysis**

# RECENT CHANGES TO THE HAZARD MAPPING SYSTEM


Smoke plume

# RECENT CHANGES TO THE HAZARD MAPPING SYSTEM

## Additional contributors who have made the system possible

Donna Mcnamara
George Stephens
John Simko
Jamie Kibler
Tim Kasheta
Po Li

UMd/NASA MODIS fire team
CIMMS GOES fire team
Yi Song
Ivan Csiszar
Rob Fennimore
Tad Franson