Avoiding Thunderstorms & Smoke

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Overview

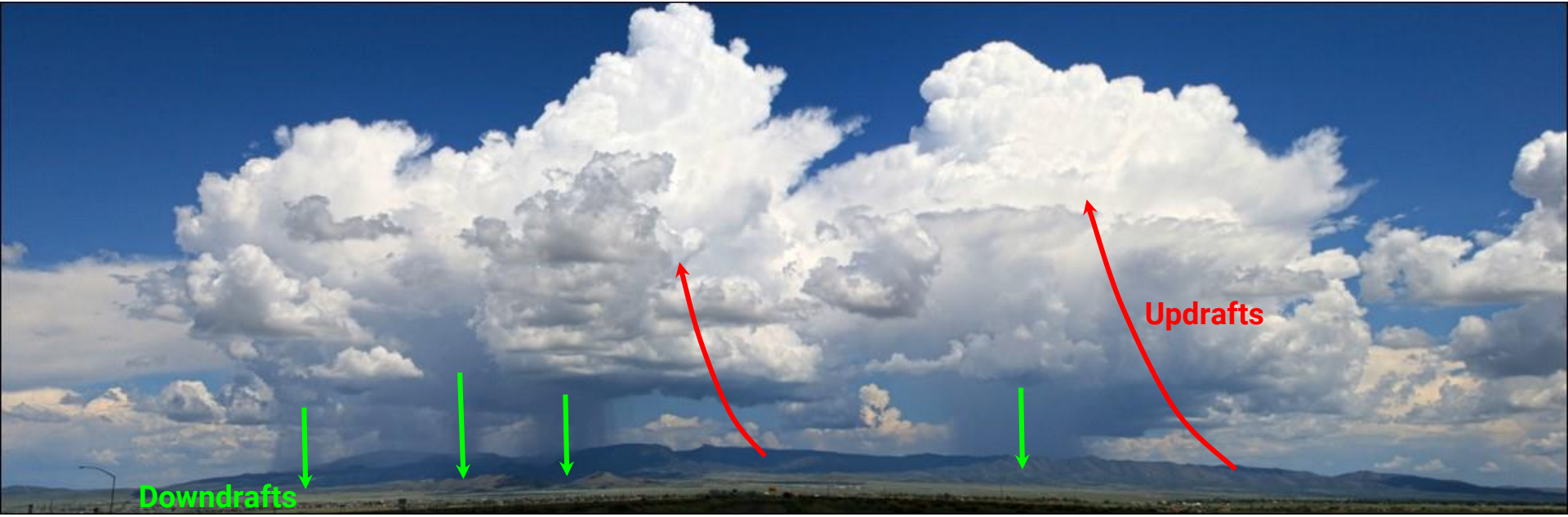
1. Thunderstorm Avoidance
   - Multicells
   - Supercells
   - Downbursts
   - Haboobs
   - Online Resources
2. Smoke Avoidance
   - Typical Diurnal Evolution
   - Online Resources
3. TAF Timing

Las Conchas Fire Smoke & Pyrocumulus Cloud
June 11, 2013

Thunderstorms

- When TS in TAF, expect:
  - Severe icing
  - Severe turbulence
  - Low level wind shear
  - Microbursts
  - Lightning
  - Potential for hail and tornadoes
- Beware of the freezing level!

Multicell Cluster



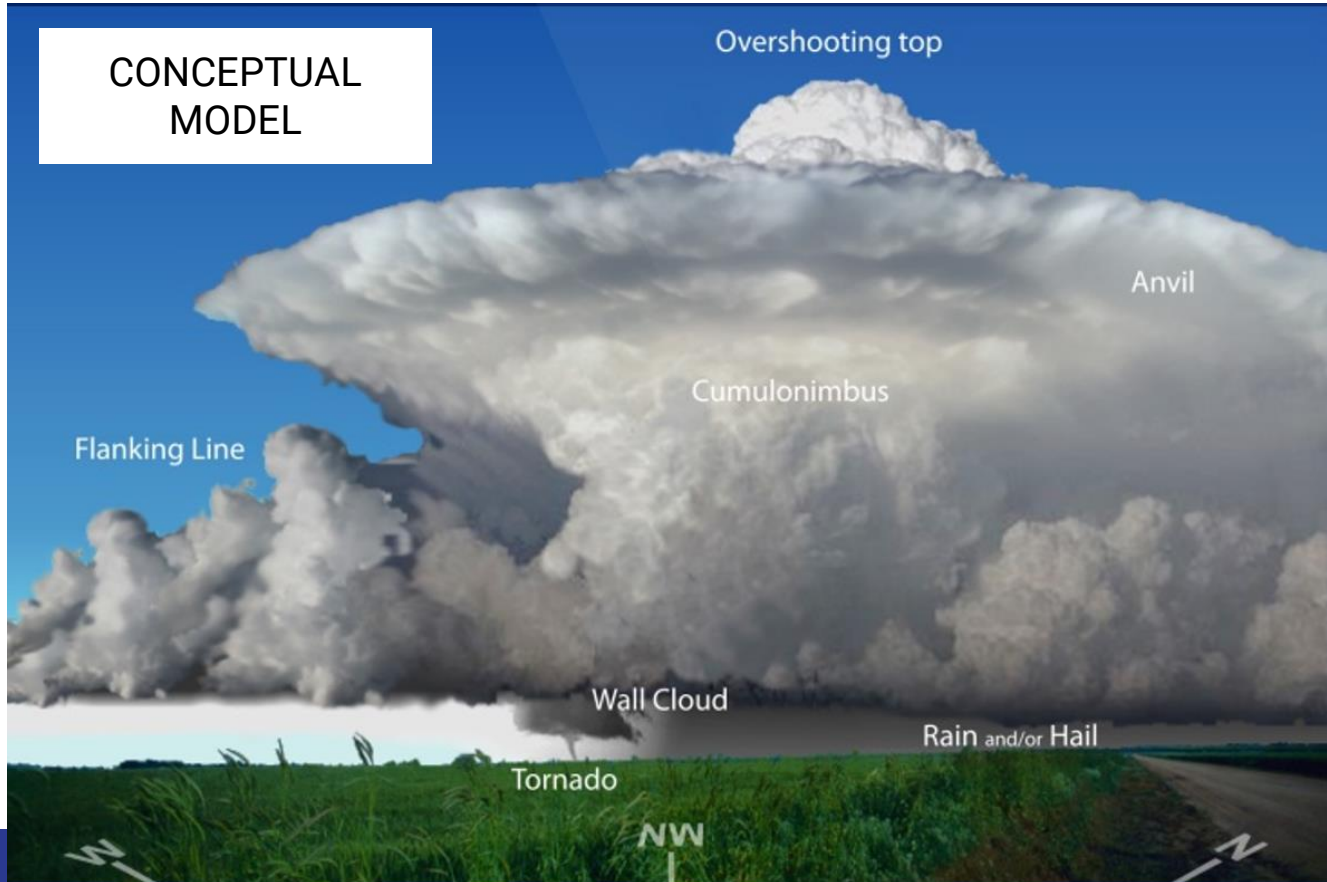
- How many thunderstorms do you see here?
  - Which are growing?
  - Which are dissipating?
- How much room should you give storms in flight? **≥ 20 SM**

Hail Can Pile Up

- Larger storms are more likely to produce hail
- Slow-moving storms can produce several inches of hail accumulation.

Supercell Thunderstorms

- Give these storms the most room!
- Up to 90% of supercell thunderstorms produce severe weather at the surface.



Supercell Thunderstorms


Clayton, NM; Douglas Coulter


Picacho, NM; May 23, 2018; Dustin Noonan


Sean Heavey


SE of Las Vegas, NM; June 12, 2021


Dora, NM; May 26, 2019; Will Leverett

Downburst Sequence

	DIAMETER	LASTS
MICROBURST	≤ 2.5 Mi.	2-5 Min.
MACROBURST	> 2.5 Mi.	5-20 Min.

1.

2.

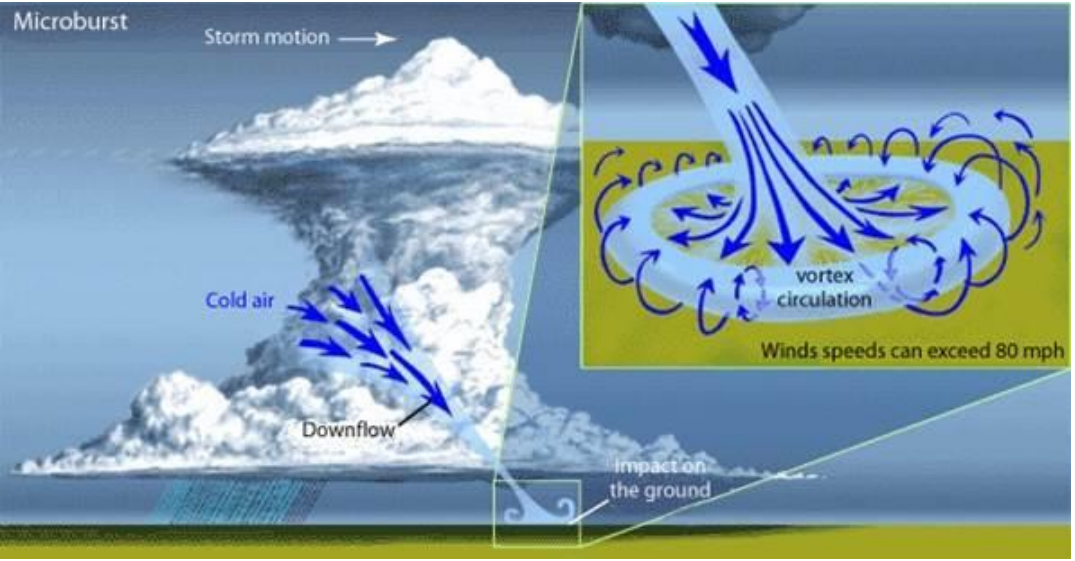
3.

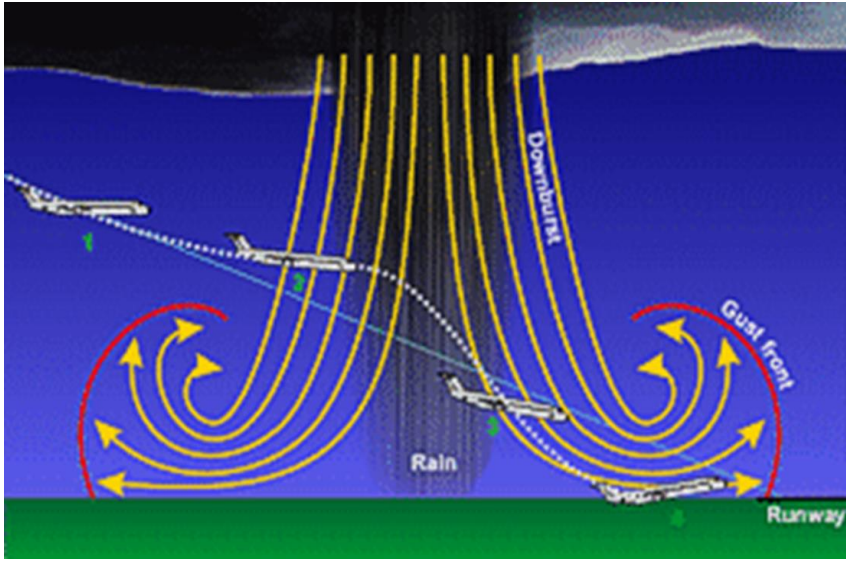
4.

5.

6.

Microburst = Severe Wind Shear





www.weather.gov/bmx/outreach_microbursts

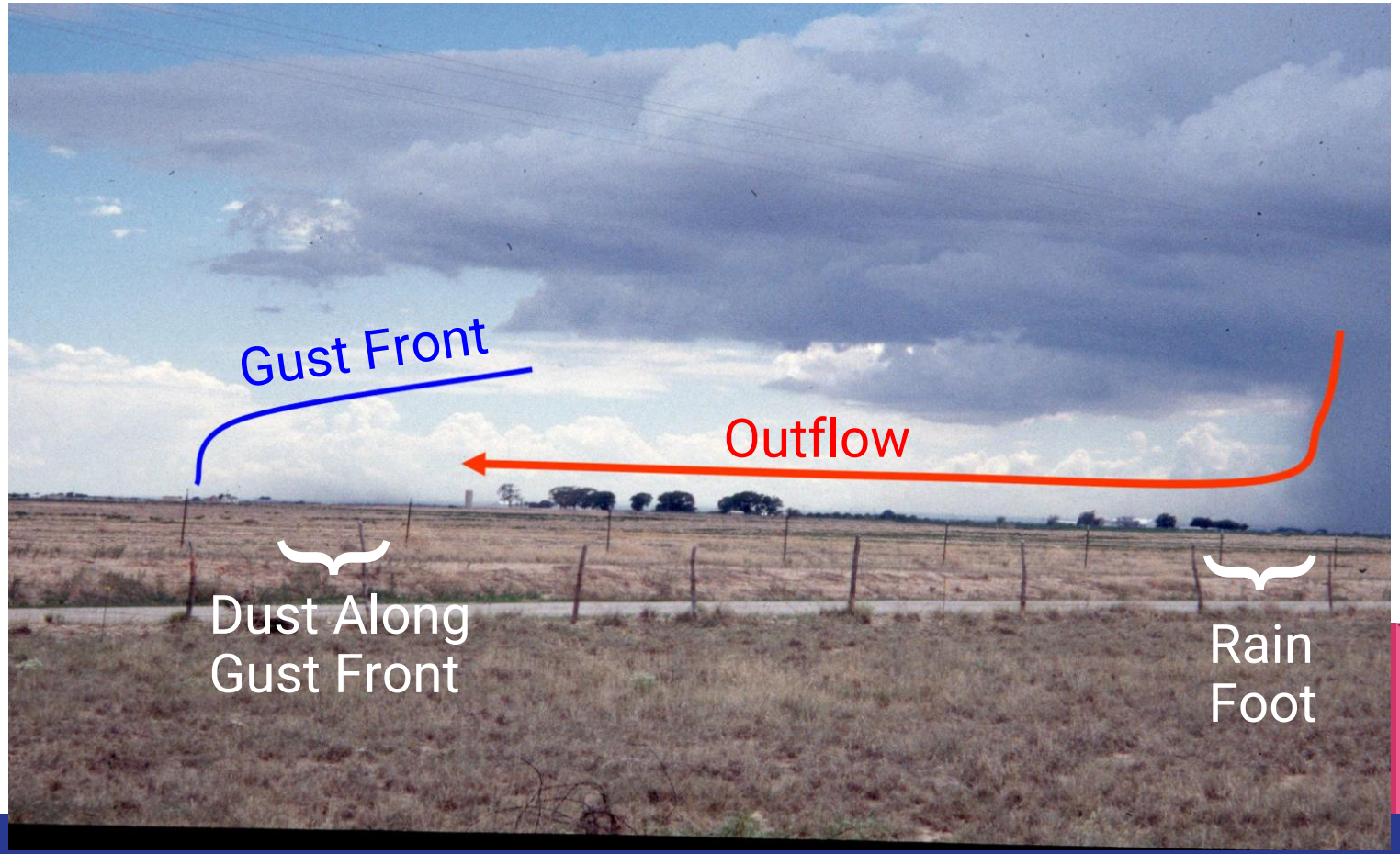
Microburst Types

Wet

Dry

Hybrid

Downburst Clues



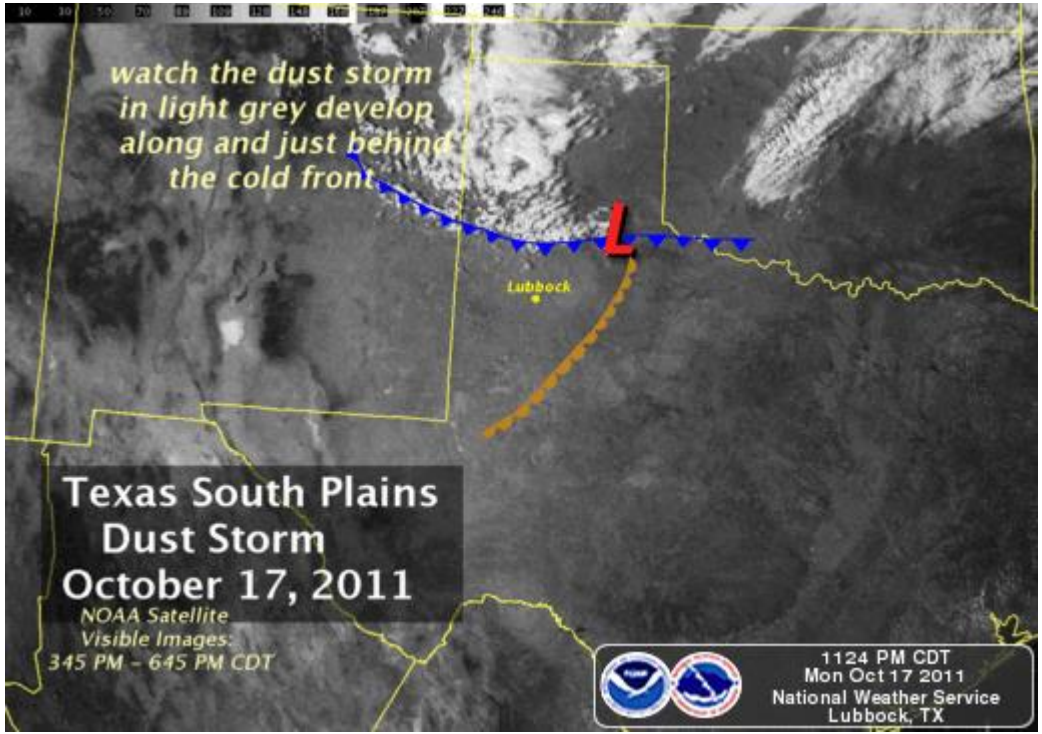
Dry Microburst From the Air

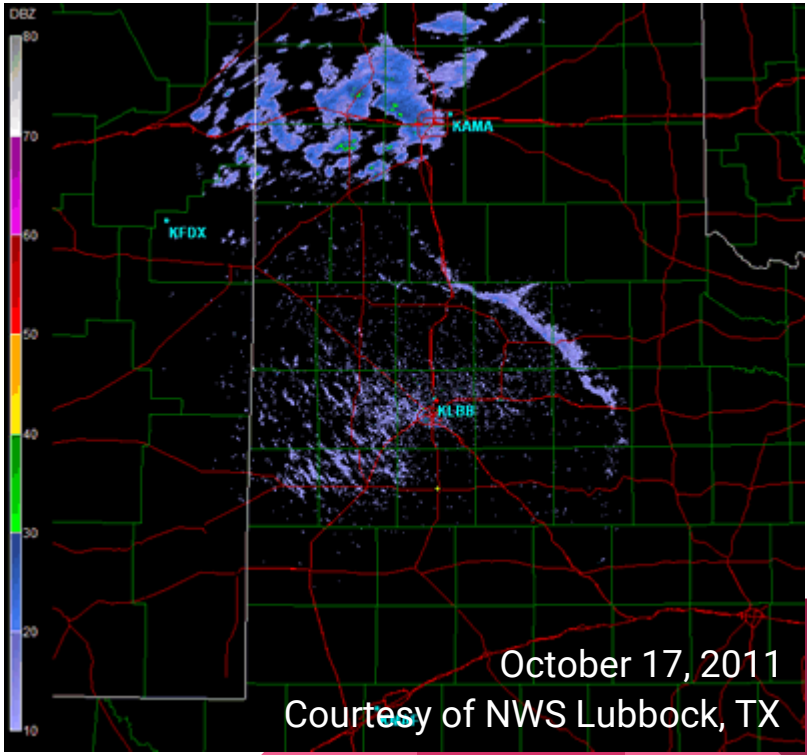
Haboob

- An extreme dust storm that can last a few hours and span hundreds of miles
- Severe wind shear can reach altitudes of 3,000 FT AGL
- Winds ≥ 50 KT don't usually last over 45 minutes in any one location
- Can be caused by thunderstorm outflow, strong cold fronts, or both.


Roswell, NM; March 16, 2021; Jenny Knob Zoe

Haboob Seen on Satellite & Radar





Haboob in Clovis - October 17, 2011 ~3-4 PM

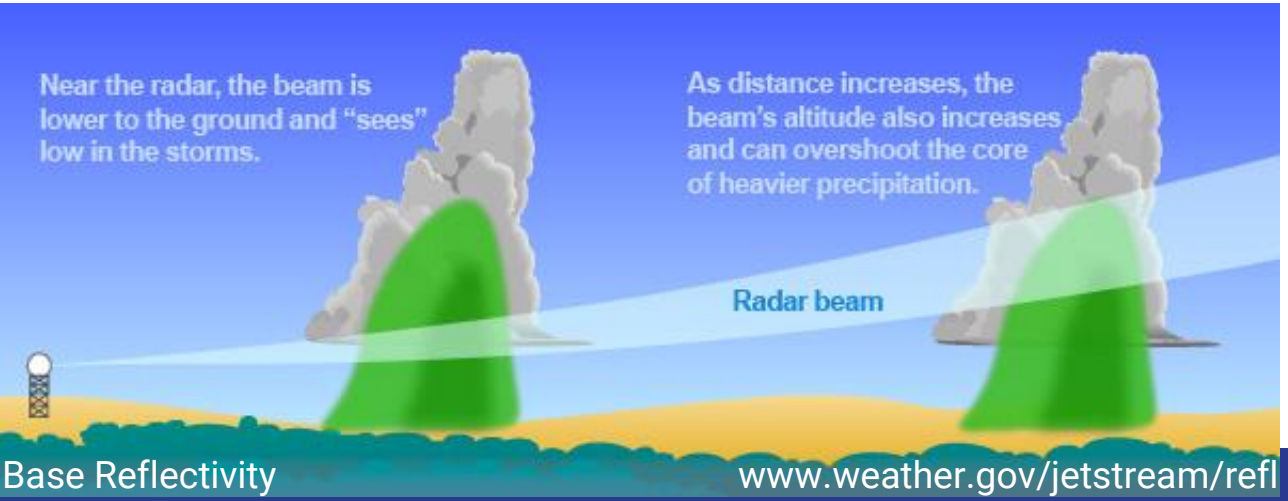





Photos courtesy of James Kraetzer, Cannon AFB Weather

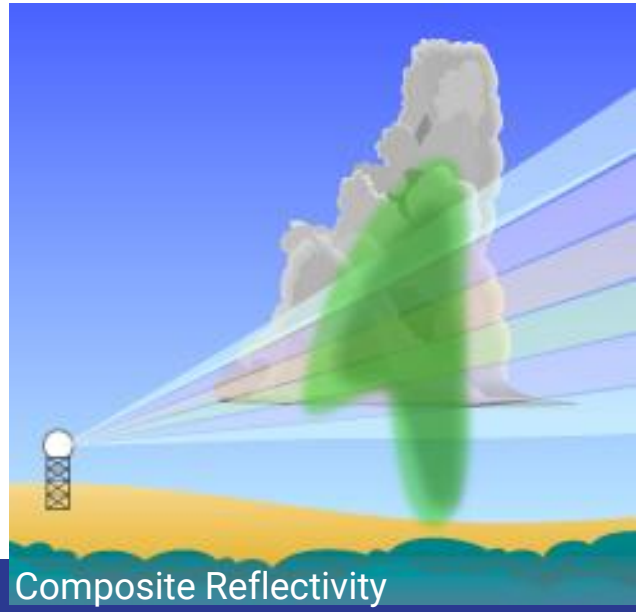
Radar Resources Online

- New Public Radar Interface: Radar.Weather.Gov
  - Choose Composite Reflectivity rather than Base Reflectivity
  - Base Reflectivity Vs. Composite Reflectivity Comparison: www.weather.gov/jetstream/refl
- Forecast Composite Reflectivity Loop: rapidrefresh.noaa.gov/hrrr/HRRR
- Radar coverage maps: www.ncei.noaa.gov/maps/radar.



Base Reflectivity

www.weather.gov/jetstream/refl



Composite Reflectivity

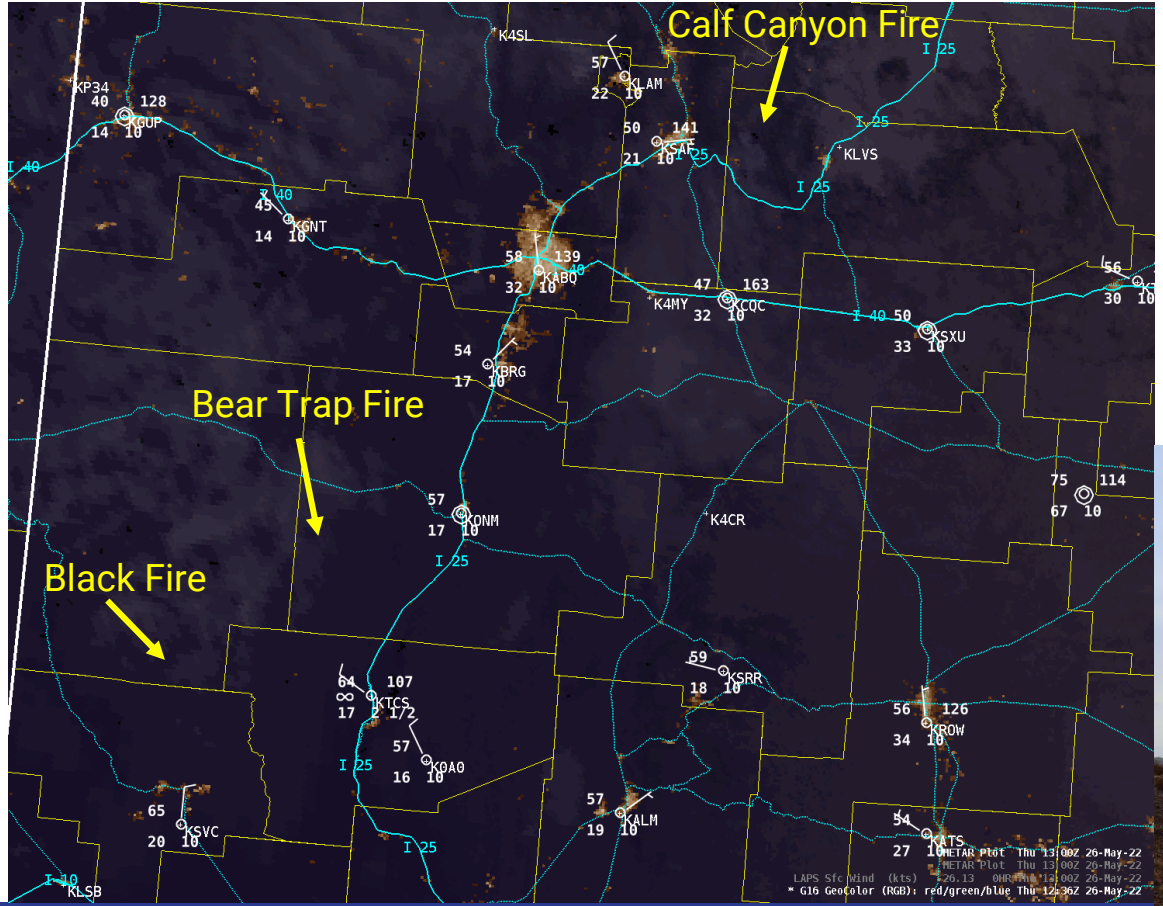
Wildfire Smoke

- Creates a ceiling
- Obstructs visibility on ground and in flight
- Can shade the ground making TAF wind forecasts unreliable
- Can influence the weather pattern locally.


Trigo Fire; April 30, 2008; © Stephanie Shope


Jaroso Fire; June 11, 2013; Dan Gerrity

Smoke Evolution - Late Night & Early Morning

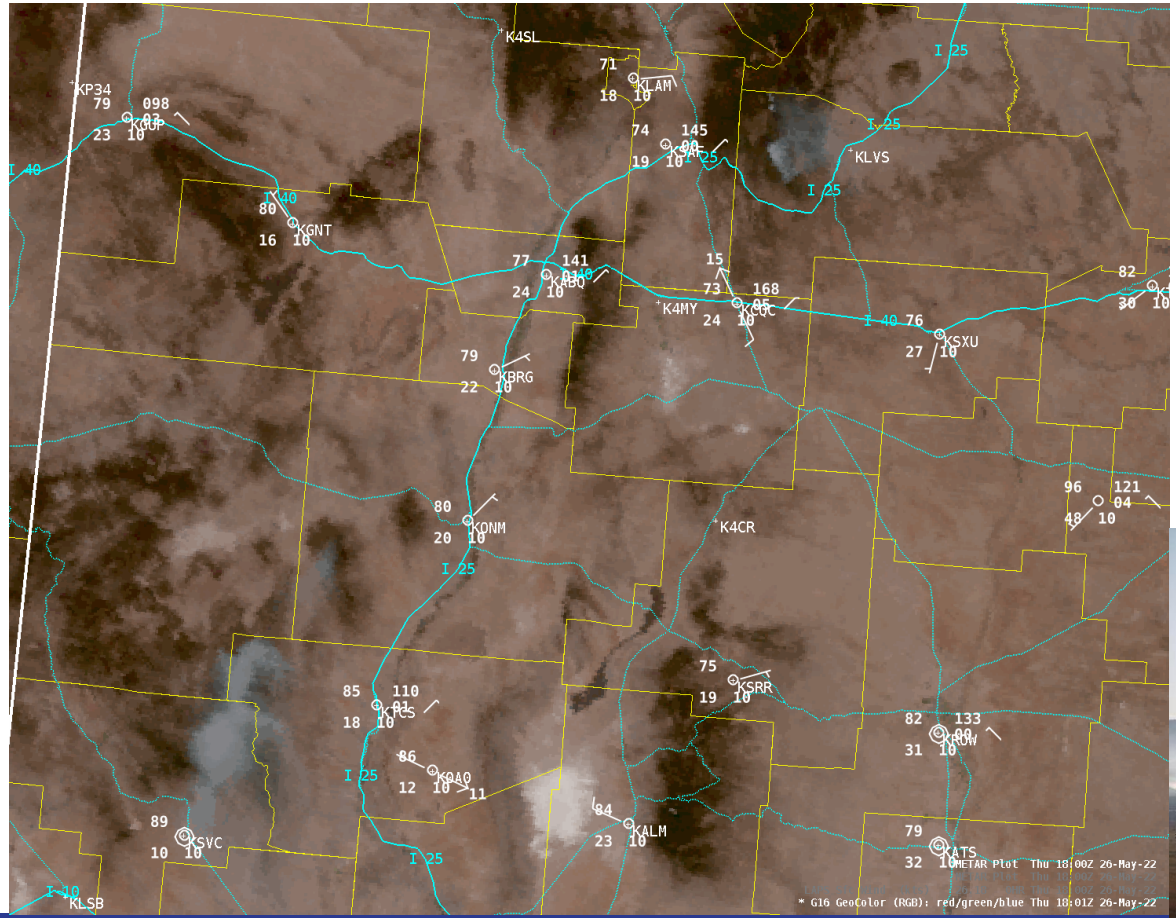


GOES E Geocolor Loop, 26 MAY 2022, 1236-1416Z

- Trapped under mid-slope temperature inversion
- Drains to lower elevations with cool, dense air currents
- Impacts limited to near and downslope from fire.

Elephant Butte Res., 27 May 22, Dave DuBois

Smoke Evolution - Late Morning to Early Afternoon

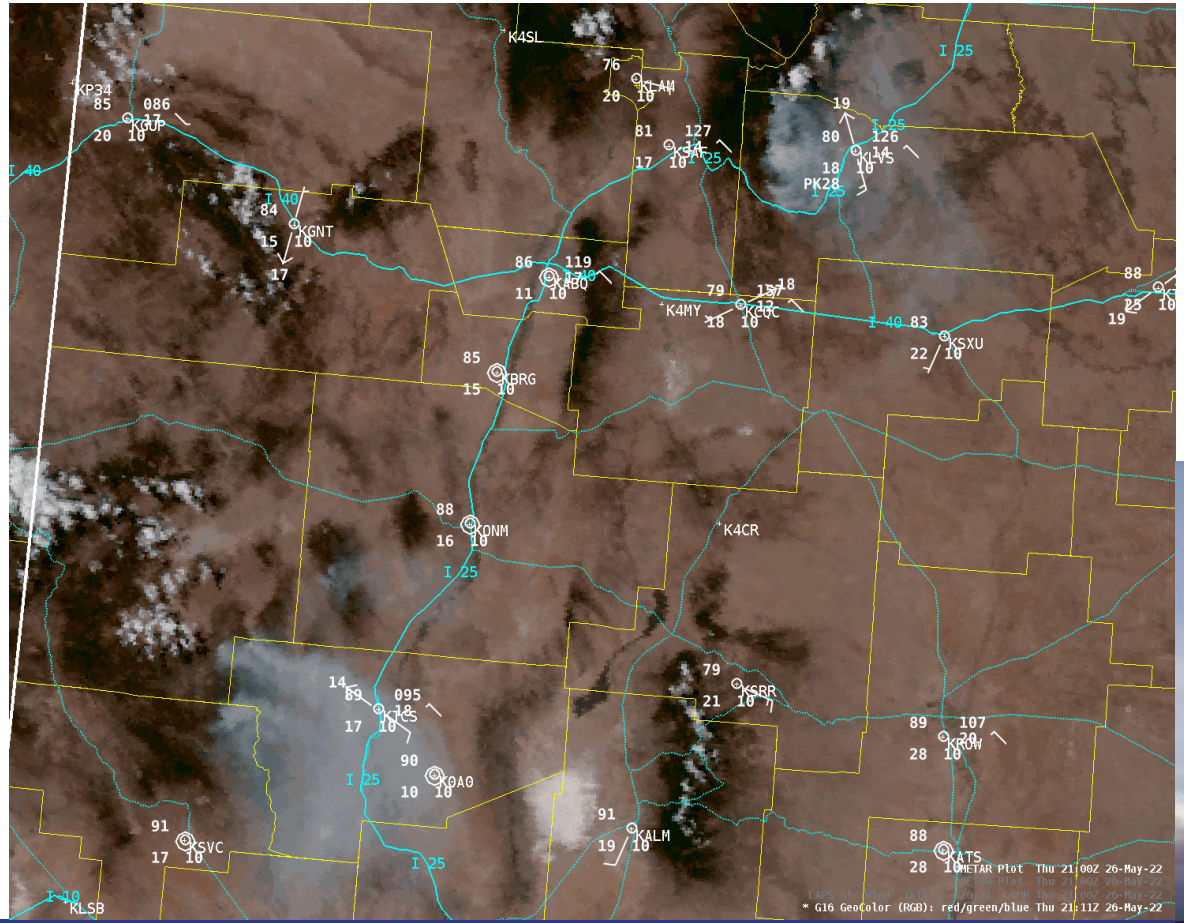


GOES E Geocolor Loop, 26 MAY 2022, 1801-1941Z

- Temperature inversion breaks
- Surface winds become gusty
- Smoke begins to loft and form a plume
- Plume direction shifts
- Flows downwind with an increasing rate of speed.

Trigo Fire, 22 APR 08, Stephanie Shope-McDaniel

Smoke Evolution - Late Afternoon



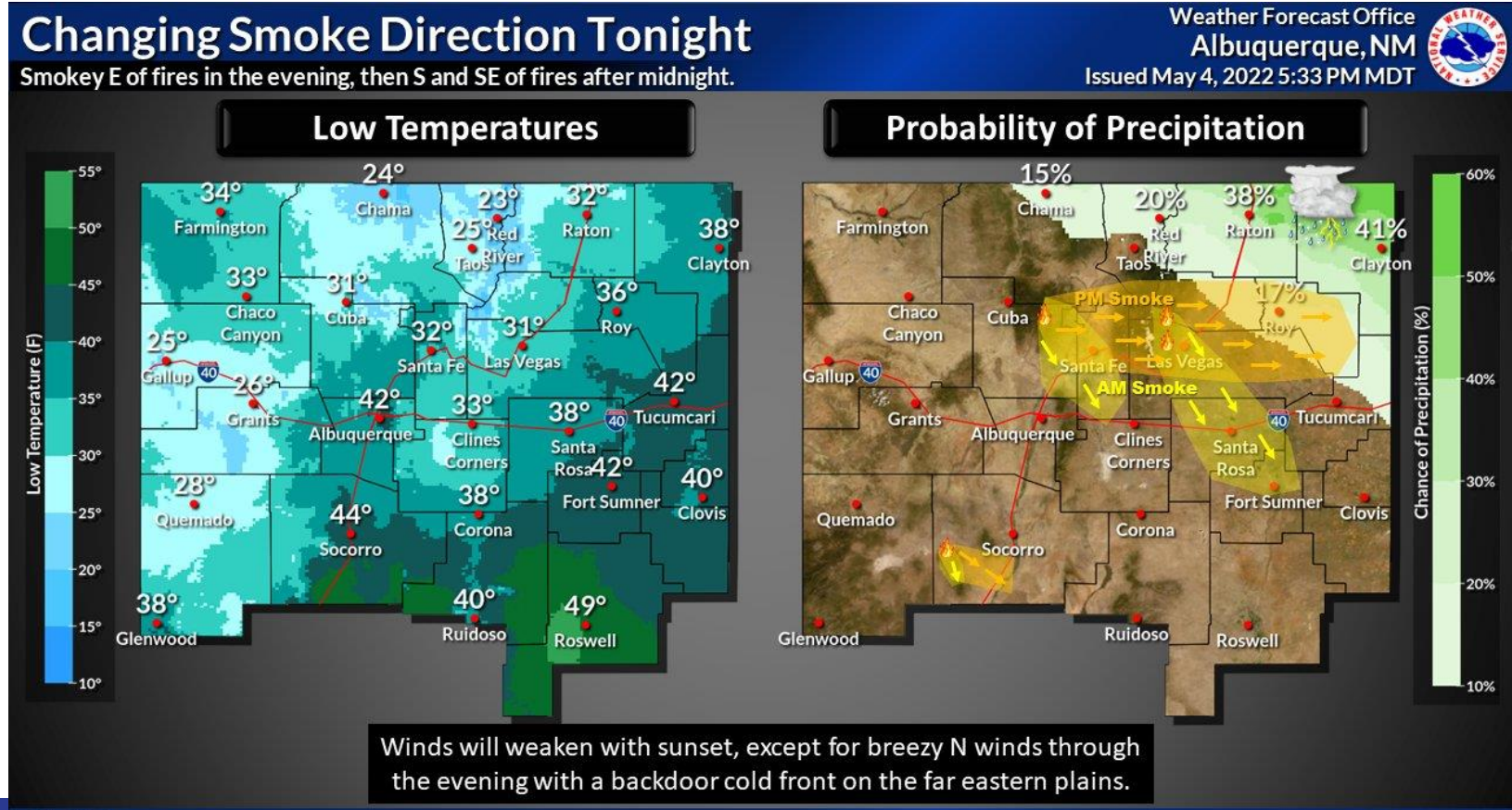
GOES E Geocolor Loop, 26 MAY 2022, 2111-2251Z

- Plume volume increases dramatically
- Rises the highest
- Impacts spread downwind
- Influences weather patterns the most.

Las Conchas Fire, 29 JUN 11, Leah Robertson

Smoke Resources Online - Graphicast at Weather.Gov/ABQ

Updated by 7 AM & 7 PM daily.



Smoke Resources Online - Aviation Forecast Discussion

- Forecaster's reasoning behind the TAF forecast
- Update by 00Z, 06Z, 12Z, & 18Z
- https://www.aviationweather.gov/fcstdisc
- Sample:

```
Area Forecast Discussion...UPDATED
National Weather Service Albuquerque NM
1200 PM MDT Thu May 26 2022

.AVIATION...
18Z TAF CYCLE
Smoke will drift to the east today, then to the northeast tonight.
High resolution smoke forecast loops depict a broad area of smoke
drifting from the Bear Trap and Black Fires northeastward across
central areas late tonight into Friday morning potentially impacting
KAEG, KABQ, and KSAF with modest visibility reduction. Southwest
winds will become gusty areawide on Friday with better developed
smoke plumes. Isolated and gusty virga showers, and maybe a few dry
thunderstorms, will be possible across west central, central,
northeast, and east central areas Friday afternoon and early evening.
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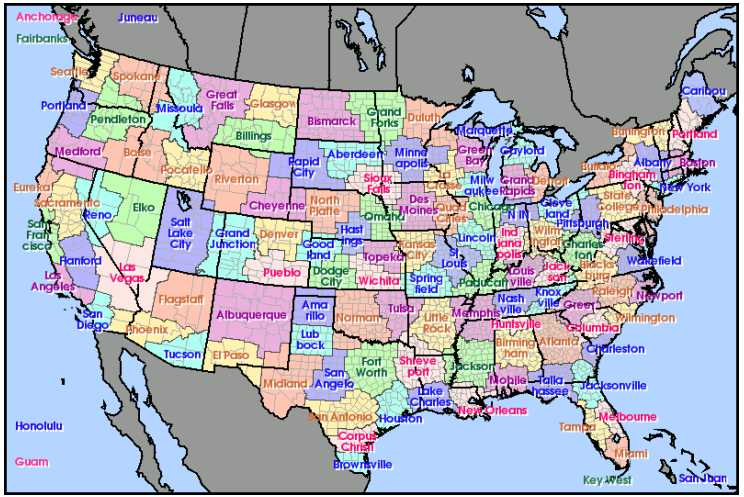
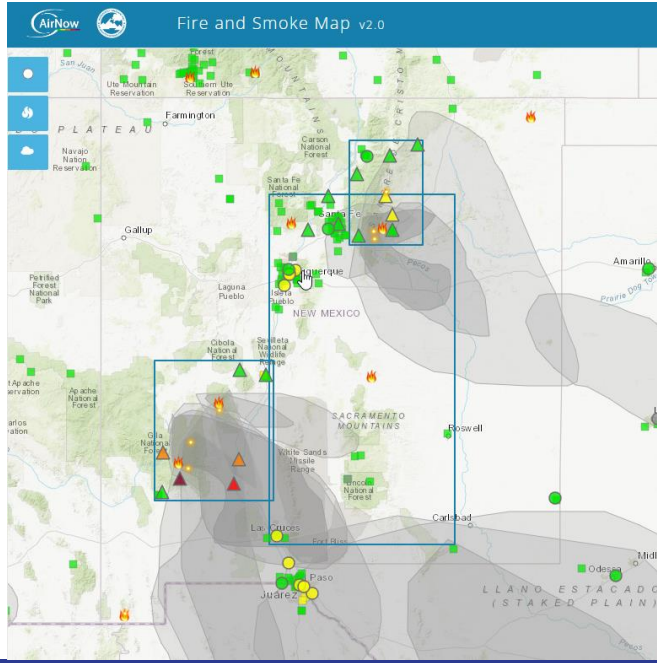


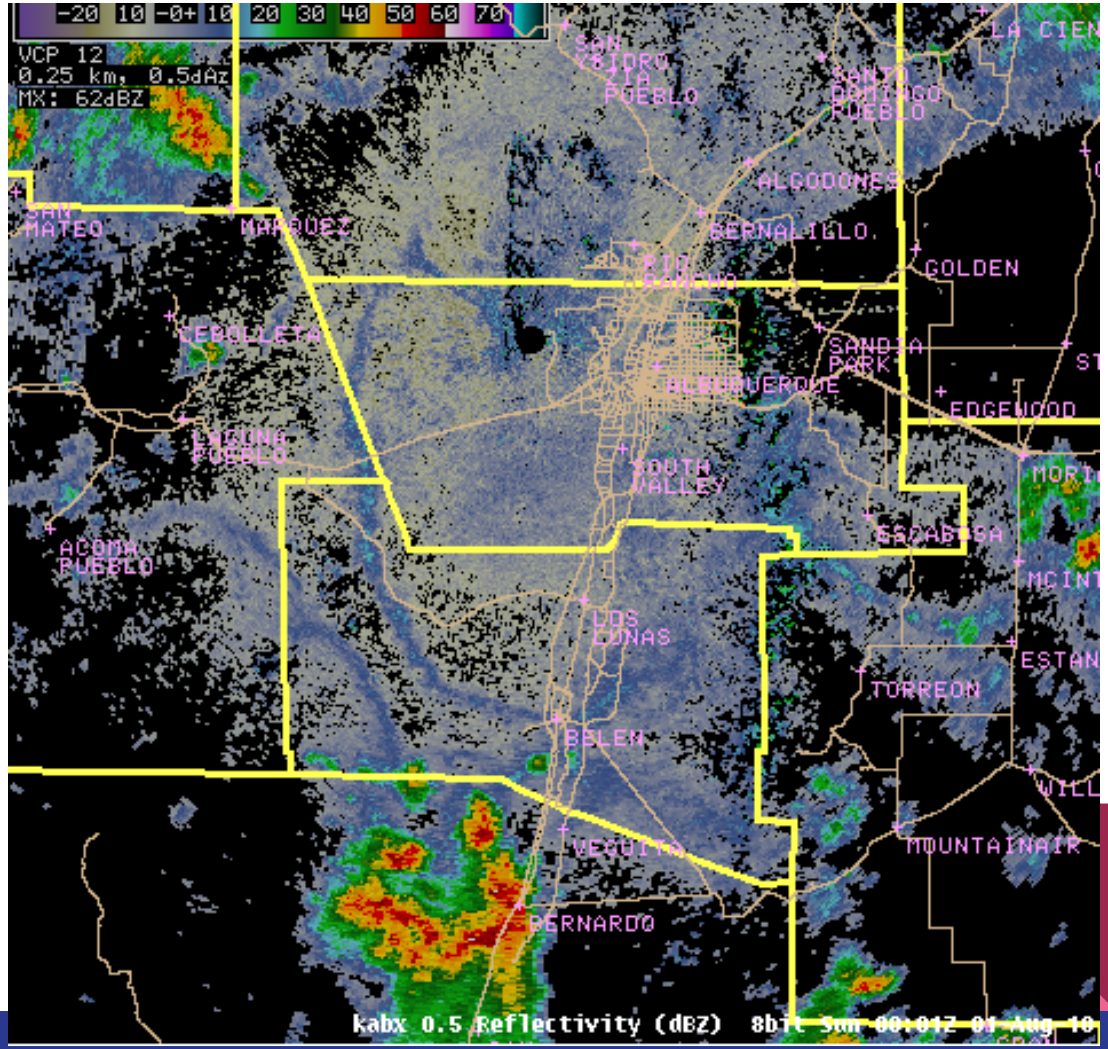
Additional Smoke Resources Online

- HRRR Smoke - https://rapidrefresh.noaa.gov/hrrr/HRRRsmoke/
  - “Vertically Integrated Smoke” depicts concentration and flow of smoke aloft
  - “Near Surface Smoke” depicts concentration and movement of low-level smoke
  - Tutorial for optimal use (for NM choose SW not NW): https://www.weather.gov/mfr/HRRR_smoke_tutorial.
- Map of air quality sensors - https://fire.airnow.gov/
  - Zoom into NM, then click on a sensor
  - Verify smoke shading using visible satellite loop.



TAF Smoke & Thunderstorm Timing

- Often a best guess
- We try to limit TS and VCTS to 1-3 hours, unless we have a meteorological reason to expect storms to last longer
- Smoke forecasts are especially uncertain
- Monitor:
  - Aviation Forecast Discussion for forecaster thoughts on confidence and timing
  - TAF for updates.



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Questions?

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