

# **Improving Short-term Predictions and the Identification of Hazardous Weather using NASA/SPoRT Transitioned Satellite Products**

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# Project Summary

- The opportunity to receive experimental satellite products from NASA SPO-RT was first offered in 2007 with the goal of SPO-RT “to transition research capabilities to operations to improve short-term forecasts”
- Several months later, in January 2008, ingest of these products began
- The list of products to be distributed was compiled based on local forecast challenges
- Currently, MODIS-GOES Hybrid Imagery and Convective initiation products are being evaluated
- The operational use of the SPO-RT transitioned products has enhanced the identification and forecasts of hazardous weather by supplementing data void areas and enhancing our current satellite analysis techniques

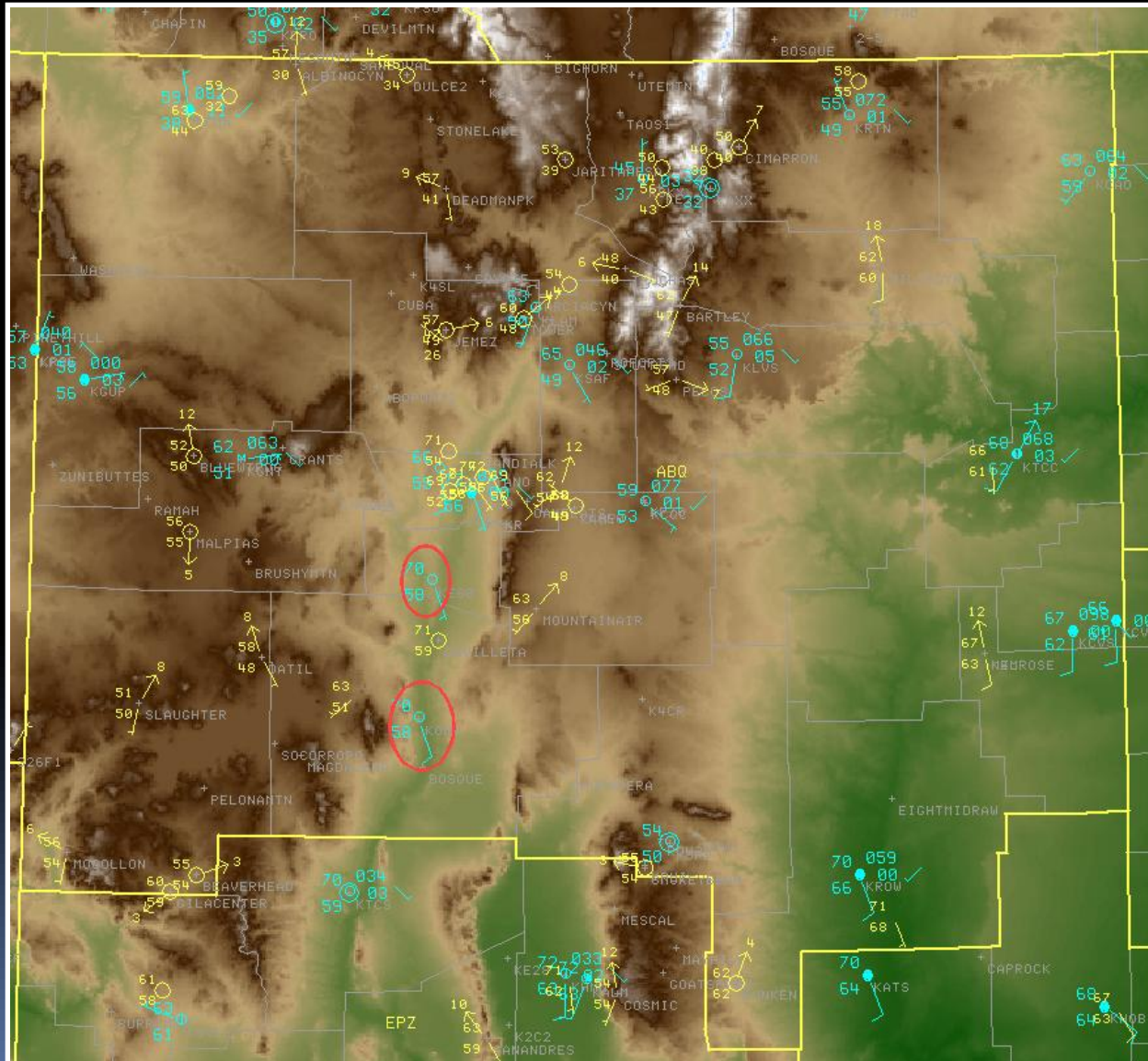
# Outline

- A brief description of WFO ABQ forecasting challenges
- Initial products and a review of some initial success stories
- Latest products and results from 2011

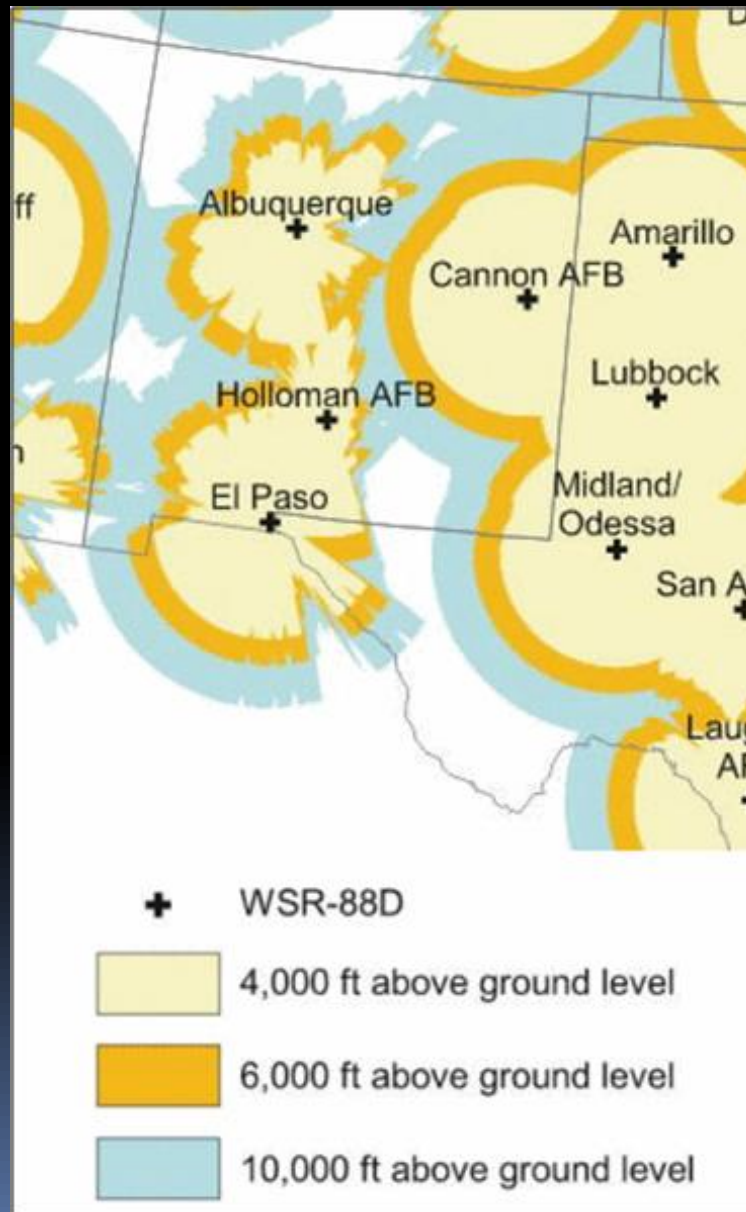
# Forecasting Challenges in New Mexico

- **Large County Warning Area**
- **Diverse terrain**
- **Relatively few surface observations**
- **Poor radar coverage**
- **Wide range of hazardous weather – fog, winter weather, severe thunderstorms, flash floods, fire weather**

# Large CWA with Diverse Terrain and Limited Surface Obs



# Poor Radar Coverage



# Initial Products Evaluated And Examples of Successes

## GOES Imager

## Use

Low Cloud Base

Locations of IFR Ceilings

Fog Depth

Fog, Low Clouds, and their depth

Icing and Cloud Top Height

Detection of supercooled clouds

## CIRA (Blended) Products

## Use

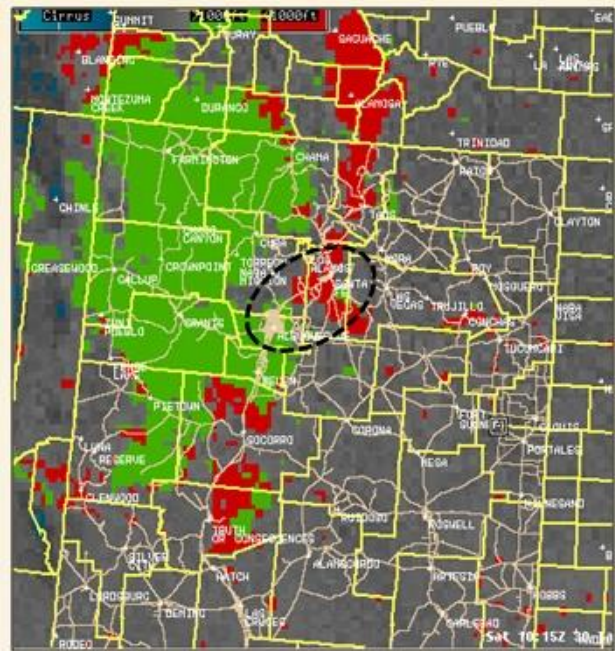
AMSU/SSMI Blended TPW

Multi-source 6 hourly TPW

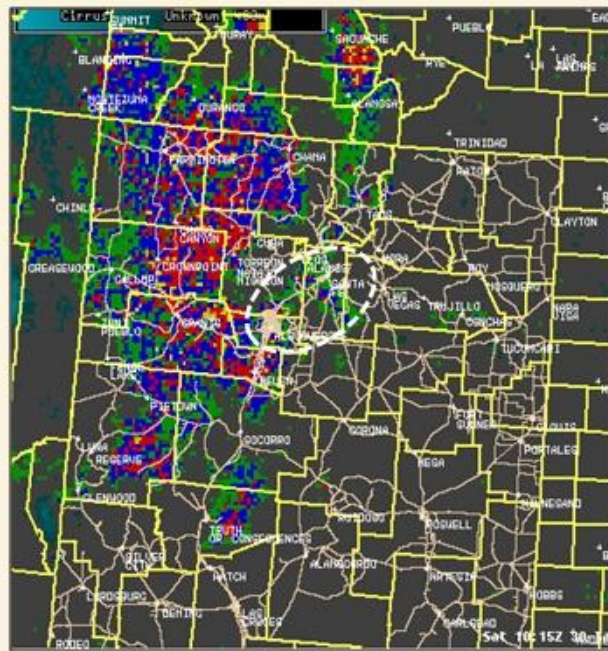
TPW Percent of Normal

Extreme values or gradients of TPW

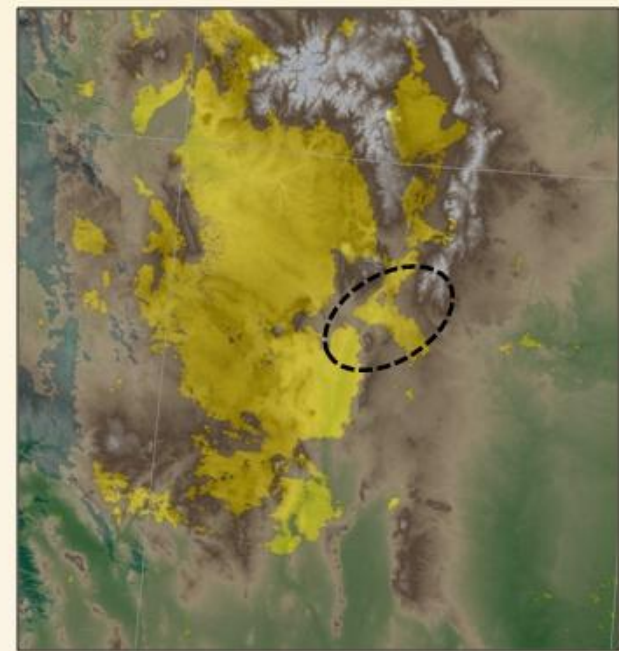
# Low Clouds and Fog



1015Z Low Cloud Base Product



1015Z Combined Fog Product

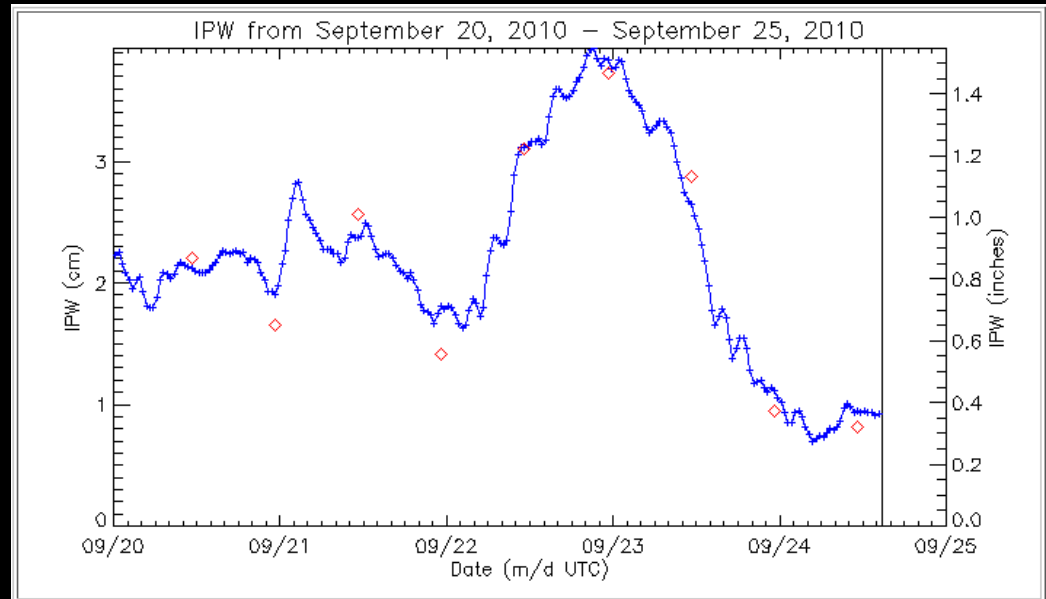
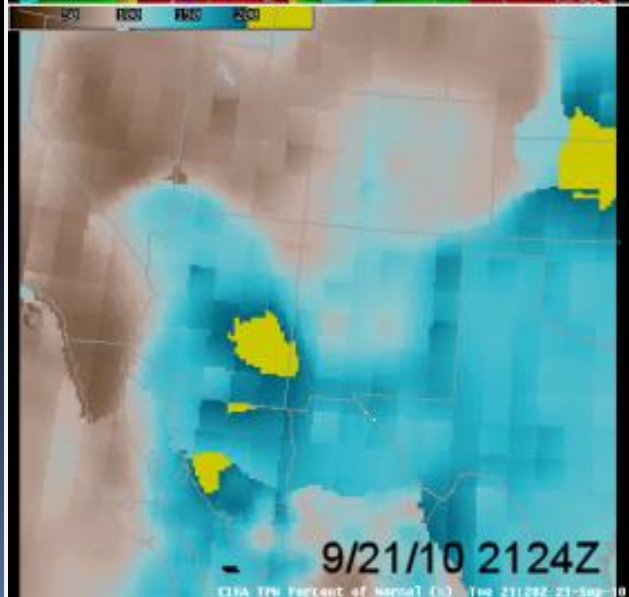
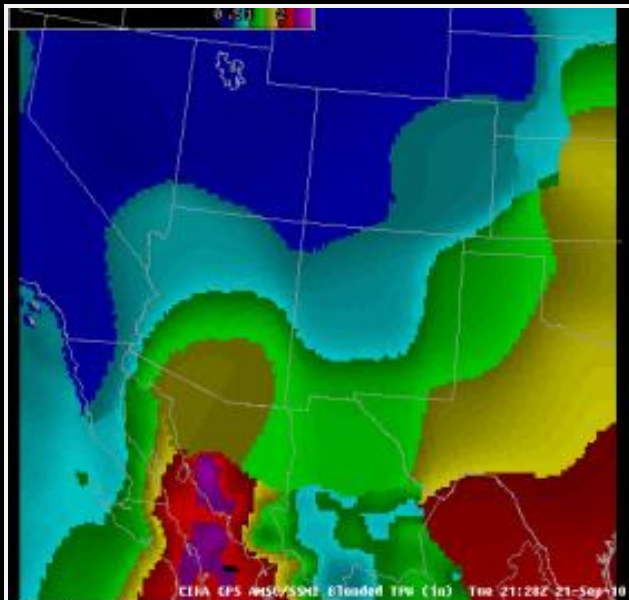


1015Z MODIS 11-3.9um Product

29 Jan 2010 – Snowmelt, clear skies, calm winds lead to widespread low clouds and fog



# CIRA Blended TPW and PON TPW

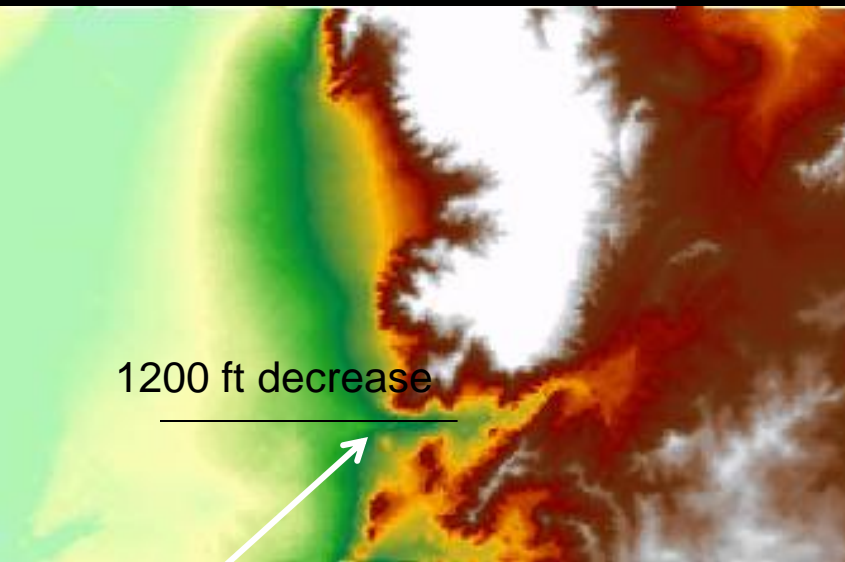


Location	Amount (inches)
Gladstone	6.42
House	3.51
Clayton	3.20
Espanola	3.20
Tesuque 2 W	2.63
Albuquerque - Candelaria & Tramway	2.35
Santa Fe	2.00
Albuquerque Sunport	1.86
Rio Rancho 2 S	1.94
Fort Sumner	1.40

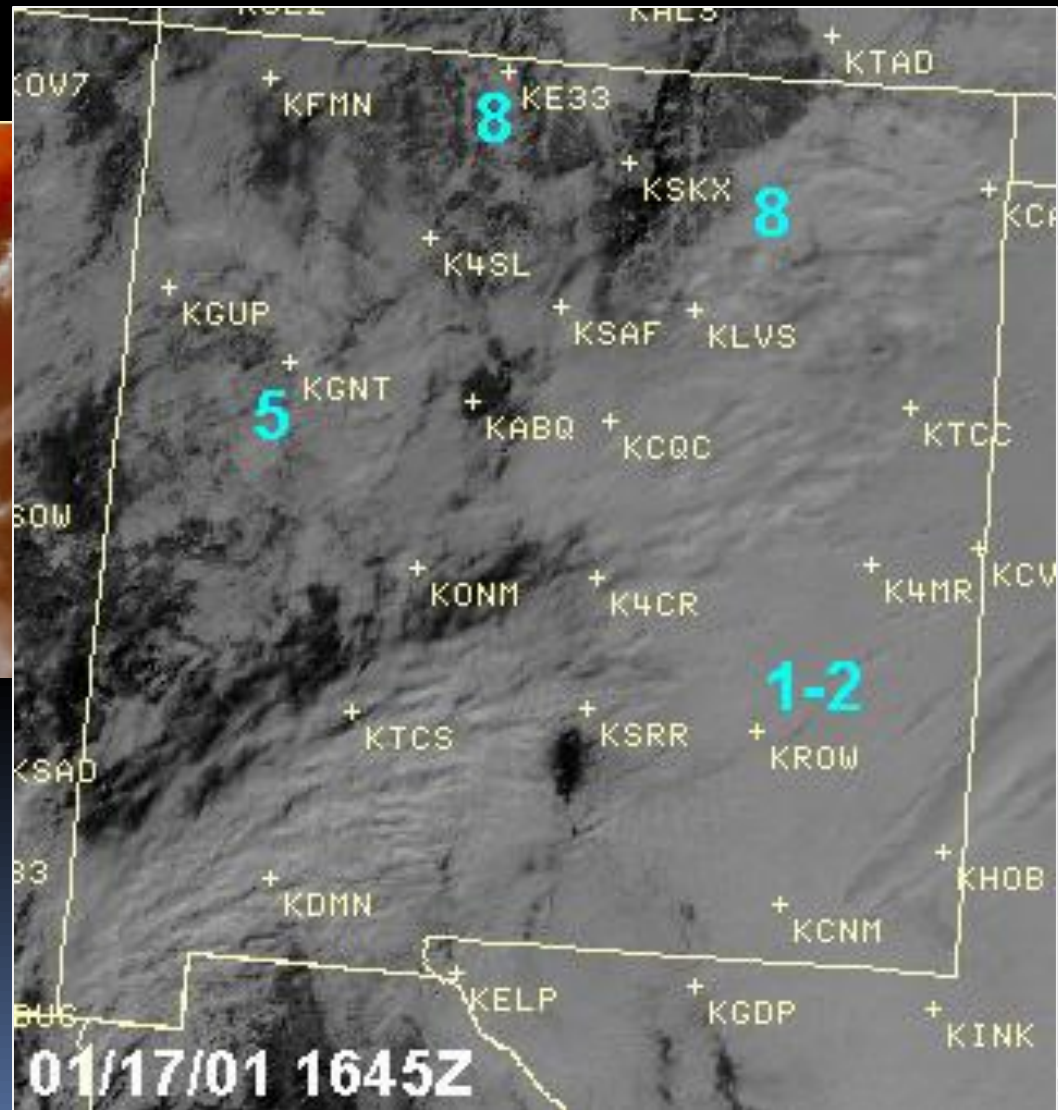
# Products Evaluated And Successes

MODIS (1km and 4km)	Use
Visible, IR, WV	Higher resolution, GOES-R preview
False Color Composite	Identify regions of snow/ice
Natural Color	True color visible
3.9 $\mu\text{m}$	Fire hot spots
11-3.9 $\mu\text{m}$	Spectral difference fog depiction
Lifted Index	Stability at cloud free pixels
Cloud Phase	Define state of the water in cloud

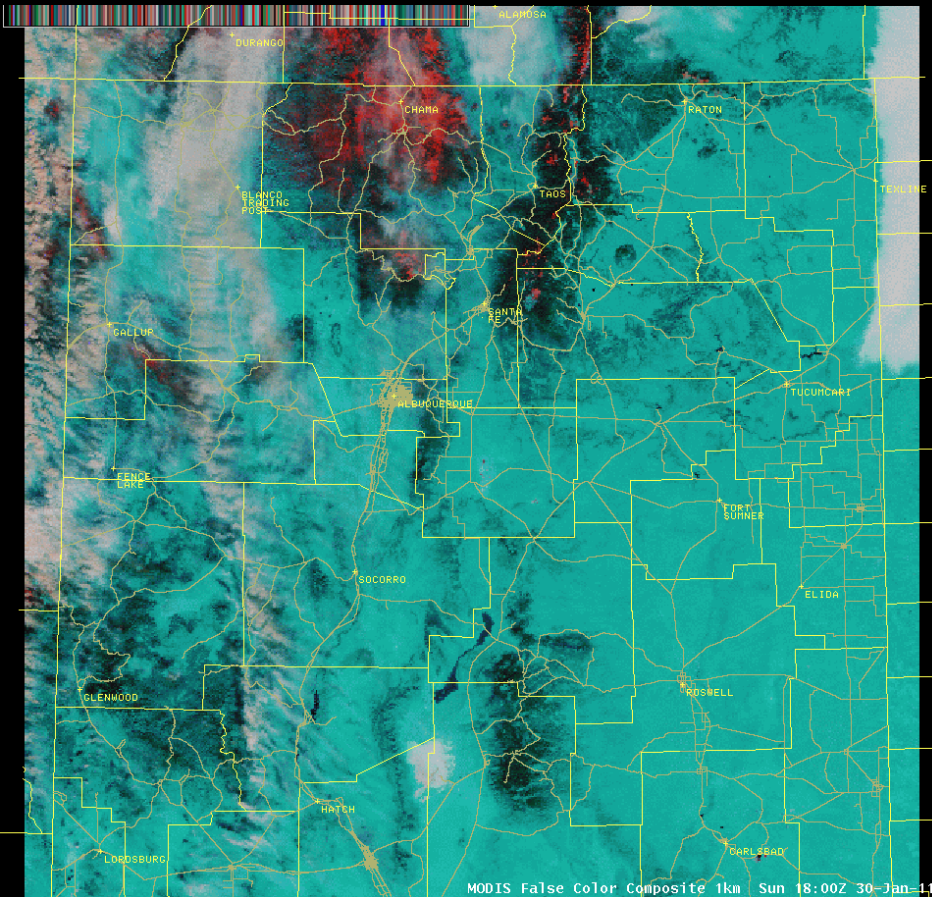
# Products Evaluated And Successes: MODIS



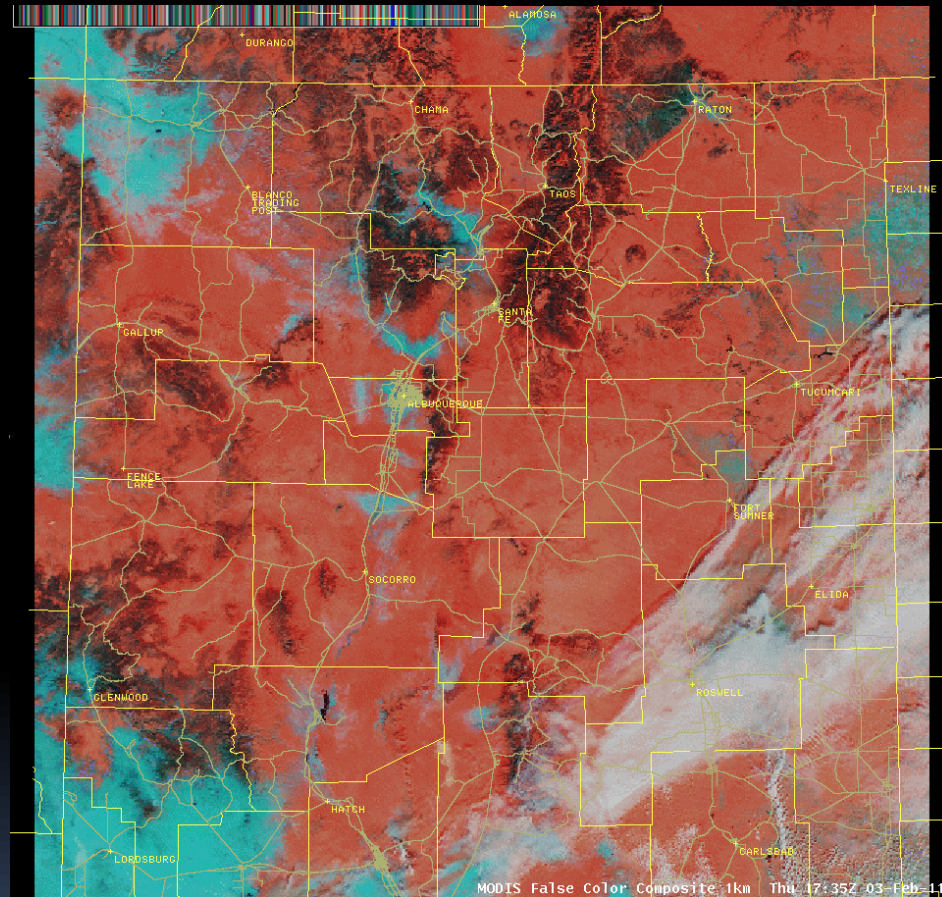
Tijeras Canyon: East of the Albuquerque Metro area



# Products Evaluated And Successes: MODIS



30 Jan 2011

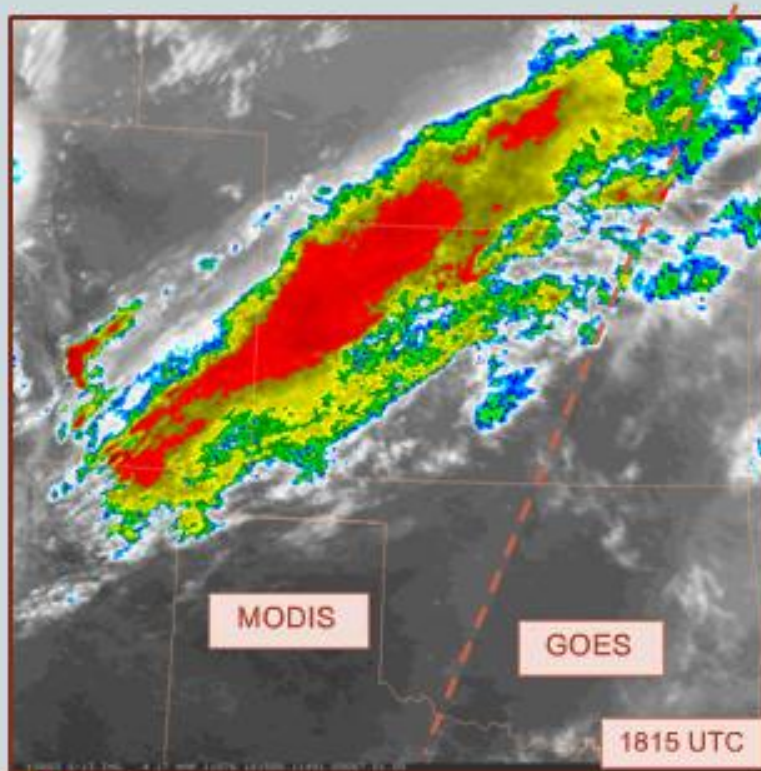


3 Feb 2011

Note the snow free areas associated with downslope gap winds

# Products Evaluated And Successes: MODIS-GOES Hybrid Imagery

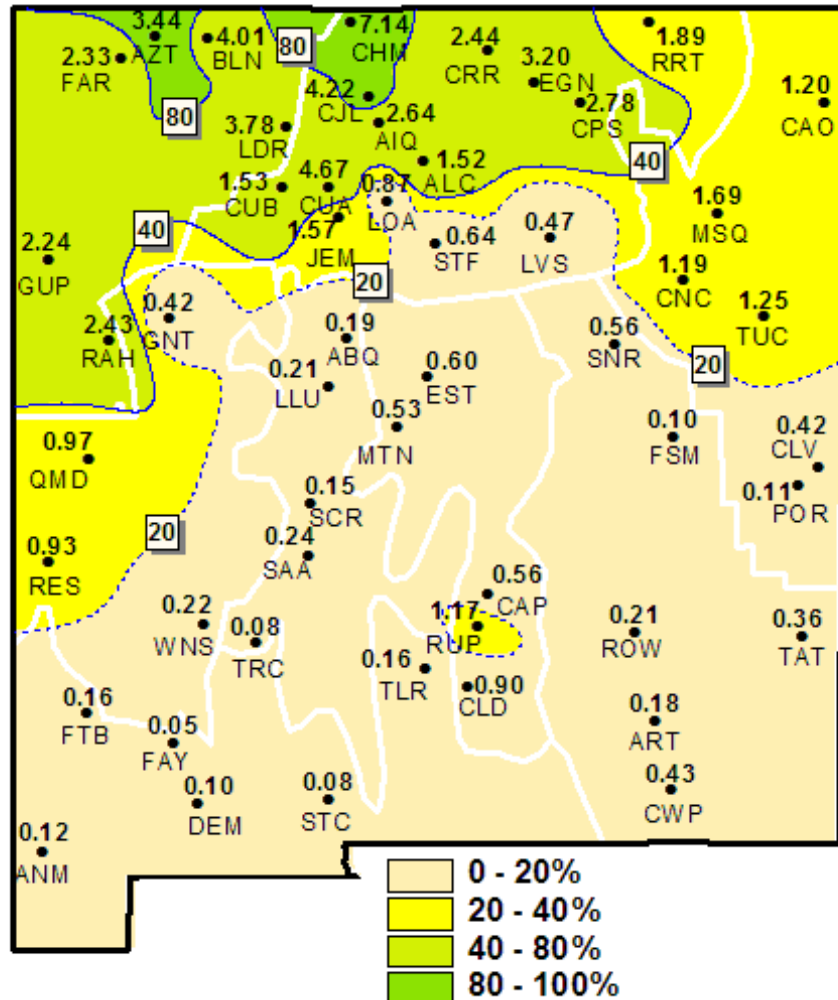
## MODIS-GOES Hybrid Imagery



- Combination of high-resolution imagery from MODIS and standard GOES.
- MODIS swath replaces GOES whenever it is available while GOES fills time periods between MODIS overpasses.
- Four hybrid channels (MODIS/GOES):
  - Longwave IR (11 micron)
  - Shortwave IR (3.9 micron)
  - Water Vapor (6.7 micron)
  - Visible (0.6 micron)

# The Effects of La Niña in 2011

January - May 2011 Precipitation  
Totals (plotted) and Percent of Normal (contours)



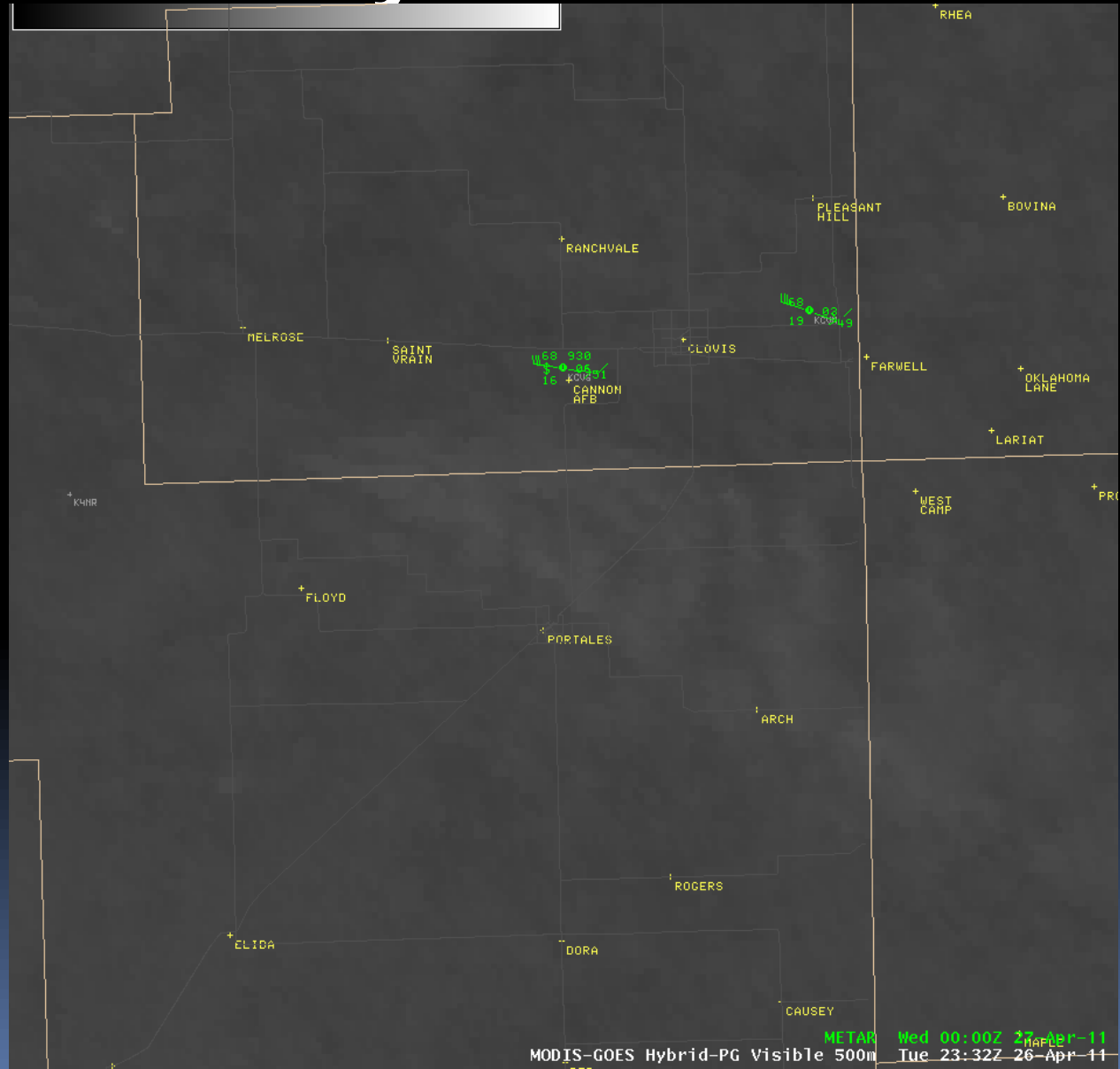
- Very dry conditions thus far in 2011 have resulted in fewer “precipitation” cases to examine
- Instead, we have experienced a historic fire weather season

# Products Evaluated And Successes: GOES Hybrid

■ 17 April 2011 – tire blow out starts a large fire in eastern New Mexico

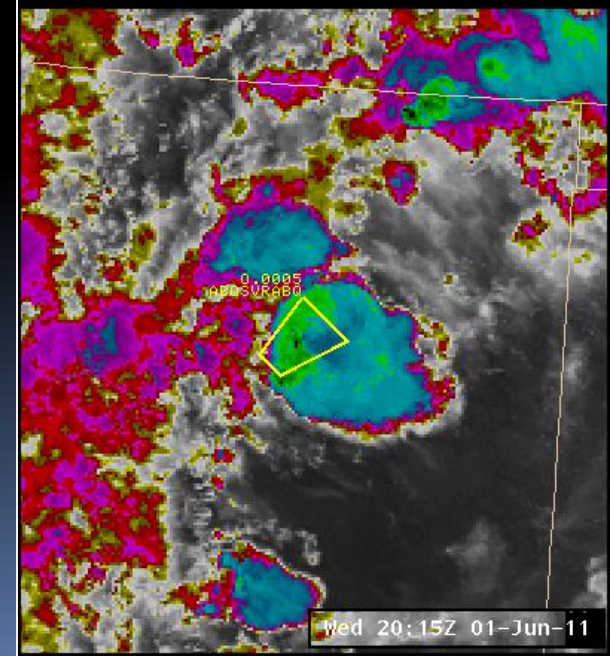
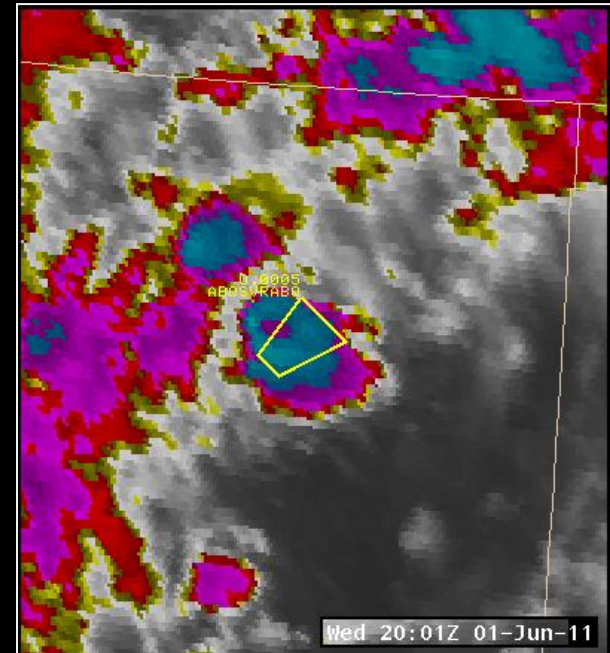
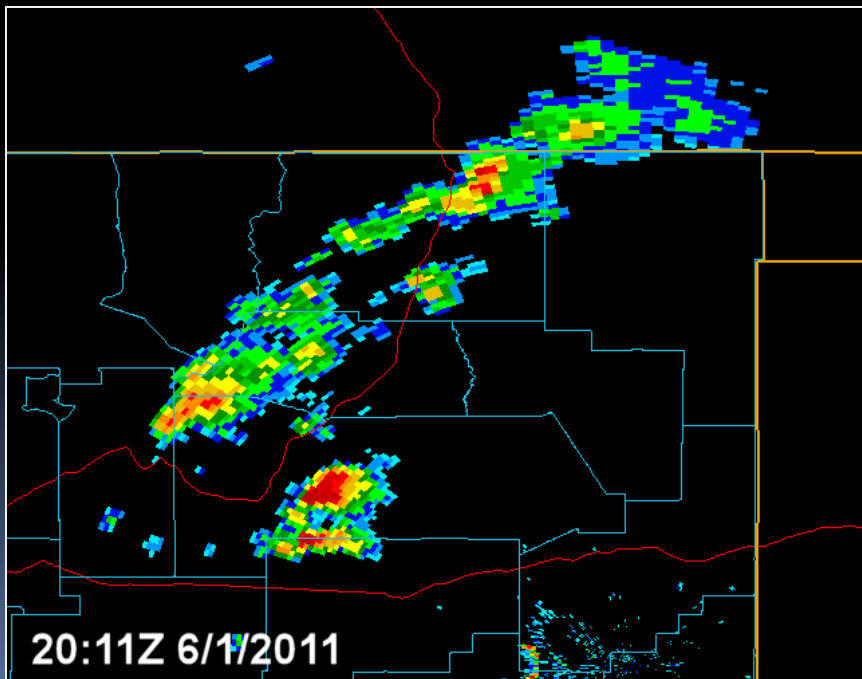
■ One week later, the burn scar is visible on 1km MODIS IR

■ Strong winds on 26 April 2011 show the burn scar as a source of blowing dust, reducing visibilities to 1-3 miles



# Products Evaluated And Successes: GOES Hybrid

- April/May 2011 – no severe weather events, 2 warnings
- June 1, 2011 moisture increases east with a dry line
- First warning of the day issued at 2001Z





# Operational Enhancements during the Fire Events of June/July 2011

- The Wallow Fire started in SE Arizona on May 29, 2011
- On the evening of June 2, a huge smoke plume driven by strong SW Winds reached central and northern New Mexico
- Visibilities dropped to 1-2 miles in Albuquerque on numerous occasions over the following week
- Air quality was poor over large areas of the state



# Albuquerque, NM



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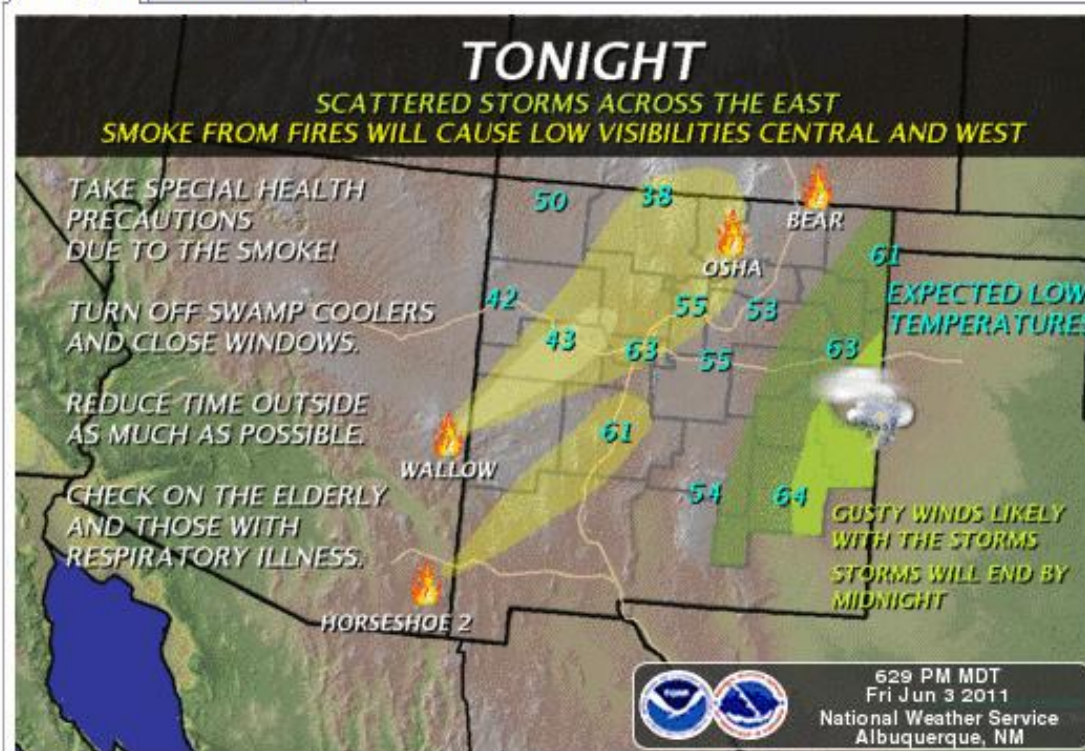
More...

Top News of the Day

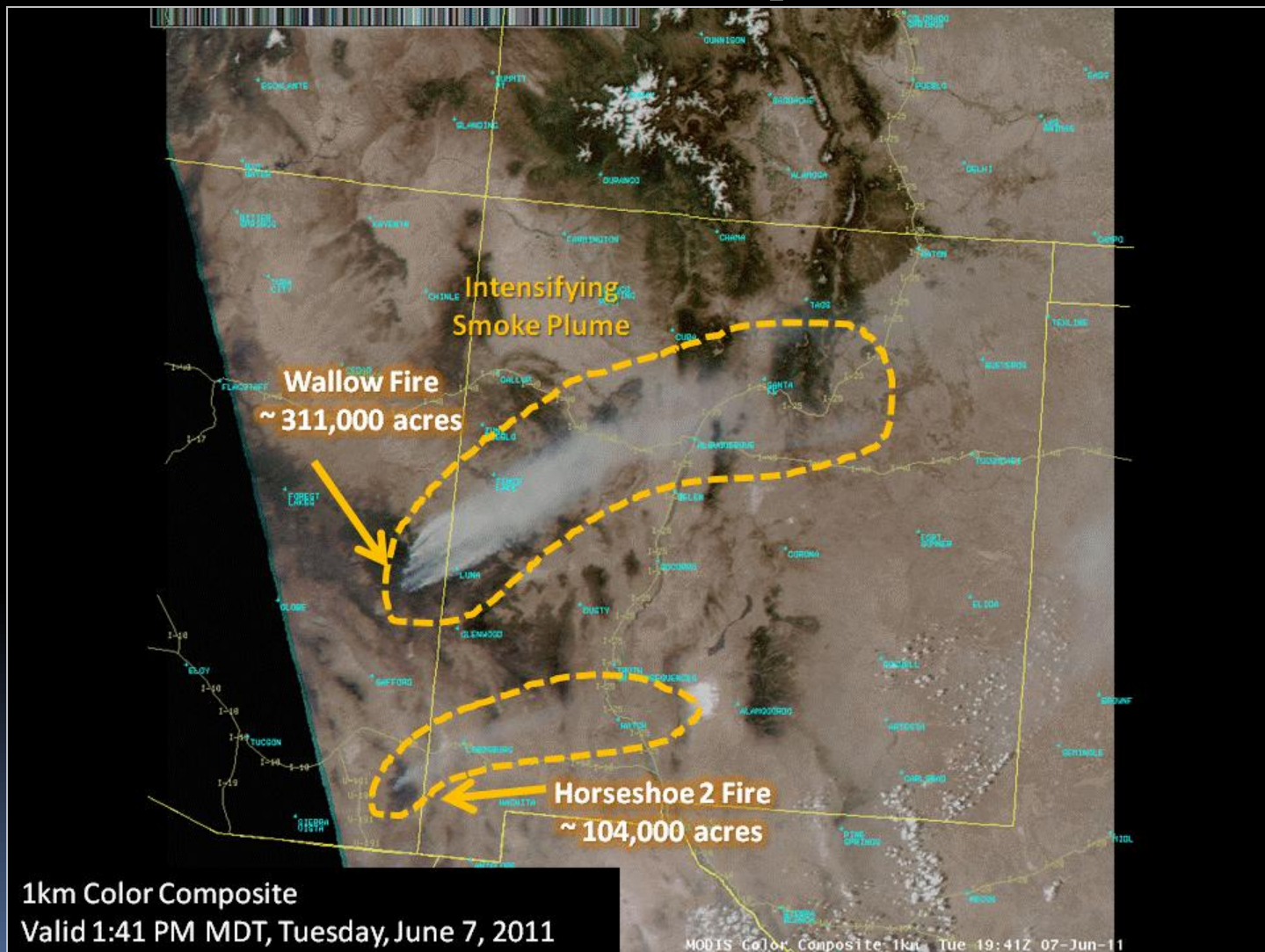
- [Smoke Measurements from the Air Force Research Lab](#)
- [Wind and Precipitation Reports for June 3rd](#)
- [Dept of Health Advises Residents to Take Precautions with Smoke from Wildfires](#)
- [Additional News Headlines](#)

Tonight

Weekend

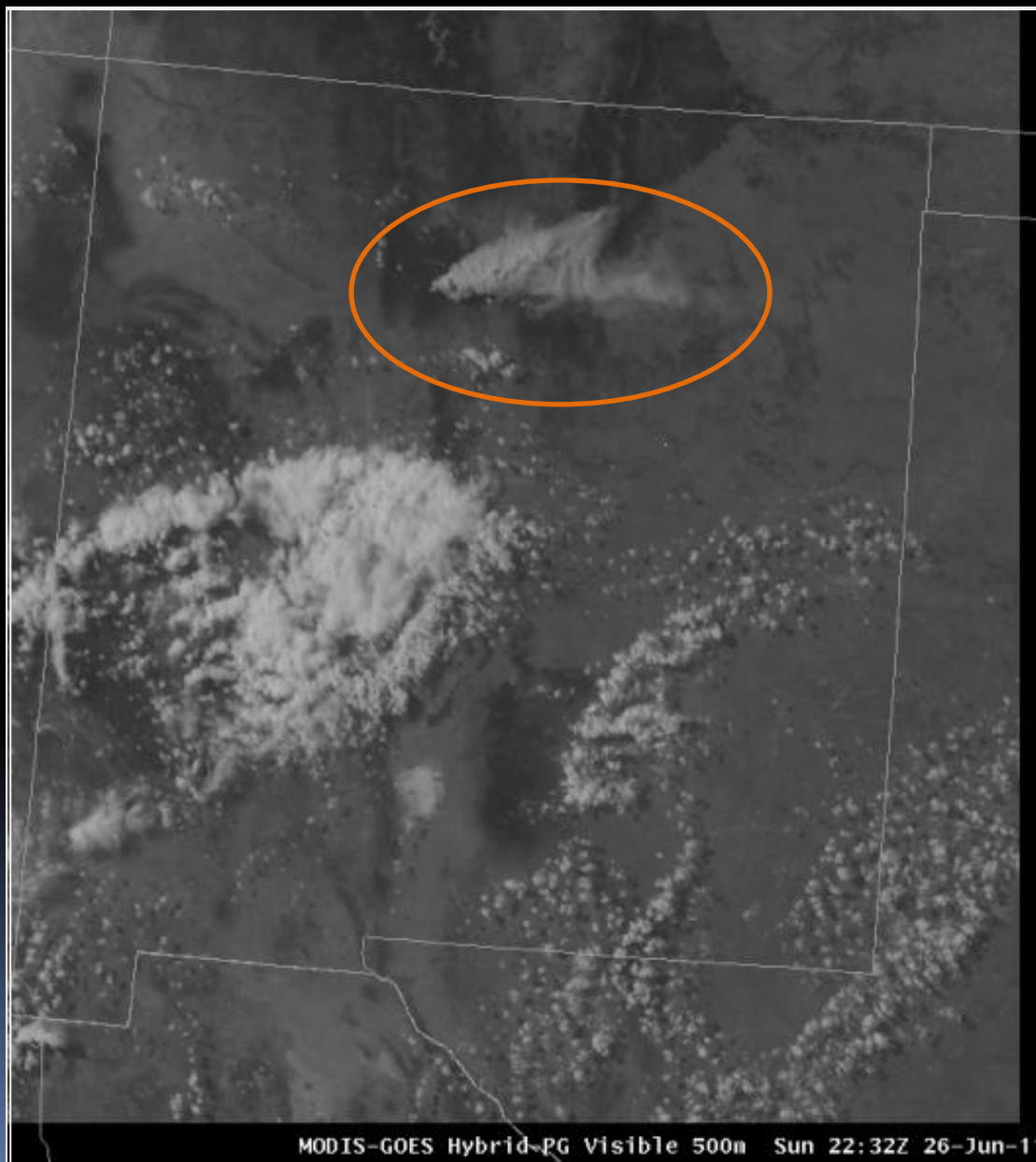


# MODIS Color Composite for use in Graphiccast

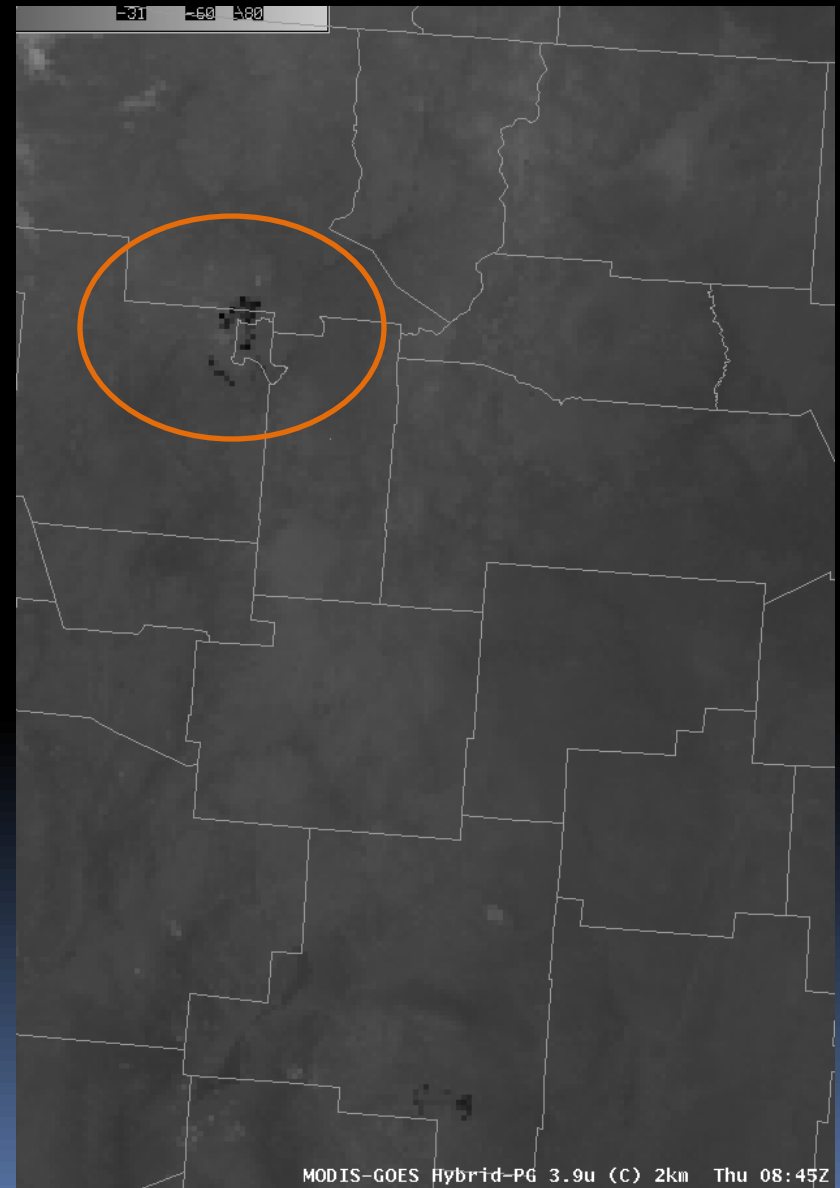
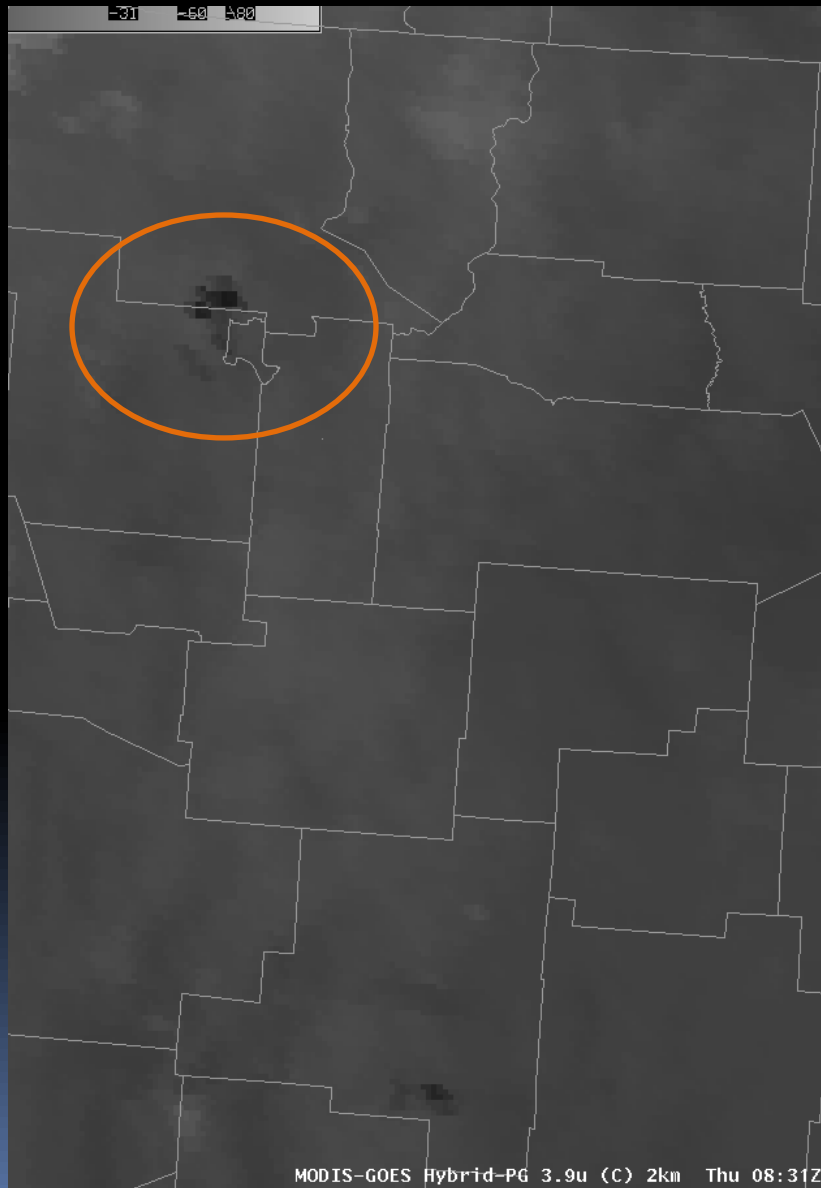


# Las Conchas Fire – 26 Jun 2011

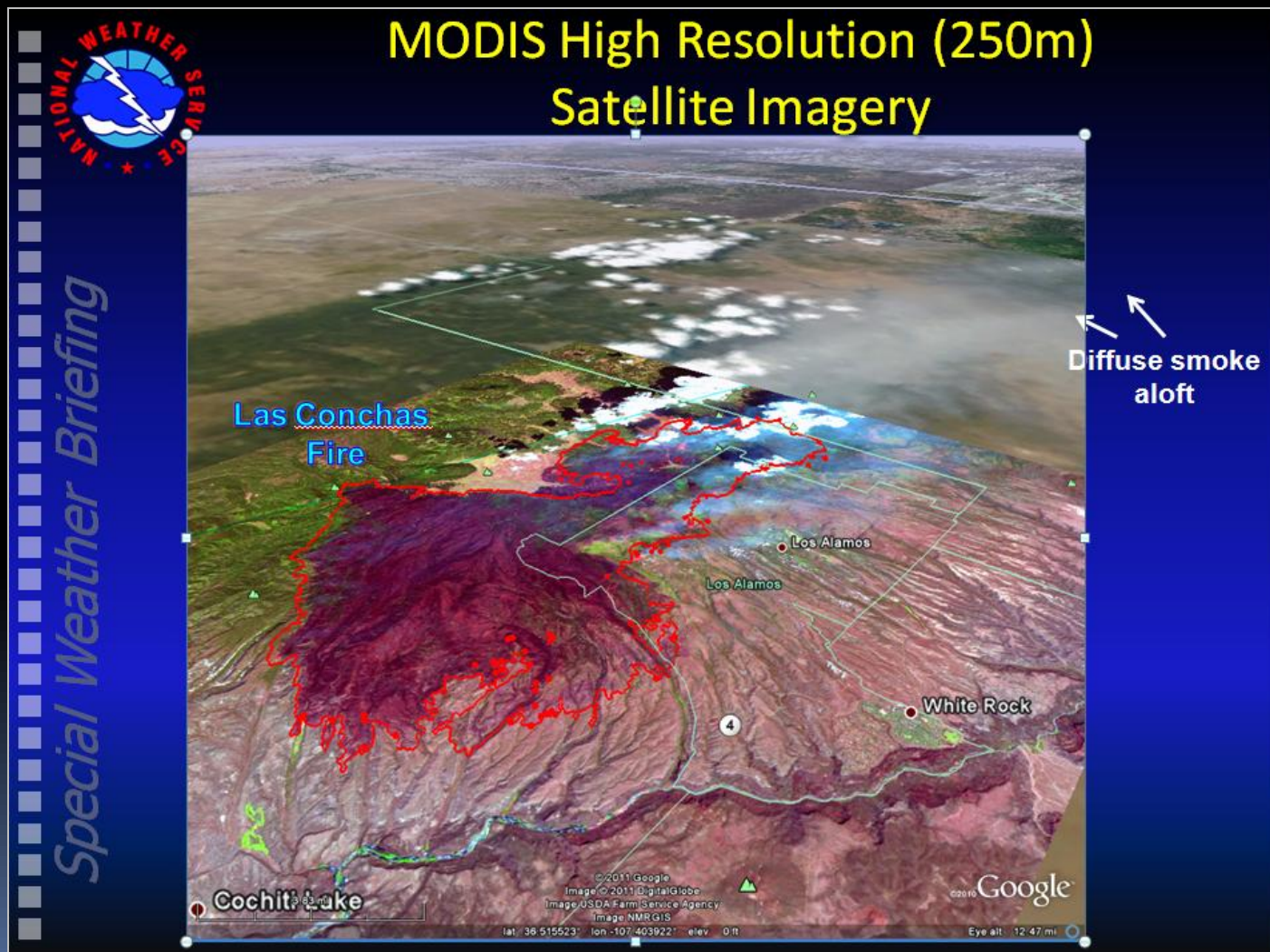
1932Z to 2232Z



# 3.9 $\mu\text{m}$ Comparison on Day 5 of the Las Conchas Fire



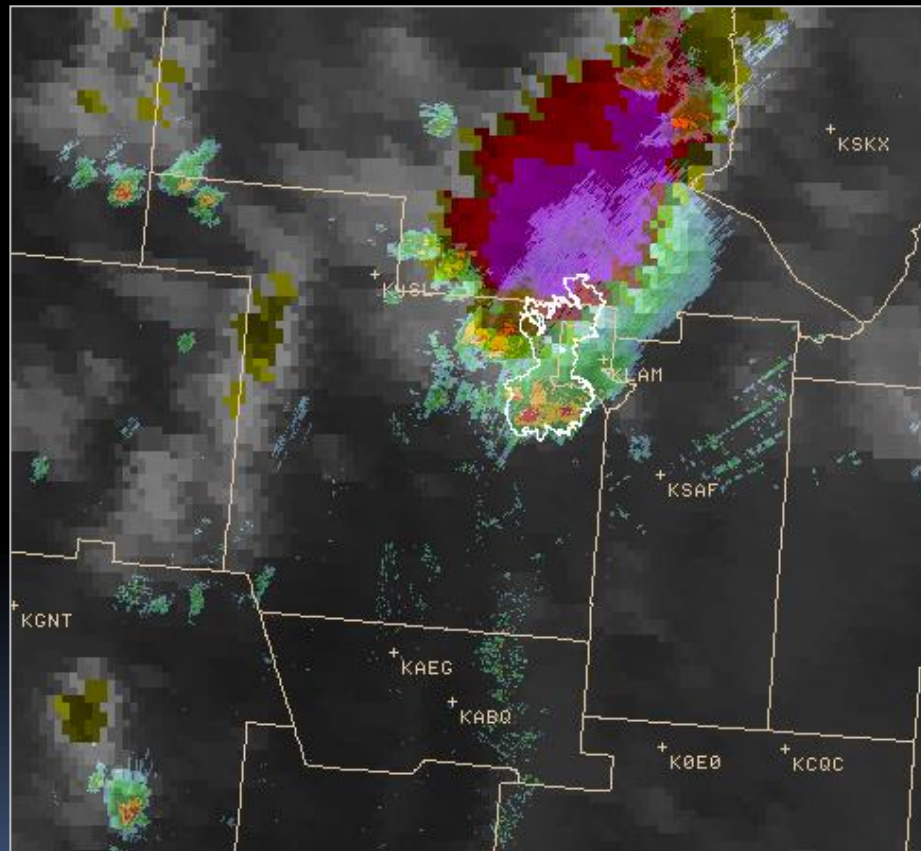
# MODIS Color Composite for use in Graphiccast



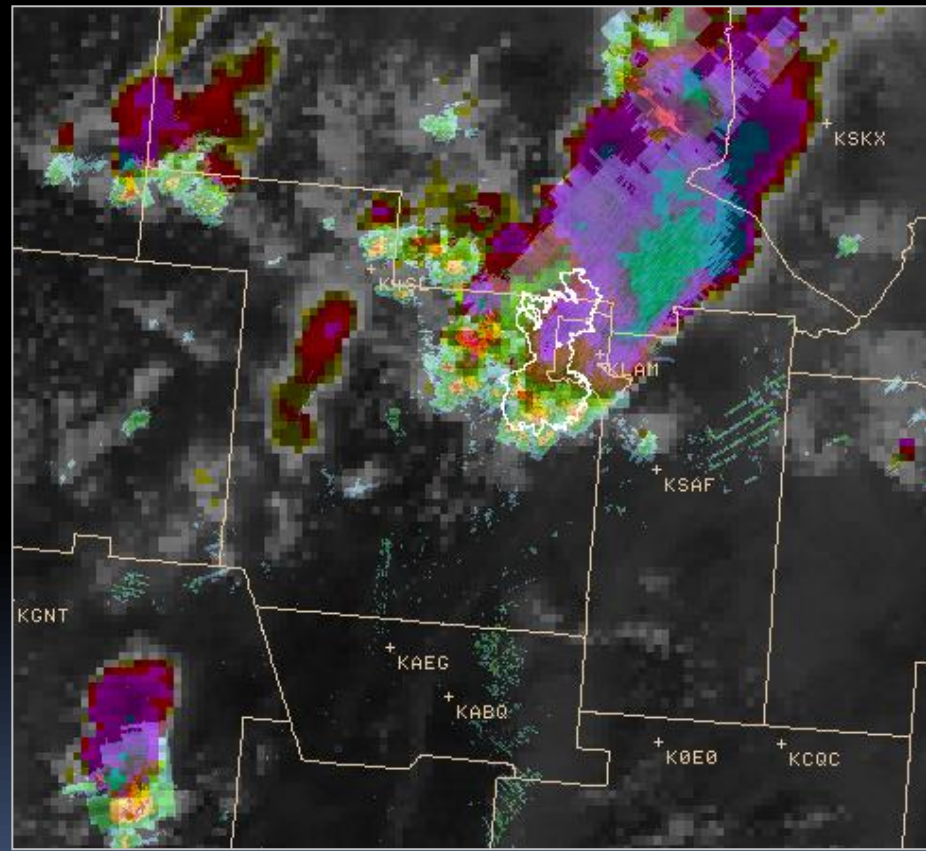
# Burn Scars and Flash Flooding

- The Los Conchas Fire Burned over 150,000 acres
- The resulting burn scar supports a greatly enhanced flash flood threat
- Over areas of intense burning, runoff increases from the normal 2% to 75%
- Ash and debris combined with flows 100x normal result in unprecedented flash floods

# August 22, 2011: GOES Hybrid IR and 0.5 Reflectivity



1945Z



2002Z



# August 22, 2011:

## Historic Flooding Downstream of Burn Scar



# Project Summary:

## The operational use of the SPoRT Transitioned Products

- Have improved the decision making process by supplementing data void areas and enhancing our current satellite analysis techniques
- Provide an excellent platform for GOES-R training
- Enhance our decision support and general customer products

# Thanks to SPoRT for Outstanding Support!

## ■ NASA SPoRT Blog

The screenshot shows the NASA SPoRT blog homepage. At the top, there are navigation links for "Home" and "Mission Statement", and a search bar. The main header reads "THE WIDE WORLD OF SPoRT" with the tagline "Fostering interaction between product developers and end users". Below this is a large banner image of Earth from space with the SPoRT logo overlaid. The logo includes the text "The Wide World of SPoRT" and "Fostering interaction between product developers and end users". To the right of the banner, there are social media icons for "Feeds:", "Posts", and "Comments". Below the banner, there are two article teasers: "« Total Lightning Data in AWIPS II" and "Experimenting with RGB Color Enhancements in AWIPS »". The main article featured is "Record Precipitable Water and New Mexico Heavy Rain Event" by dmkann, dated September 28, 2010. On the right side, there is a "CATEGORIES" section listing various satellite and instrument categories like AIRS, AMSR-E, AWIPS II, CALIPSO, CIRA Products, and CloudSat.

## ■ Training Modules

The screenshot shows a training module slide titled "NASA SPoRT Hybrid PG Imagery Intro". The slide features the SPoRT logo and a profile picture of Kevin Fuell, a Research Scientist at the University of Alabama in Huntsville. A table of contents is visible on the left, listing 13 topics. The main content area shows an "Example of future GOES-R Imagery" with a satellite image of a storm system. The image is annotated with yellow dashed boxes and blue circles, highlighting features like "outflow boundary", "convective clouds", and "wave-like clouds from topographic and pressure-induced forcing". A caption at the bottom of the image reads: "Alternating hybrid and GOES visible imagery for 13-March-11 at 1845 UTC over north-AL & GA and southern TN (WFO borders in yellow)". The slide is presented in a presentation software interface, showing "SLIDE 5 OF 13" and "PAUSED" status.