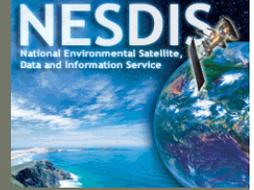




NOAA/NESDIS Satellite Products For Hazard Mitigation

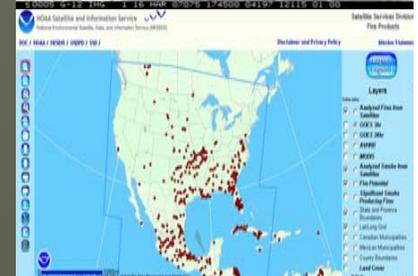
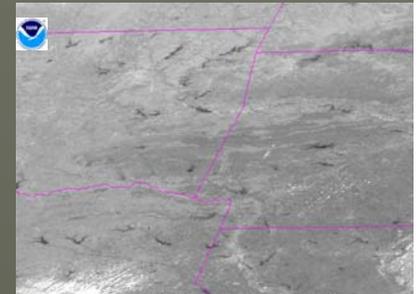
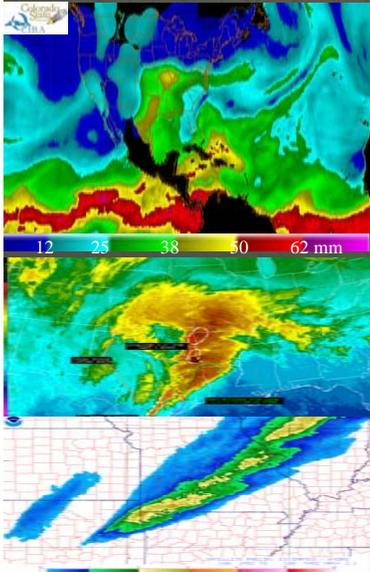


Sheldon J. Kusselson and Jamie M. Kibler

NOAA / NESDIS / Satellite Services Division

Camp Springs, Maryland

<http://www.ssd.noaa.gov>



*National Severe Weather Workshop 2008
Norman, Oklahoma
March 6-8, 2008*

ftp://gp16.ssd.nesdis.noaa.gov/pub/Presentations/Conferences/Severe_Weather_Workshop.ppt

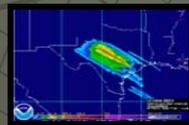
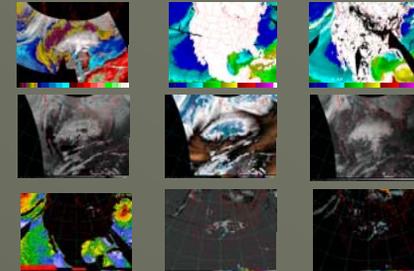


NOAA's Satellite and Information Service



Satellite Services Division

<http://www.ssd.noaa.gov>



- Satellite Imagery (GOES & POES)
- Collaborating with Research
- Testbed and Validation
- User Services
- Outreach
 - Satellite Information
 - Satellite Application Education

24/7 Operations

- Precipitation 
- Fire & Smoke Analysis 
- Tropical Analysis
- Volcanic Ash Detection
- Satellite Coordination for RSO/SRSO

Daily

OSEI - Event Imagery



World Weather Building - Maryland



NOAA's Satellite Services Division Precipitation Program



24/7/365 monitoring of precipitation with emphasis on satellite analysis and short term trends

Supporting NWS WFO/RFCs

Priorities

- heavy rainfall / flash flooding
- moderate to heavy winter precipitation
 - West Coast winter storms
 - Great Lake snows



satellite discussion messages

IM chat messages

graphical analysis

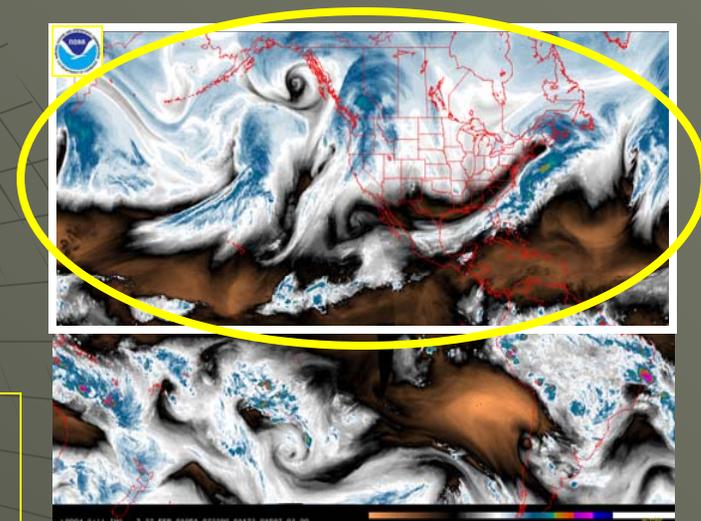
satellite rainfall estimates

Supporting NWS NCEP HPC

Priorities

- excessive rainfall area
- 0-6 hr rainfall guidance
- satellite tropical rainfall
- precipitation trends

satellite rainfall estimates



<http://www.ssd.noaa.gov/PS/PCPN/>



Satellite Precipitation (SPE) Message

<http://www.ssd.noaa.gov/PS/PCPN/precip.html>

ZCZC NFDSPENES ALL
SPENES

SATELLITE PRECIPITATION ESTIMATES..DATE/TIME 12/16/07 0518Z

SATELLITE ANALYSIS BRANCH/NESDIS---NPPU---TEL.301-763-8678

← **consultation number**

LATEST DATA USED: GOES-10: 0445Z DS

NOAA AMSU: 2221Z/0156Z

← **microwave satellite data used**

LOCATION...NW FLORIDA...S GEORGIA...

ATTN WFOS...TBW...JAX...TAE...

← **weather offices in concern area**

ATTN RFCS...SERFC...

EVENT...HVY RAIN OVER PARTS OF N FL AND PANHANDLE

satellite analysis information



SATELLITE ANALYSIS AND TRENDS...WV IMAGERY SHOWS A SMALL WAVE ALONG THE TROPICAL MOISTURE REMNANTS OF OLGA IN THE ERN GULF OF MEXICO THAT IS BRINGING HVY RAINS TO THE PANHANDLE/NW FL AND EVENTUALLY MOST OF THE WRN COAST OF FL. THIS WAVE..MOVING TO NORTH IN THE EASTWARD MOVING CNVTN..HAS BEEN THE MAIN FACTOR FOR HVY RAINS BEING TEMPORARILY HELD UP OVER THE ERN PANHANDLE. . 00Z PW ANALYSIS SHOWED 1.8-2" PW'S IN THE PRE STORM ENVIRONMENT OVER FL BUT WITHIN THE CNVTN OVER THE ERN GULF...RECENT AMSU PASSES SHOWED THAT A LARGE AREA OF OVER 2" PW'S EXISTED...SOME AS HIGH AS 2.2-2.4". COLDEST CLOUD TOPS ARE SEEN ON IR IMAGERY WHERE IMPLULSE MENTIONED ABOVE IS COLOCATED. OBJECTIVE ANALYSIS SHOWS THETA-E AXIS ACROSS N FL INTO S CENTRAL/SE GA WITH A SMALLER SECONDARY AXIS POINTED NWD JUST W OF TLH ACROSS KAAF AND KMAI. SFC MOISTURE CNVG IS ALSO AT A MAX ACROSS THIS SAME AREA INTO SW/S CENTRAL GA WITH WARM FRONT JUST TO THE NORTH. BELIEVE THAT THE LIFTING WAVE WILL MOVE TO SW OF KCTY/WNW OF KBKV IN THE NEXT FEW HRS. THIS WILL KEEP HVY RAINS STILL FOCUSED ACROSS THE FAR ERN PART OF THE FL PANHANDLE

AND THE NW/N CENTRAL PART OF THE STATE... ALONG WITH SERN GA.... PRODUCING RAINFALL RATES THAT WILL BE WELL IN EXCESS OF 1"/HR. WITH THE VERY POTENT MOISTURE SOURCE AVAILABLE MAX RATES COULD REACH 2.5-3"/HR AS THE STRONGEST CELLS ARE STILL OFFSHORE PER IR IMAGERY BUT ARE EXPANDING NWD TWDS K40J. AUTOMATED ESTIMATES ARE TOO LOW ONSHORE DUE TO WARMER TOPPED CELLS THAT STARTED THIS EVENT BUT ARE SHOWING MAX 3 HR AMOUNTS OFFSHORE WITHIN THE WAVE OF 3-4" ..MAX 4.5" ENDING 0445Z. SEE WEB ADDRESS IN ABOUT 10 MIN FOR GRAPHICS. WILL CONTINUE TO MONITOR AS HEAVIEST RAINS PUSH ASHORE.

satellite rainfall estimate information

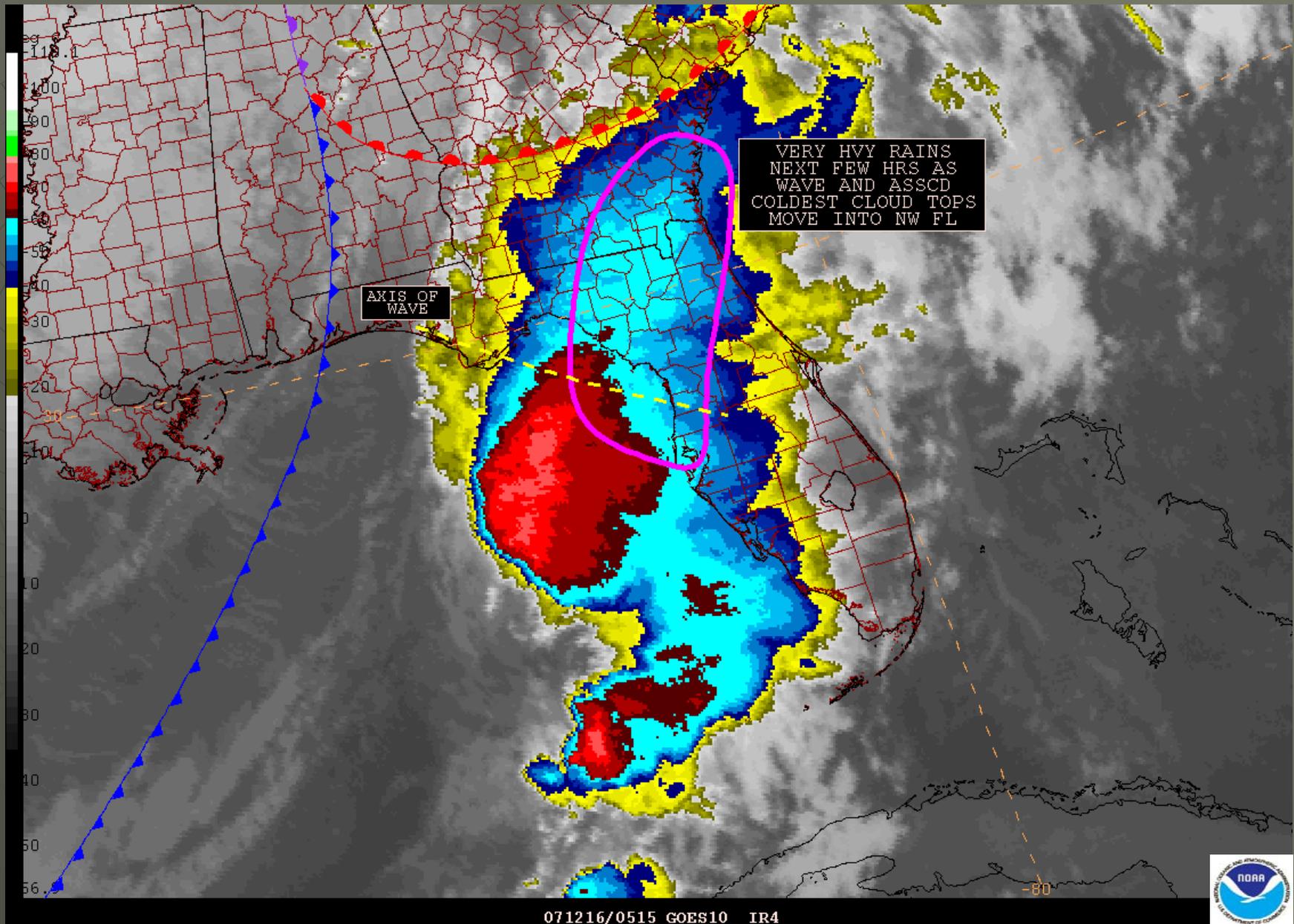
SEE NCEP HPC DISCUSSION AND QPF/S FOR FORECAST.

← **coordination with National Center**

...NESDIS IS A MEMBER OF 12 PLANET....

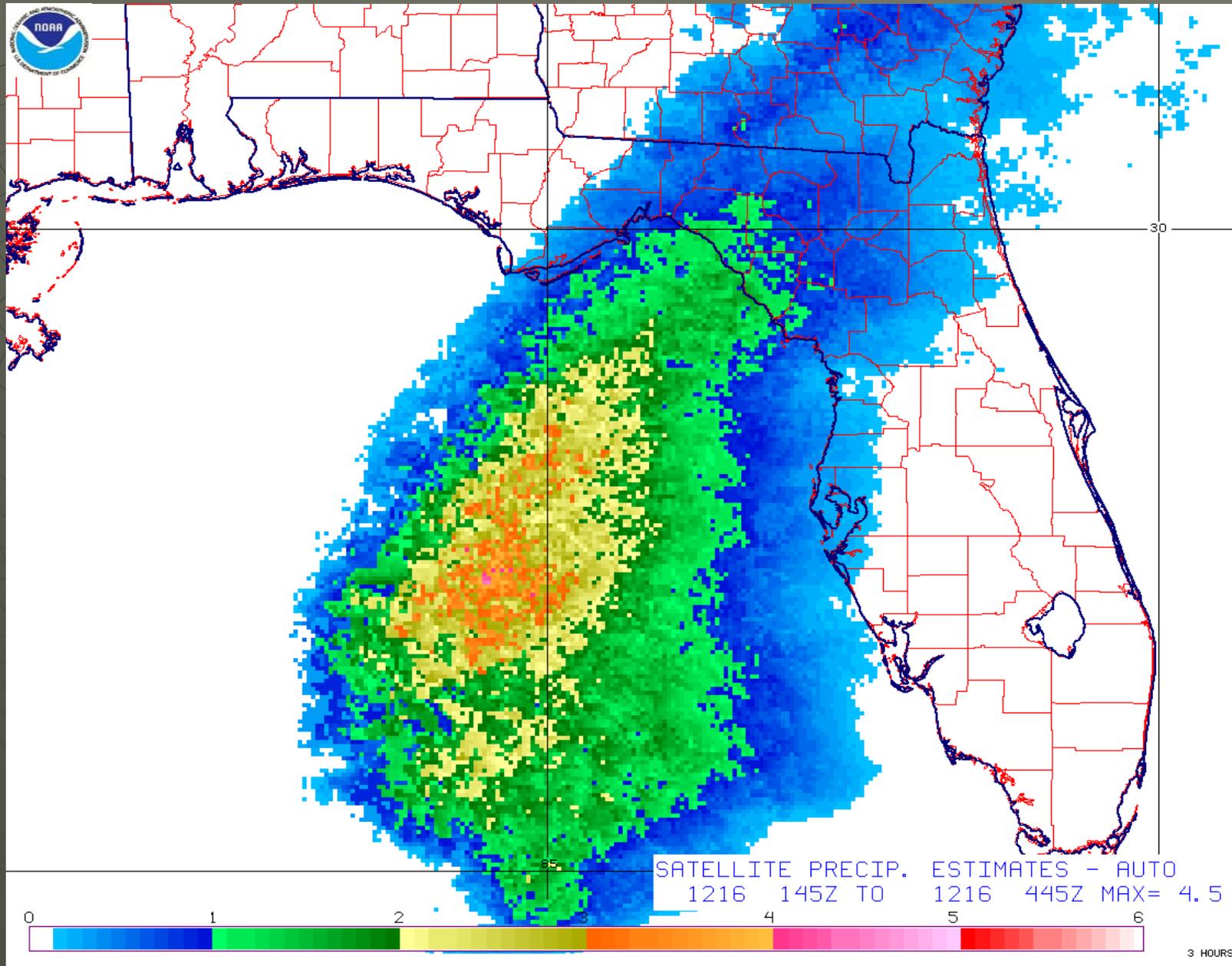
← **consult privately with weather offices**

Satellite Precipitation Message Graphic



<http://www.ssd.noaa.gov/PS/PCPN/DATA/SPEGIF/>

Satellite Precipitation Estimates Graphic



<http://www.ssd.noaa.gov/PS/PCPN/DATA/SPEIFFA/>

NOAA Satellite Precipitation Estimate Home Page

[READ ME](#)

AUTOMATIC SATELLITE-DERIVED PRECIPITATION ESTIMATES

The original Auto-Estimator algorithm was developed for deep, moist convective systems. Over time, enhancements and improvements to the program led to a completely new product, called the Hydro-estimator, which is currently in operational use by the National Weather Service for monitoring potential flash flood events. Precipitation rates are primarily based on the cloud top temperature obtained from GOES 12 and GOES 10 (10.7 micron). Instantaneous, 1 hour, 3 hour, 6 hour, and 24 hour precipitation estimates are available. Numerous other factors, including the cloud-top geometry, the available atmospheric moisture, stability parameters, radar, and local topography, are used to further adjust the rain rate. For more details see [technique description](#)

INSTANTANEOUS RAIN RATES [Current Archive](#)

1-HOUR TOTAL [Current Archive](#)

3-HOUR TOTAL [Current Archive](#)

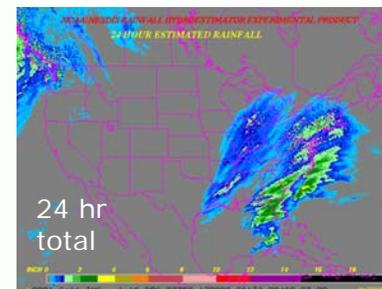
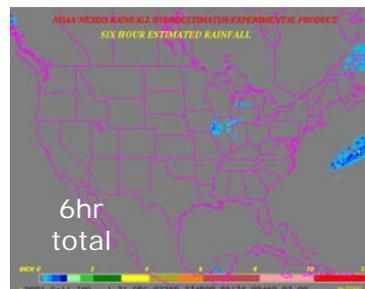
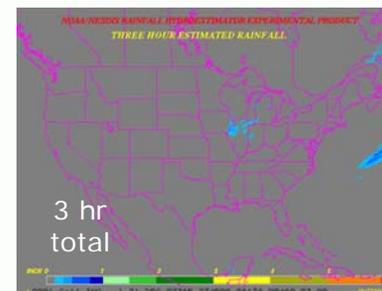
6-HOUR TOTAL [Current Archive](#)

24-HOUR TOTAL [Current Archive](#)

INFRARED SATELLITE [Current Archive](#)

VISIBLE SATELLITE [Current Archive](#)

PWRH (MOISTURE CORRECTION) [Current](#)



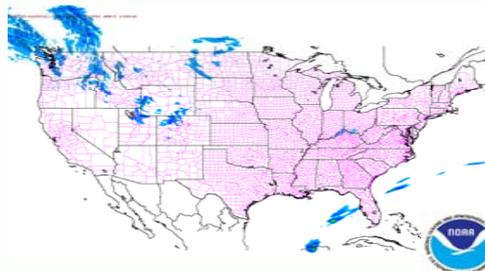
Blowups of the instantaneous, 1-, 3-, and 6-Hour Products

[INSTANTANEOUS](#)

[1 HOUR](#)

[3 HOUR 3 HOUR ANIMATION](#)

[6 HOUR](#)



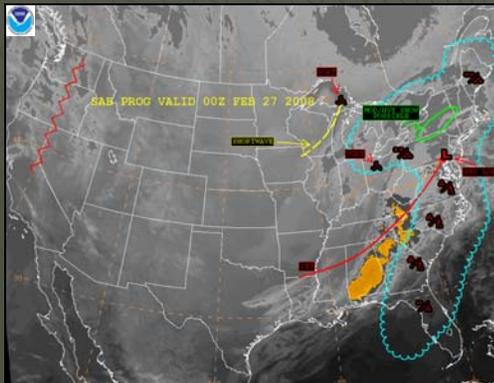
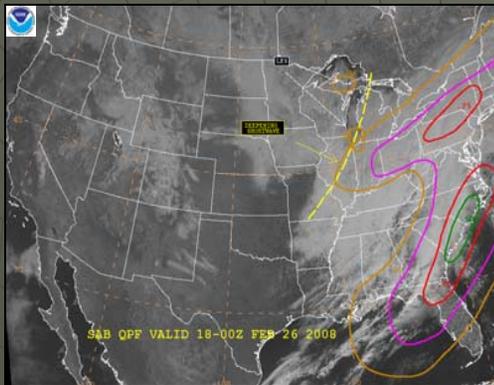
Supplement Radar/obs

- + Outages or sparse observations
- + Out of radar range
- + Mountainous area
- + Radar algorithm difficulties
- + Inclusion blended estimates

<http://www.orbit.nesdis.noaa.gov/smcd/emb/ff/auto.html>

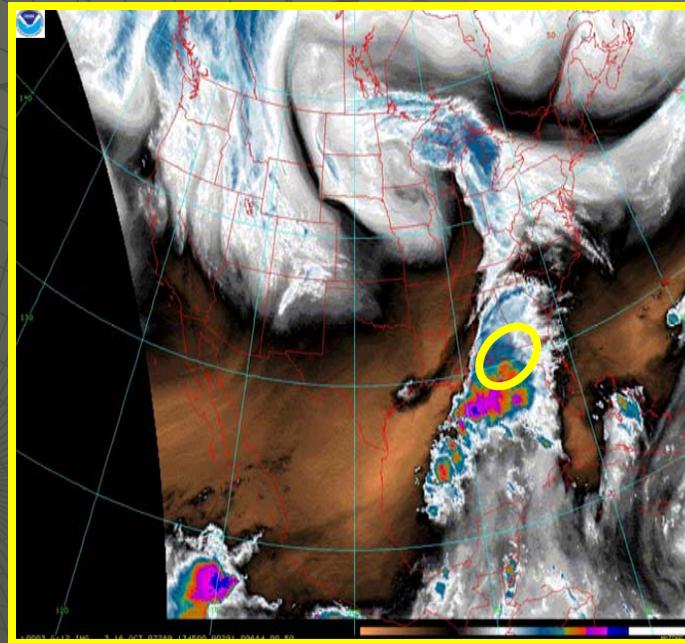
Satellite Support to NWS/NCEP Hydrometeorological Prediction Center

0-6 hour rainfall guidance

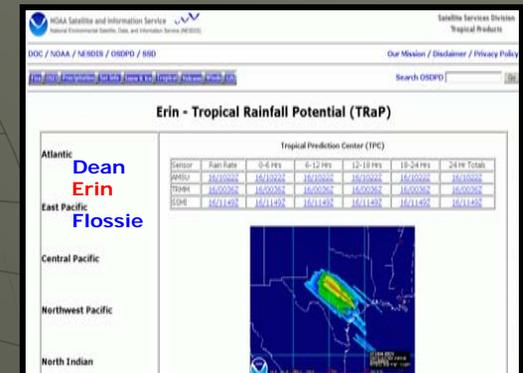


Precipitation Trends

Excessive Rainfall Potential



Satellite Rainfall Estimates

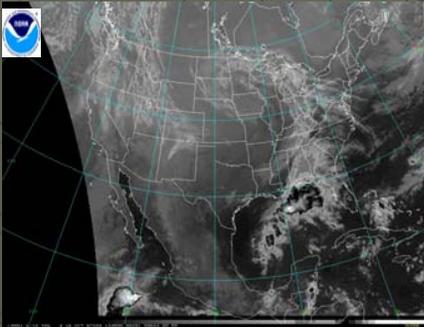


Satellite derived Tropical Rainfall Potential (TRaP)

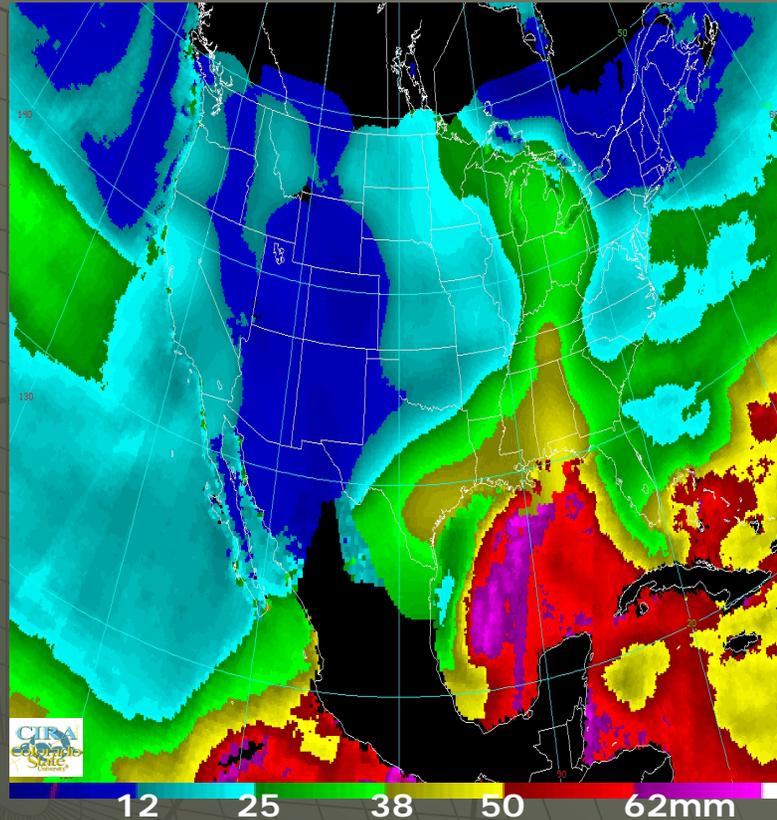
<http://www.ssd.noaa.gov/PS/TROP/trap.html>

Familiar, Value added and New Satellite data

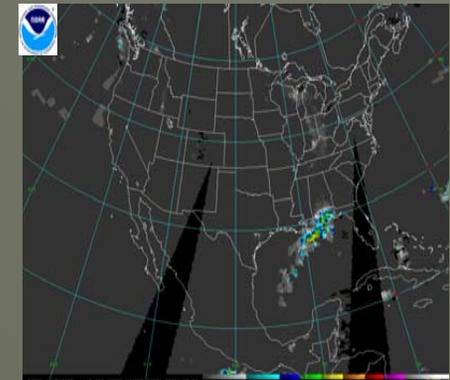
GOES IR



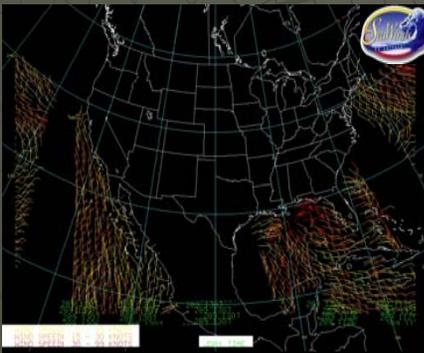
Blended Total Water Vapor



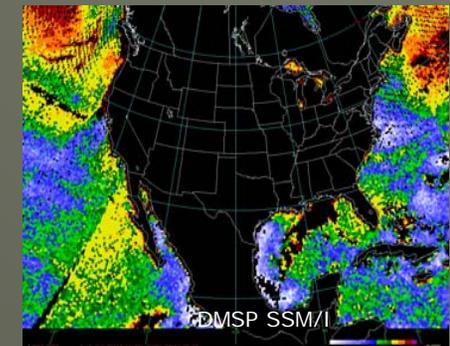
Microwave Rain Rates



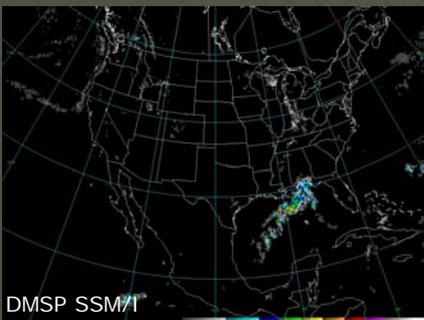
Quikscat Winds



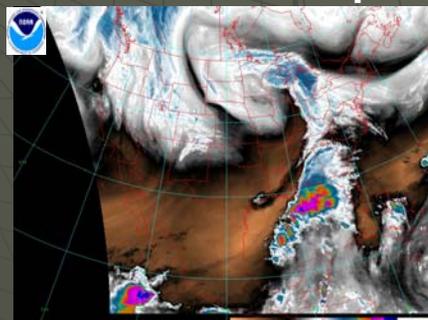
Microwave Winds



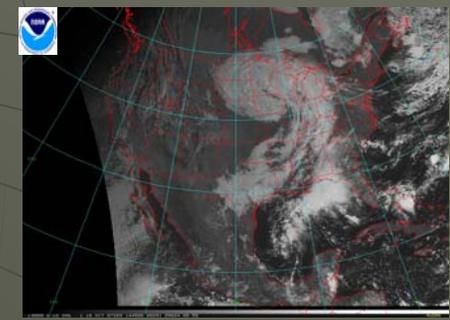
Microwave Rain Rates



GOES Water Vapor

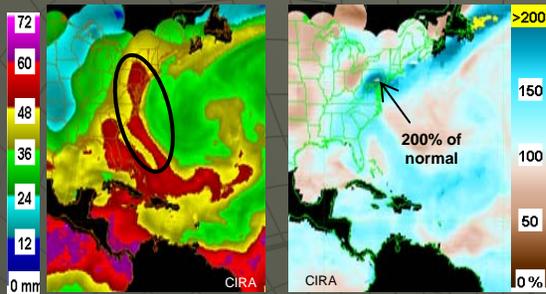


GOES Visible



Collaborate with Research to Develop Satellite Products Useful for Hazard Mitigation

Blended Total Moisture Products



Heavy Rainfall/Flash Flooding

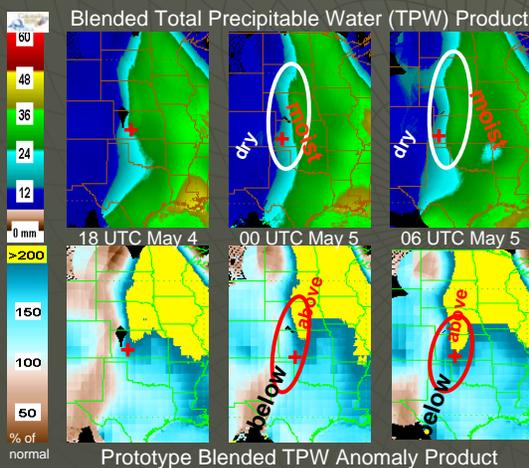
Severe Storms



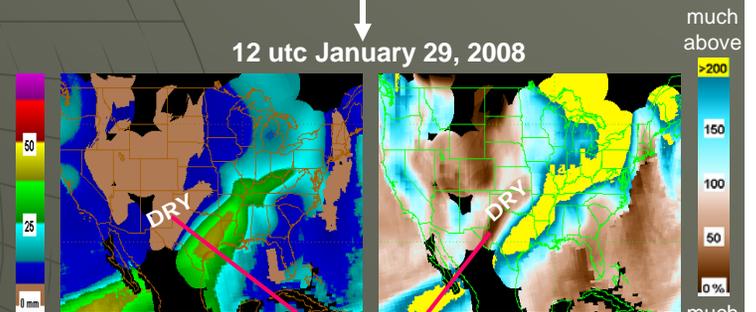
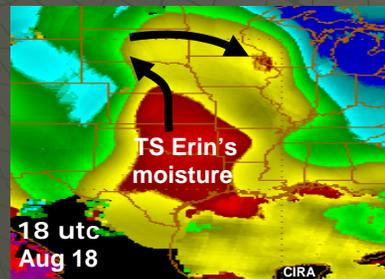
Tropical Storm Flooding

Fire Potential

12 utc January 29, 2008



X Greensberg, KS



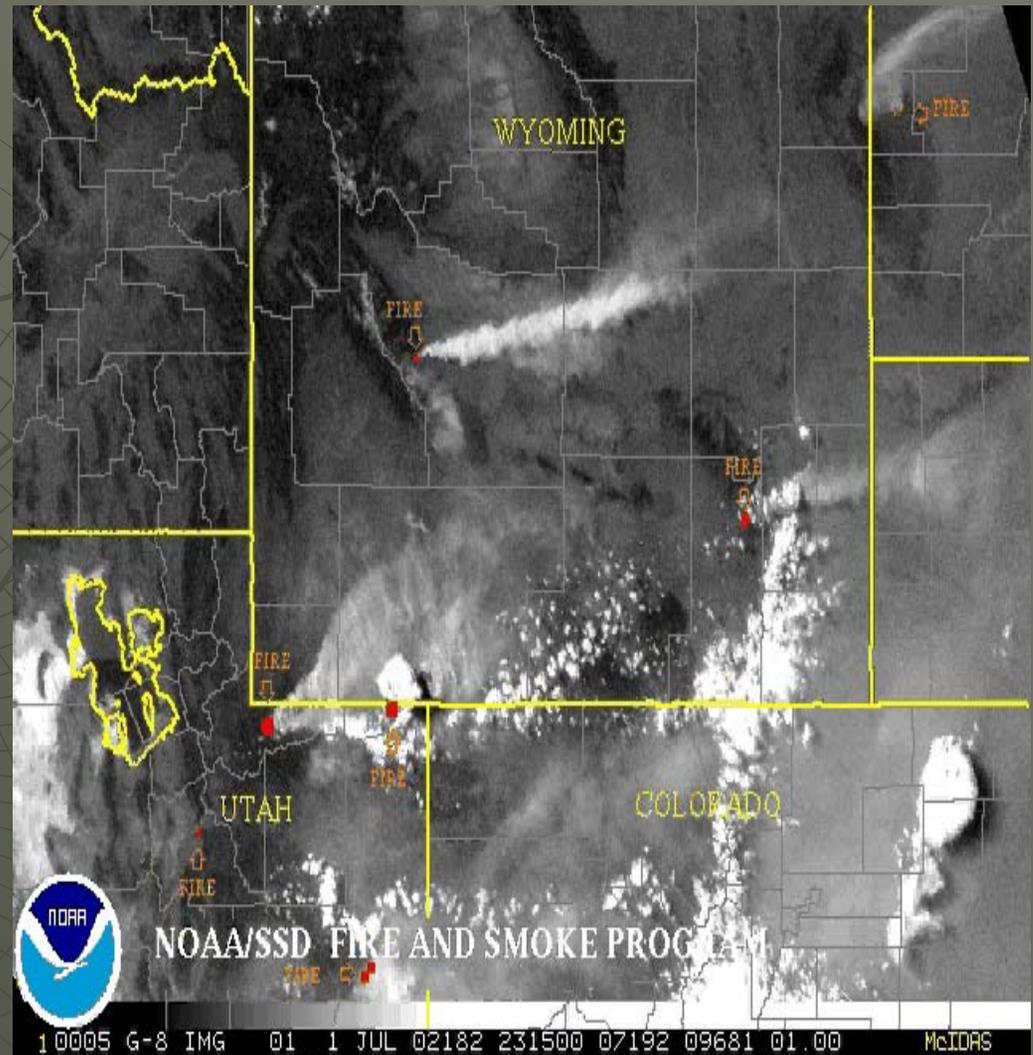
Part 2



**NOAA's Satellite Services Division
Smoke and Fire Program**

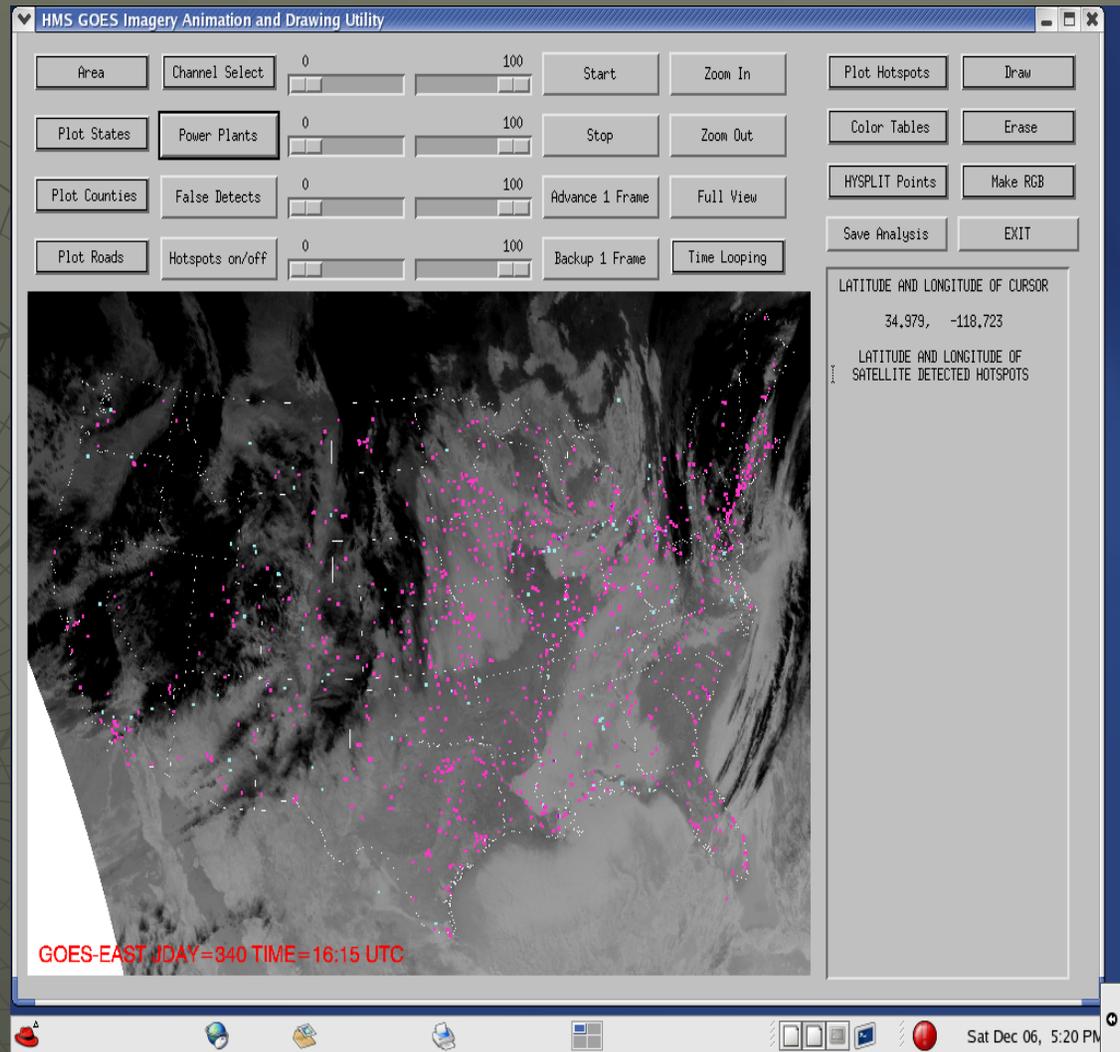
NOAA's SATELLITE SERVICES DIVISION SMOKE AND FIRE PROGRAM

**In 1998
NOAA/NESDIS
began a fire and
smoke analysis
as smoke from
Mexico began
moving into the
southern US
and affecting
health,
transportation
and other forms
of industry.**



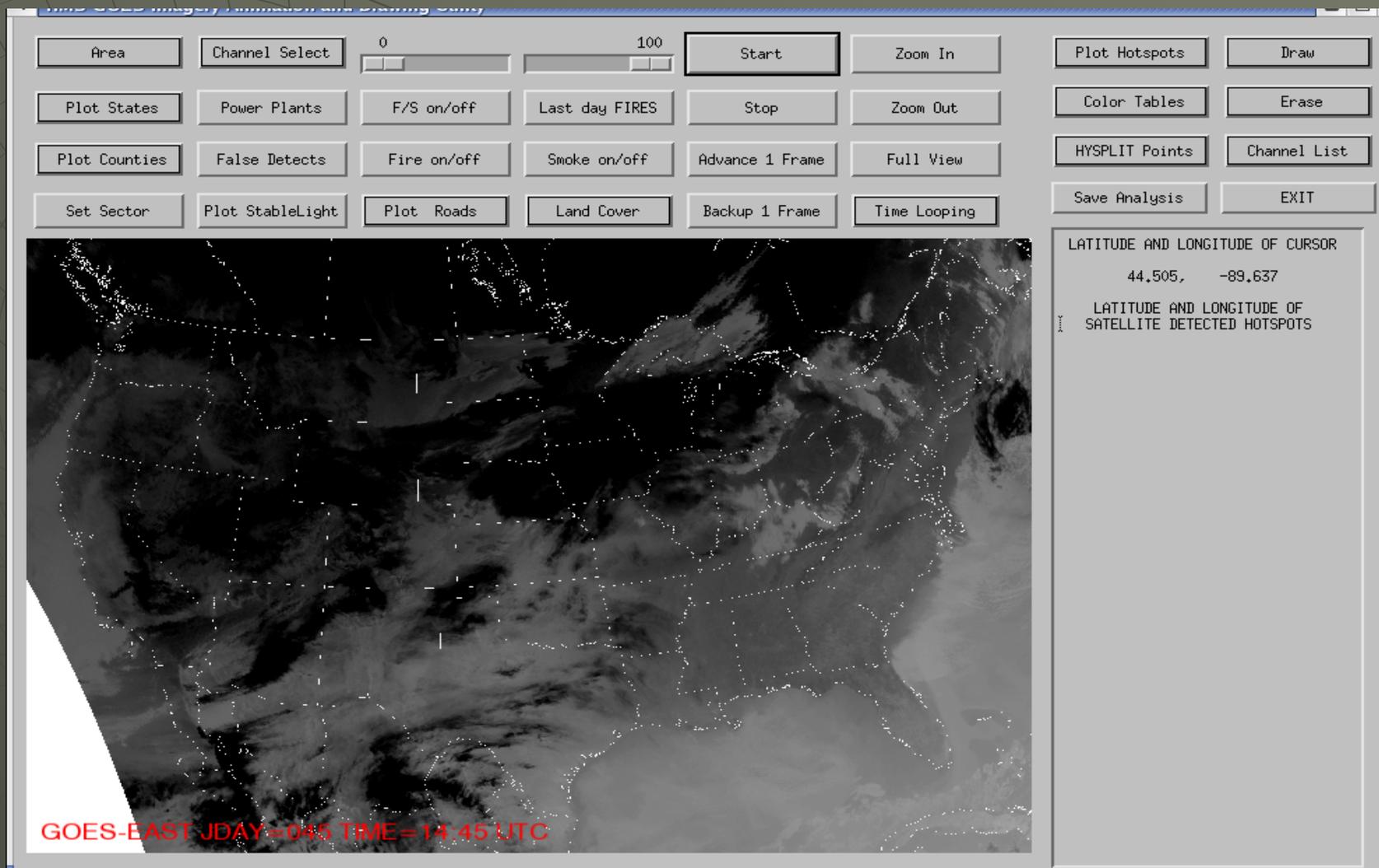
SATELLITE SERVICES DIVISION FIRE AND SMOKE PROGRAM

- ◆ In July 2002 the fire and smoke analysis began on the Hazard Mapping System (HMS) for the continental US, Alaska, Hawaii, Canada and Mexico/Central America sectors are now included.



<http://www.ssd.noaa.gov/PS/FIRE>

The Hazard Mapping System



<http://www.ssd.noaa.gov/PS/FIRE>

SATELLITES CURRENTLY USED FOR FIRE AND SMOKE DETECTION

- **GOES 12 and GOES 11**
- **NOAA 15, 17 and 18**
- **MODIS AQUA AND TERRA**
- **METOP – Hopefully soon**

**Over 100 looks per day in areas of
GOES-East and GOES-West overlap.**

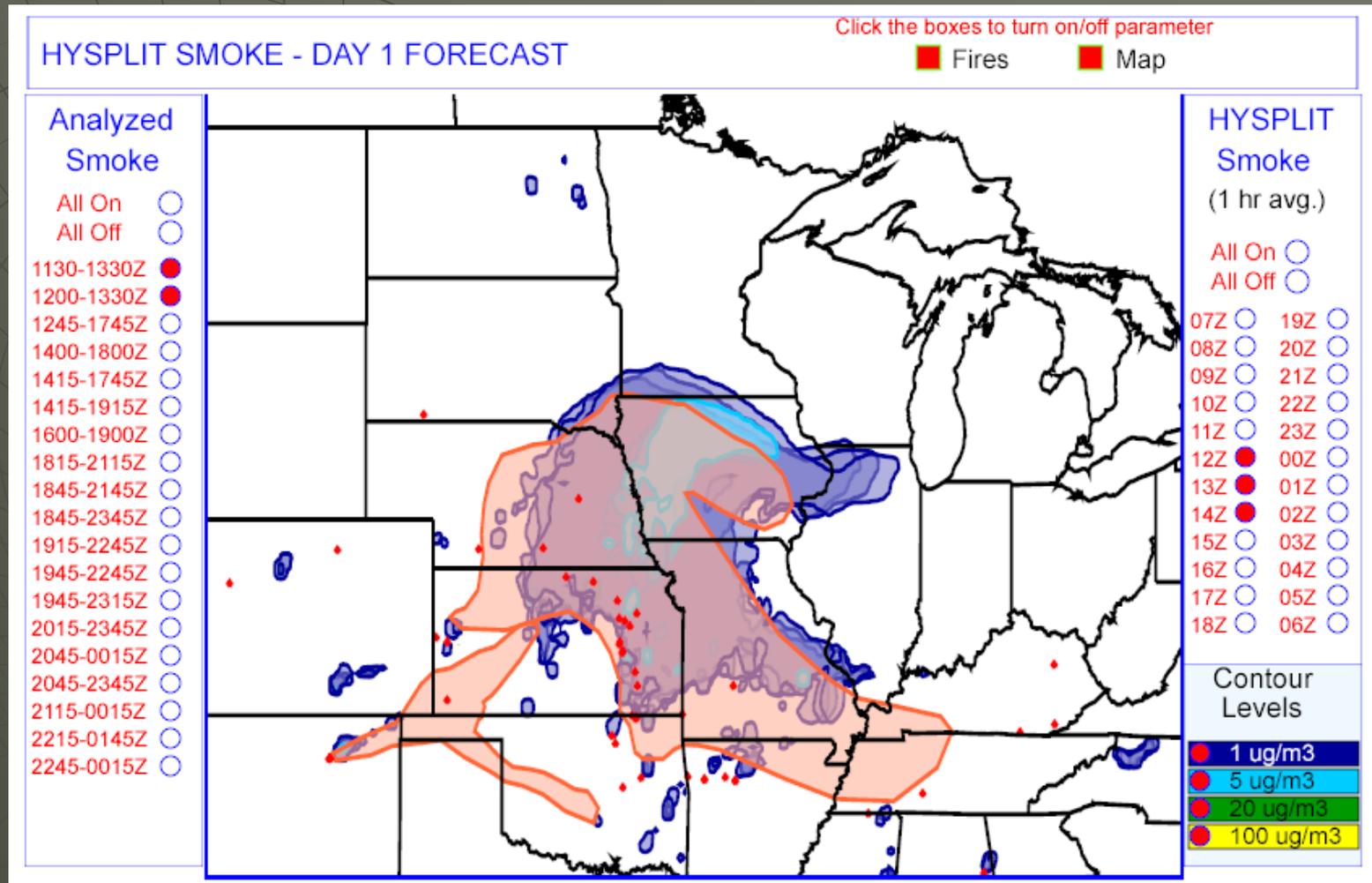
**Two looks per satellite per day with
Polar spacecraft in mid latitudes –
more at high latitudes**

THE FIRE AND SMOKE ANALYST

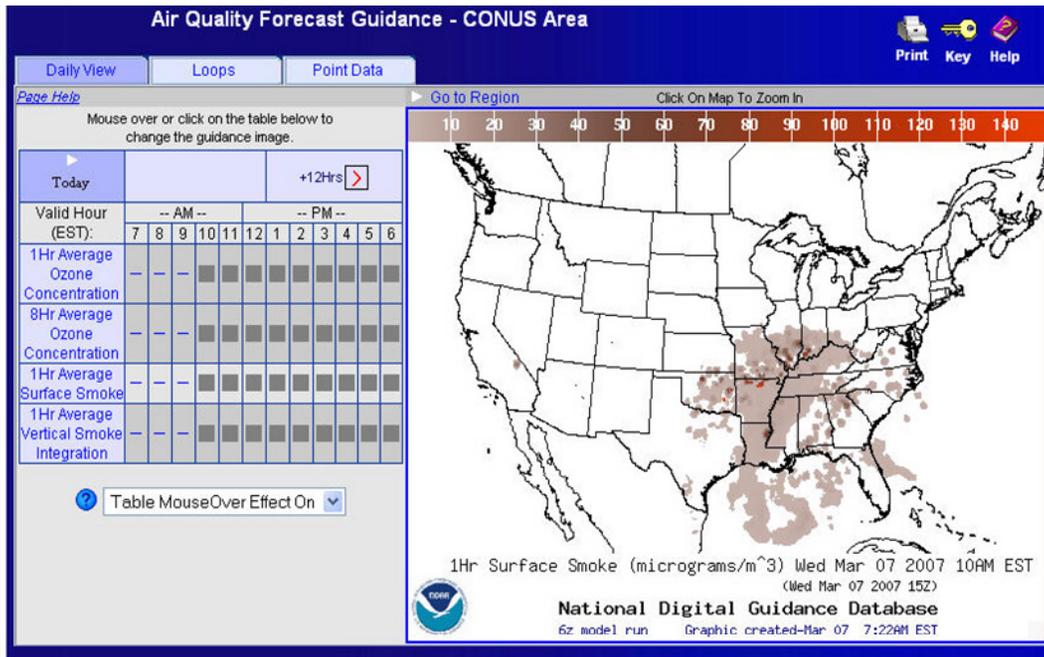
THEIR JOB

- **Quality checks the fire points produced by the ABBA, FIMMA and MODIS algorithms by looking at the associated satellite data. Additional fire detects added by the analyst.**
- **Draws in the smoke produced by the fires. The analyst can identify the smoke as light, moderate or thick with an assigned numerical value for each plume.**
- **Provides locations of significant smoke producing fires as input to the Air Resources Laboratory (ARL) 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.**

Hybrid Single-Particle Lagrangian Integrated Trajectory (HYSPLIT) model



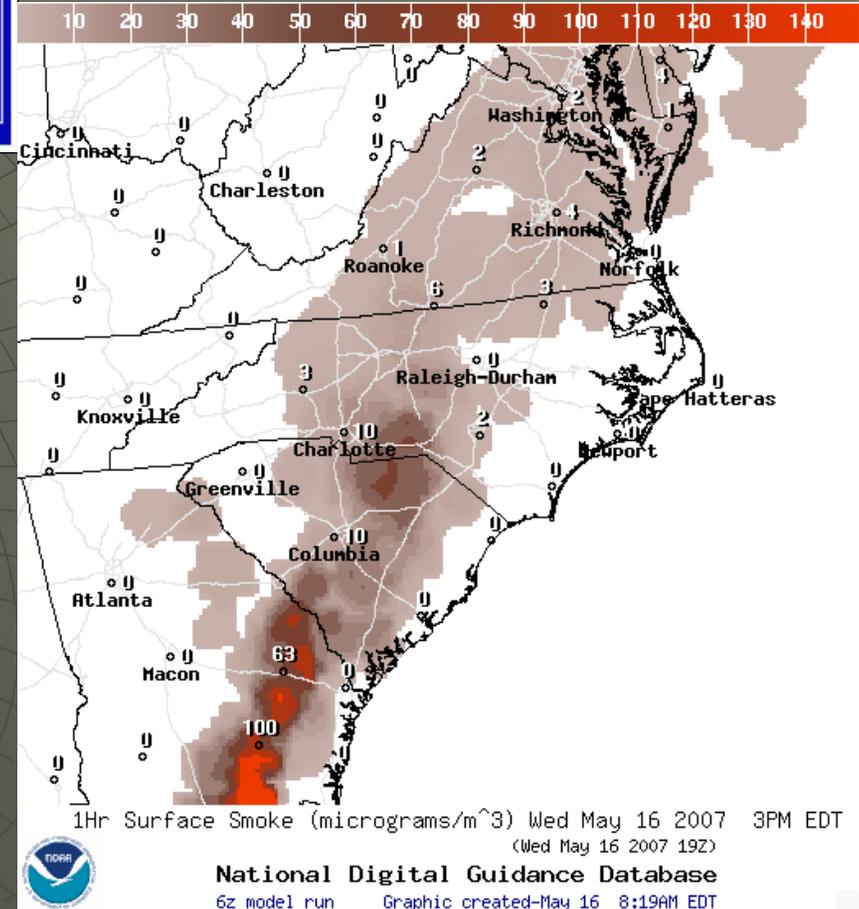
<http://www.arl.noaa.gov/smoke/forecast.html>



Points for significant smoke producing fires are provided daily by NESDIS analysts for inclusion as smoke emission sources into the Air Resources Lab (ARL) HYSPLIT model

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

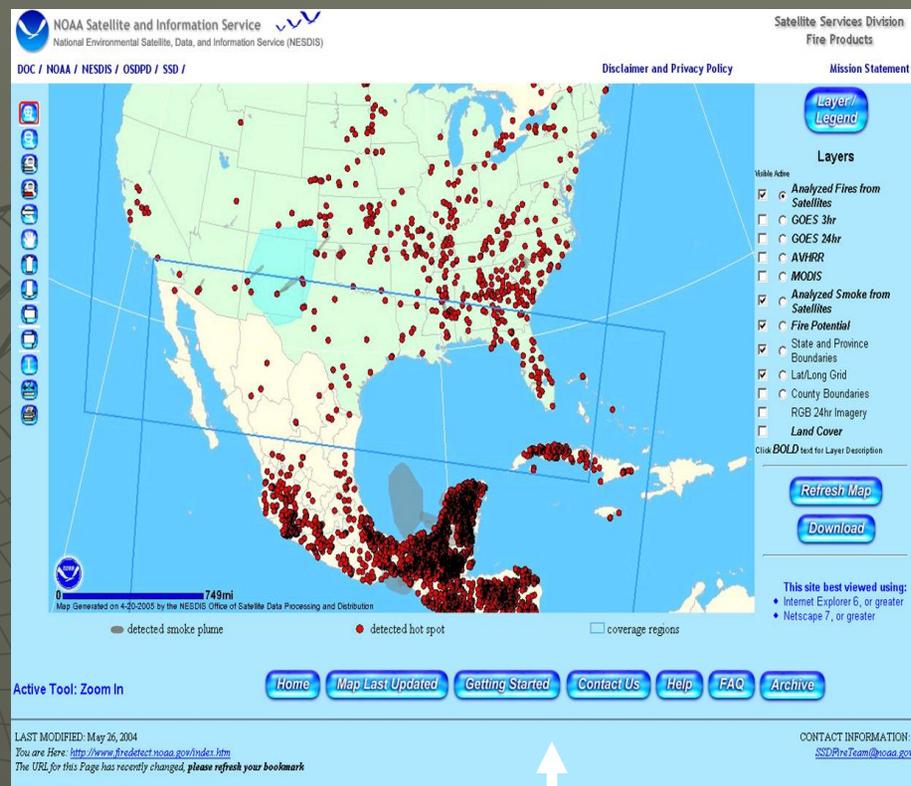
www.weather.gov/aq/



HMS GRAPHICAL OUTPUT IN A STATIC JPG AND GIS



<http://www.ssd.noaa.gov/PS/FIRE/hms.html>



<http://www.firedetect.noaa.gov/viewer.htm>

SMOKE TEXT PRODUCT

Friday, September 14, 2007 DESCRIPTIVE TEXT NARRATIVE FOR SMOKE/DUST OBSERVED IN SATELLITE IMAGERY THROUGH 0130Z September 15, 2007

Idaho/Montana to the Central US and Great Lakes Region/Southeastern Canada:

A very large region of smoke was observed originating from the wildfires in Idaho and western Montana and possibly also from the large north central Washington fire. The smoke extended eastward across Wyoming and then southeastward into the Central Plains and mid Mississippi Valley. The smoke then turned more to the northeast as it became entrained into a frontal system and covered the Ohio Valley along with the central and eastern Great Lakes region before spreading into southeastern Canada south of Hudson Bay. Early in the day the smoke was at least moderately dense and even locally dense along the frontal boundary which extended at that time from northern Missouri to Michigan. The smoke was also dense closer to the fire sources over central Idaho, western Montana, and northern Wyoming.

Canada/North Central US: A swath of very thin smoke from an unknown source moved south-southeastward across the south central Canadian provinces of Manitoba and southwestern Ontario into North Dakota during the morning and over South Dakota and Minnesota during the afternoon. It is possible (but definitely not certain) that the smoke was transported a very long distance from the large fires burning in north central Alaska. Also, several moderately dense to even locally dense smoke plumes were observed moving eastward across the southern portion of Manitoba Province in south central Canada. The fires were scattered around south central Canada and North Dakota, but particularly concentrated in southern Manitoba.

Florida: Fires along the east coast of Florida just northwest of Cape Canaveral were emitting a plume of moderately dense to locally dense smoke which moved mainly to the northeast and out over the Atlantic Ocean.

Southeastern Missouri/Western Tennessee:

Numerous agricultural burns over southeastern Missouri were producing an area of thin smoke with embedded patches of moderately dense smoke which spread to the southeast into western Tennessee, just to the north and northeast of Memphis.

Utah:

Several fires were detected in Utah during the day, but widespread cloudiness hindered smoke detection from satellite imagery. One plume which did appear for a time extended to the northeast from a fire in Tooele County in northwestern Utah. The moderately dense to dense smoke plume moved across the Great Salt Lake and very close to Salt Lake City and Ogden.

Product Availability

Fire and Smoke Product

- ◆ Analysis done between the hours of 1:00 and 11:00 p.m. and finished up overnight by 6:00 a.m. the next morning.
- ◆ First analysis of the day saved by 3:00 p.m. with additional saves throughout the day and night.

Smoke Text Product

- ◆ Done at 12:00 and 11:00 p.m. each day.
- ◆ Only significant smoke producing fires are discussed.
- ◆ Amount of detail on each smoke producing fire is up to the analyst.

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

Includes links to:

- ◆ Archived products
- ◆ Automated fire algorithms
- ◆ GIS page
- ◆ HYSPLIT smoke forecasts
- ◆ Near real time imagery
- ◆ GASP imagery
- ◆ Manual quality controlled analysis

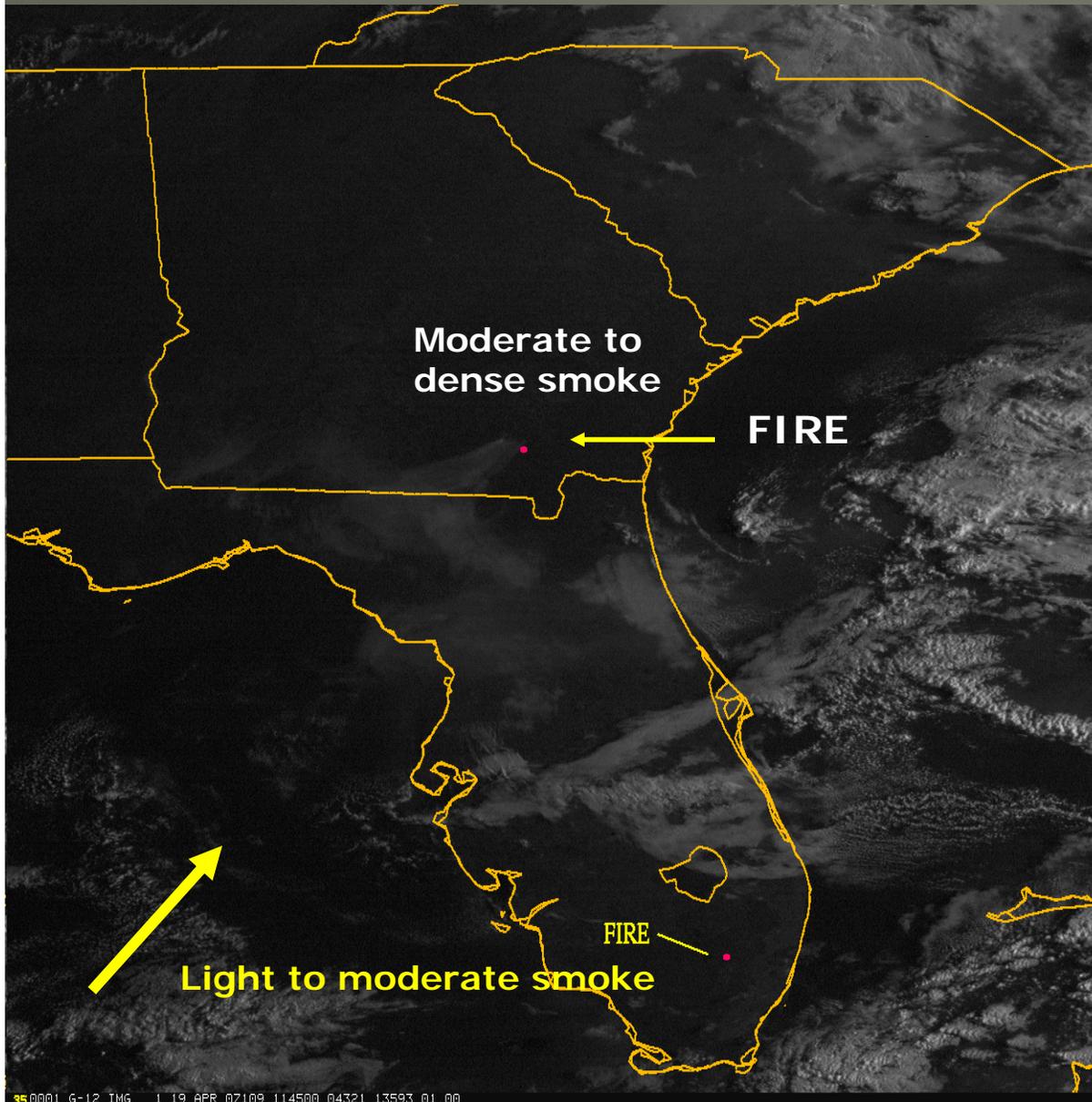
NOAA's Satellite Services Division Smoke and Fire Satellite Imagery Home Page

The screenshot shows the NOAA Satellite and Information Service website for Florida fire monitoring. The page title is "Real Time Satellite Fire Monitoring - Florida". It features a navigation menu with options like "Fire", "OSI", "Precipitation", "Sat Info", "Snow & Ice", "Tropical", "Volcano", "Winds", and "GIS". Below the navigation, there are six satellite imagery thumbnails arranged in a 2x3 grid. The top row includes "GOES-East Visible", "GOES-East Infrared Ch. 4", and "GOES-East Infrared Ch. 2". The bottom row includes "GOES-East Reflectivity", "GOES-East Shortwave Alb.", and "NOAA-14 Infrared Ch. 3". Each thumbnail has a "Java Loop" link below it. The page also includes a "Search OSDPD" field and a "Go" button.

The screenshot shows the NOAA Satellite and Information Service website for Southwest US fire monitoring. The page title is "Real Time Satellite Fire Monitoring - Southwest US". It features a navigation menu with options like "Fire", "OSI", "Precipitation", "Sat Info", "Snow & Ice", "Tropical", "Volcano", "Winds", and "GIS". Below the navigation, there are six satellite imagery thumbnails arranged in a 2x3 grid. The top row includes "GOES-10 Visible", "GOES-10 Infrared Ch. 4", and "GOES-10 Infrared Ch. 2". The bottom row includes "GOES-10 Reflectivity", "GOES-10 Shortwave Albedo", and "HMS Fire Analysis". Each thumbnail has a "Java Loop" link below it. The page also includes a "Search OSDPD" field and a "Go" button.

<http://www.ssd.noaa.gov/PS/FIRE/fires-fl.html>

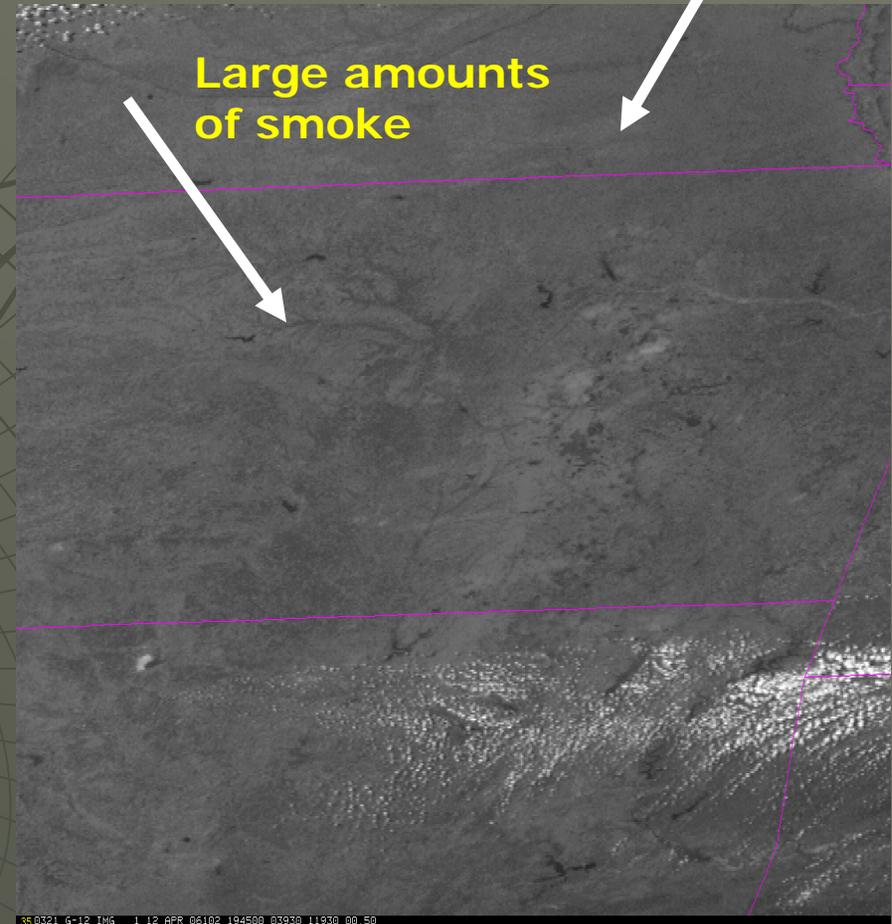
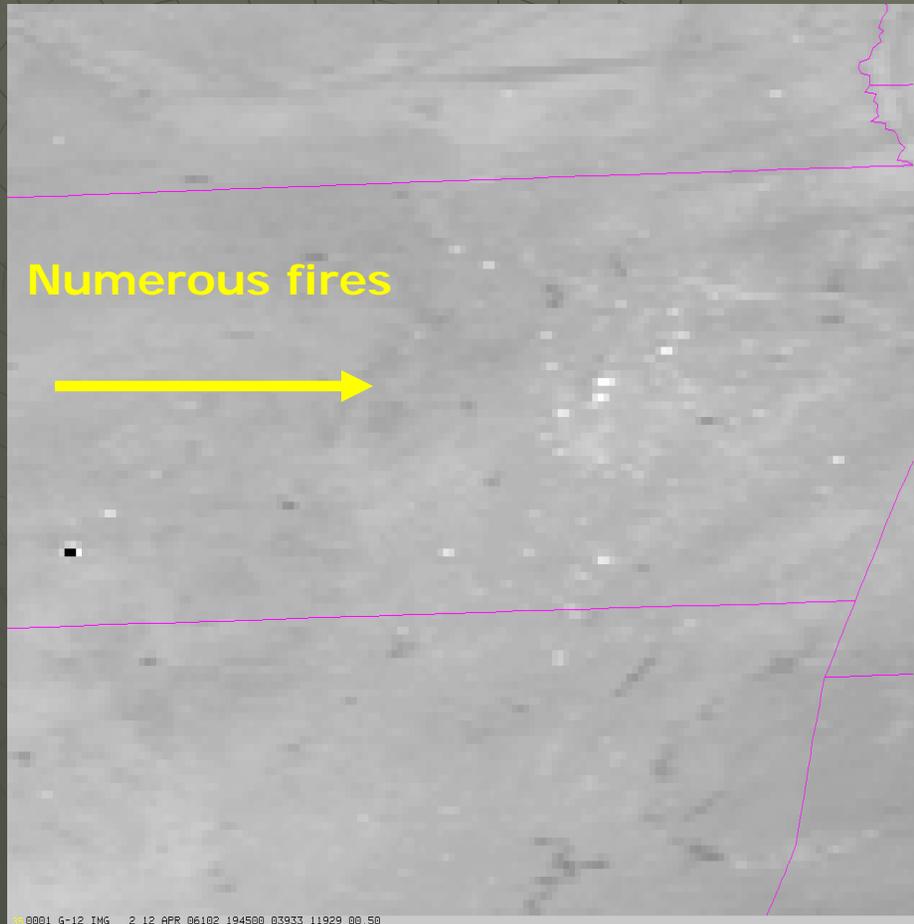
<http://www.ssd.noaa.gov/PS/FIRE/fires-sw.html>



These are easily identified as wildfires. However, sea breezes and shifting winds present challenges for transport models

Analyst can determine the duration of the smoke being produced by the fire

Smoke



Numerous fires producing thin smoke can make an overall area of dense smoke causing visibility and air quality problems.

THANK YOU !!!

ANY QUESTIONS ??

For additional information please contact

Sheldon.Kusselson@noaa.gov

Jamie.Kibler@noaa.gov

Phone contact: 301-763-8444