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# CASA ALERT!

Supporting EM Decision Making  
During the May 10, 2010 Tornado Outbreak

Cedar League  
University of Colorado, Colorado Springs

Jon Tankersley  
City of Newcastle Emergency Management

March 4, 2011  
National Severe Weather Workshop, Norman, OK

Anadarko, OK May 13, 2009

# What is CASA?

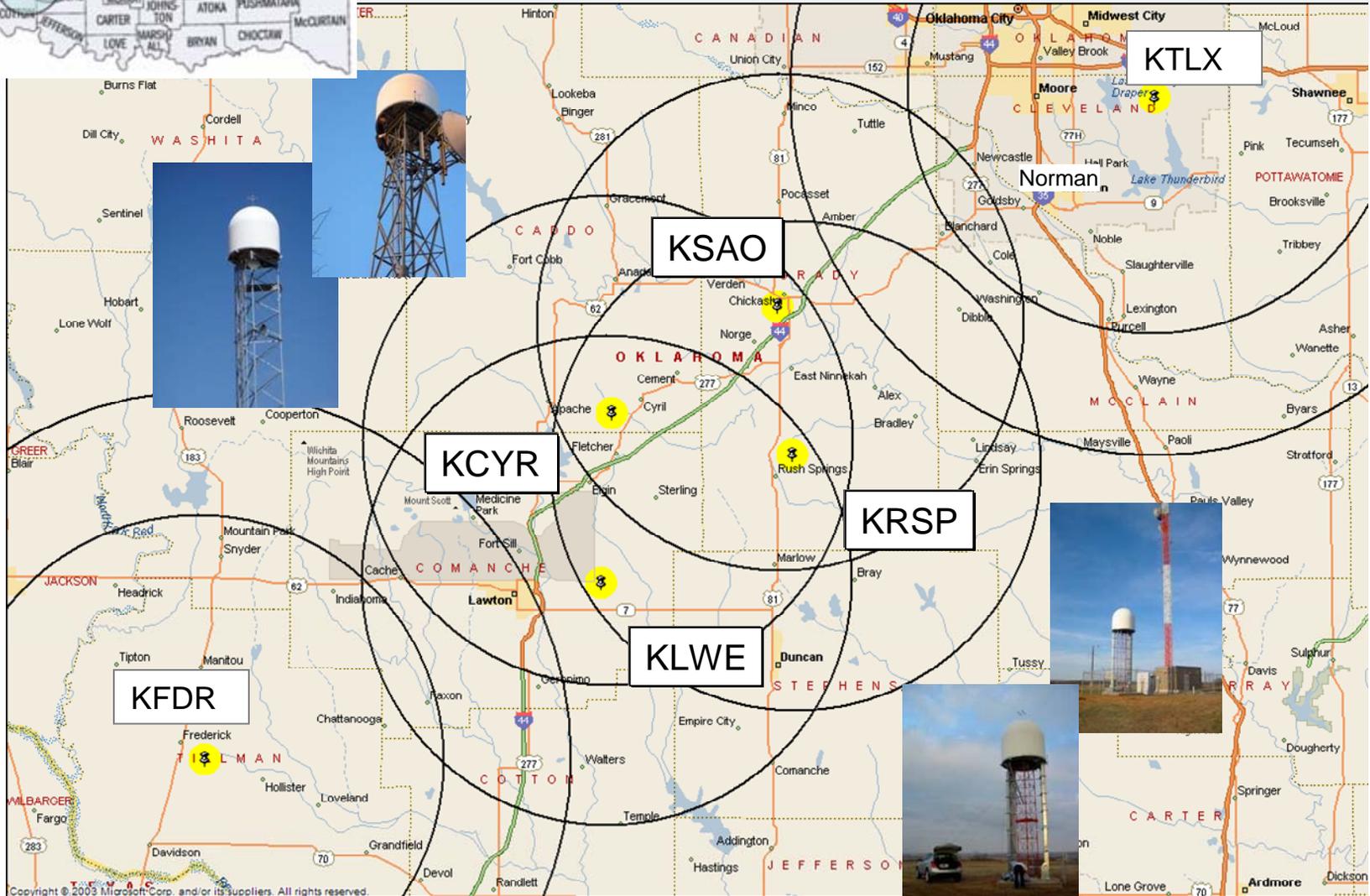


Chickasha Radar - KSAO

- NSF Engineering Research Center for Collaborative Adaptive Sensing of the Atmosphere
- CASA's Focus: low altitude coverage, high resolution radars
- Year 8 of a 10-year research project

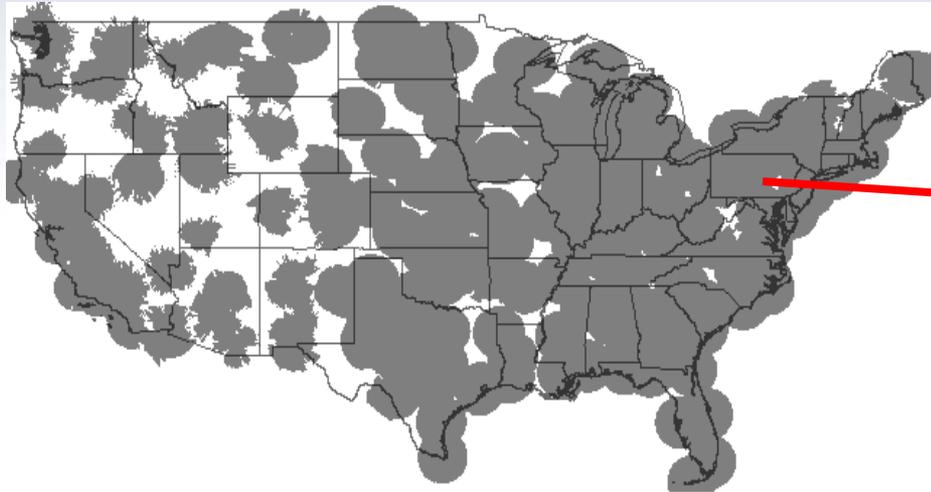


# Oklahoma Test Bed

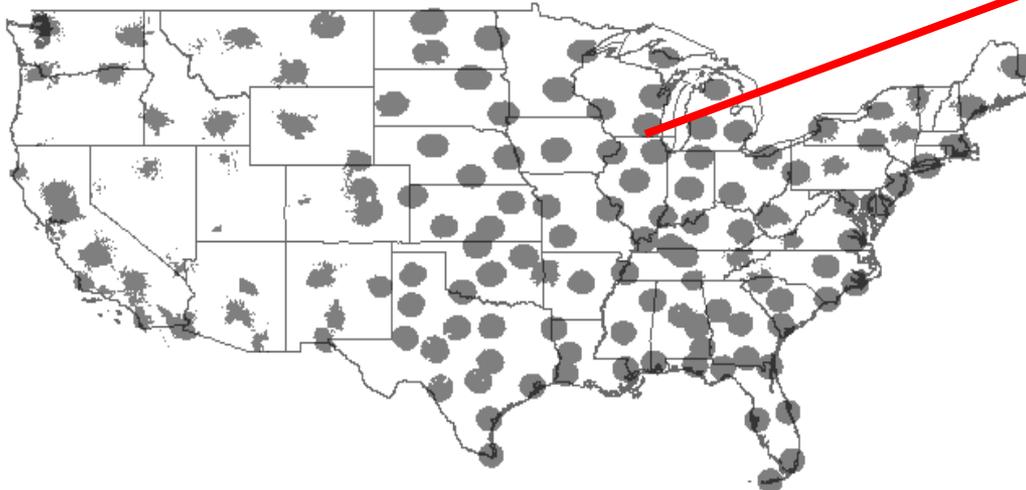


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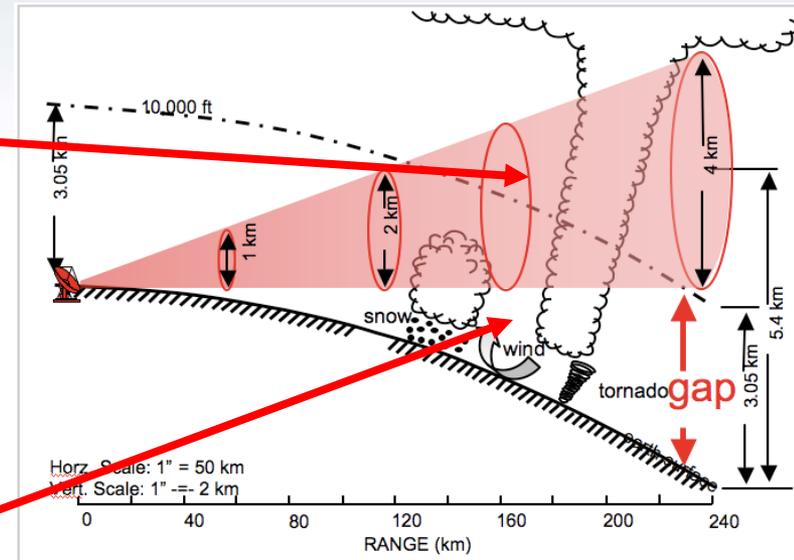
# CASA Motivation



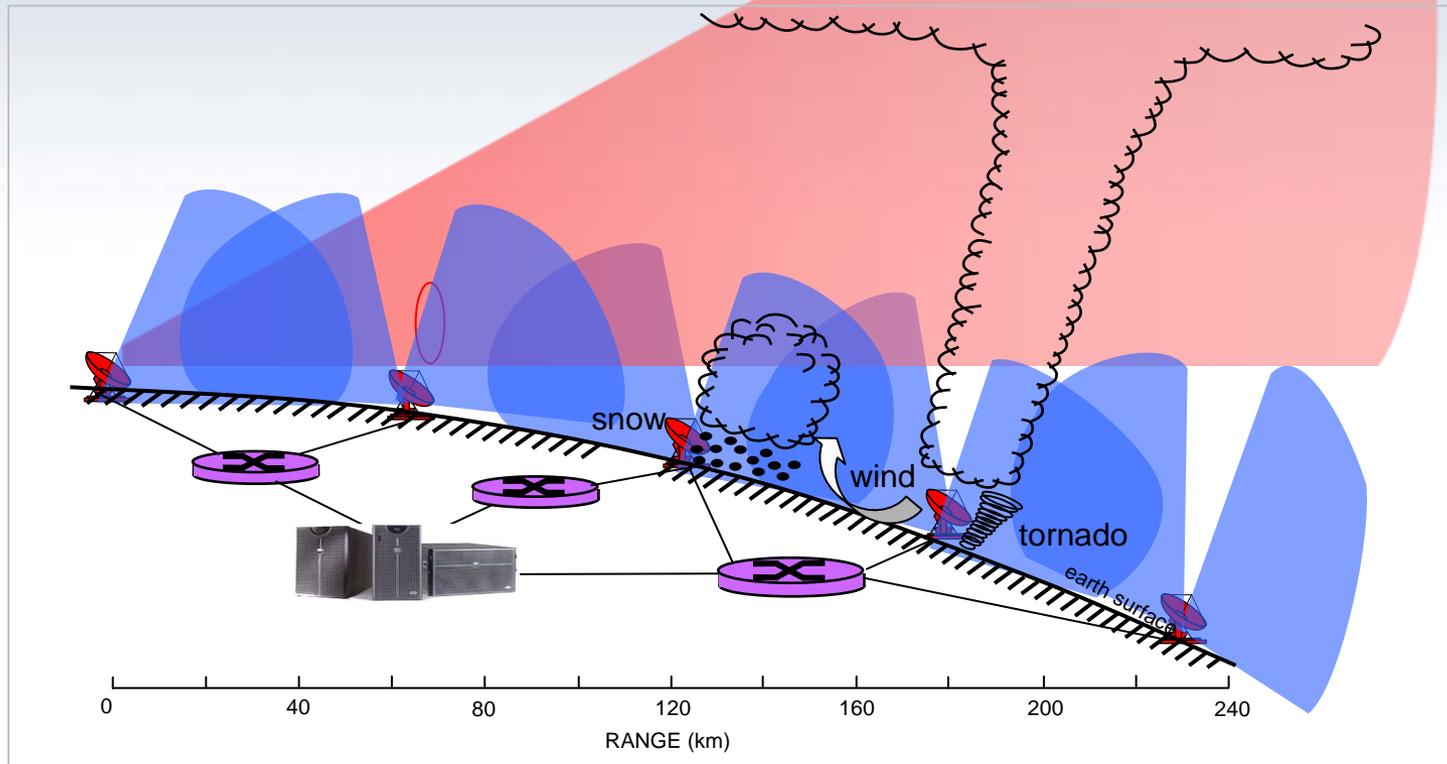
**NEXRAD coverage at 3 km (10,000 ft)**



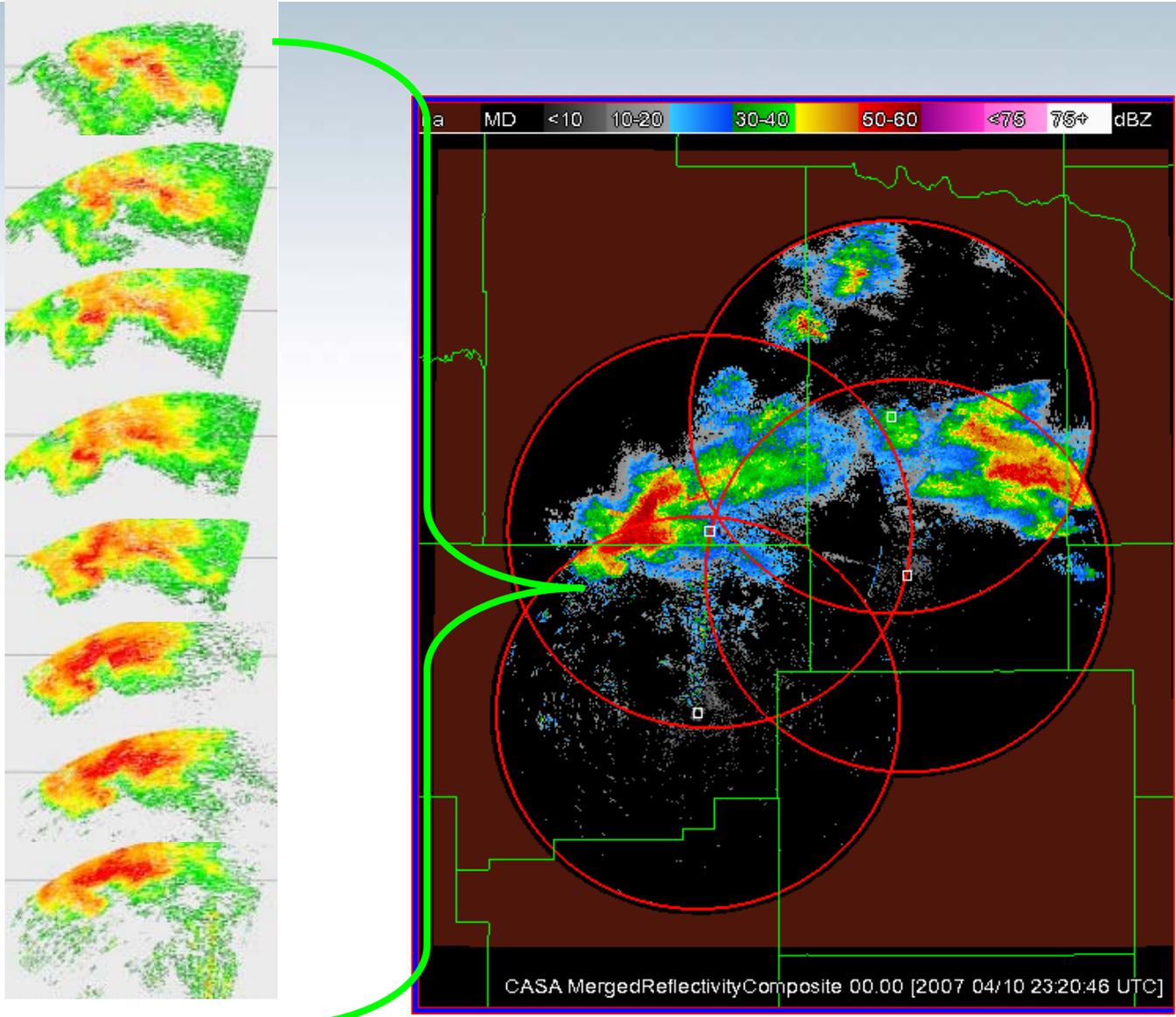
**NEXRAD coverage at 1 km (~3200 ft) AGL.**



# CASA's Solution



- Low power, X-band radars
- Dual pol, multi-Doppler
- High spatial res (ave. 0.5 km vs. 2.5 km)
- High temporal resolution (1 min vs. ~5)
- Adaptive scanning based on weather, user needs and radar capabilities vs. sit and spin
- 40km range rings
- Overlapping coverage – spacing at 30km
- 100% coverage below 1km AGL versus about 30% NEXRAD
- Scan at 8 angles between 1° -14°
- Range: 100m-600m at 1° elevation to 200m - 7.4 km at 14°



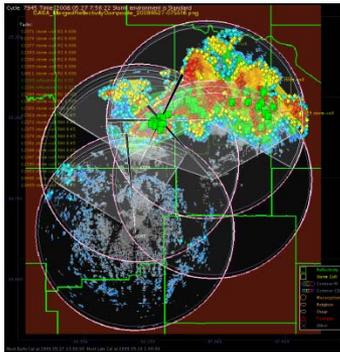
**CASA's Adaptive Sector scanning at multiple elevations from 1 to 14 degrees**

**Situational Awareness & Sector Scans each minute**



# Severe Weather - Integrated Warning System

Radar Data



NWS



Media



Public



Spotter

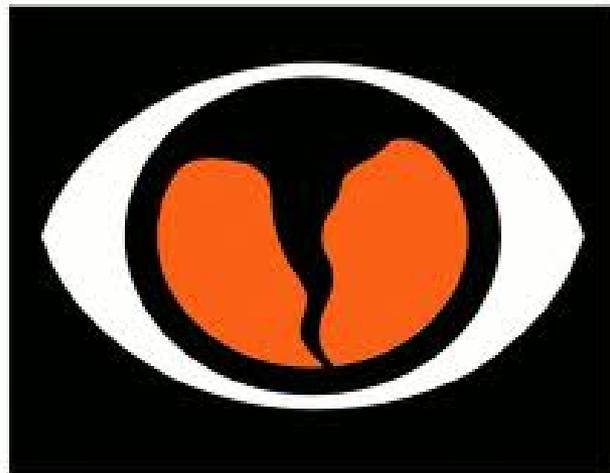


EMs



End-to-end: Flow of information to the public

# Verifying Information



**SKYWARN**

## **Spotters: 82% of Oklahoma EMs regularly use spotters**

- Spotters are generally deployed by EMs (rather than self-deployed)
- Spotters are public works volunteers (police/fire), community volunteers, and HAM operators
- Radar aids spotter deployment
- Problem: night-time and rain-wrapped events.

# *Warning Process is Complex and based on Uncertainty*

Uncertainty:

- When
- Where
- If a tornado will occur



# Hazardous Weather Testbed

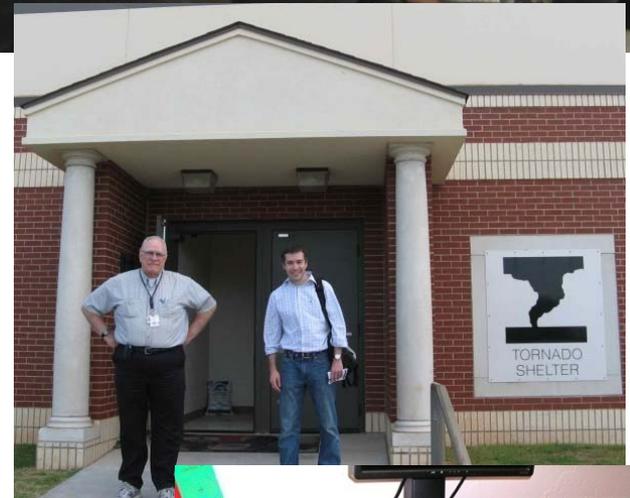


- ❑ 2010 Goal: Optimizing EM/NWS communications
- ❑ Twitter, CASAChat, Email, WDSS-II, and AWIPS

# May 10, 2010



- ❑ Cells Initiate in CASA network
- ❑ Observations of EMs in Newcastle
- ❑ Anti-cyclonic tornado in network
- ❑ CASA Damage Survey at Bray
- ❑ Tornadoes in Norman! 35 Total

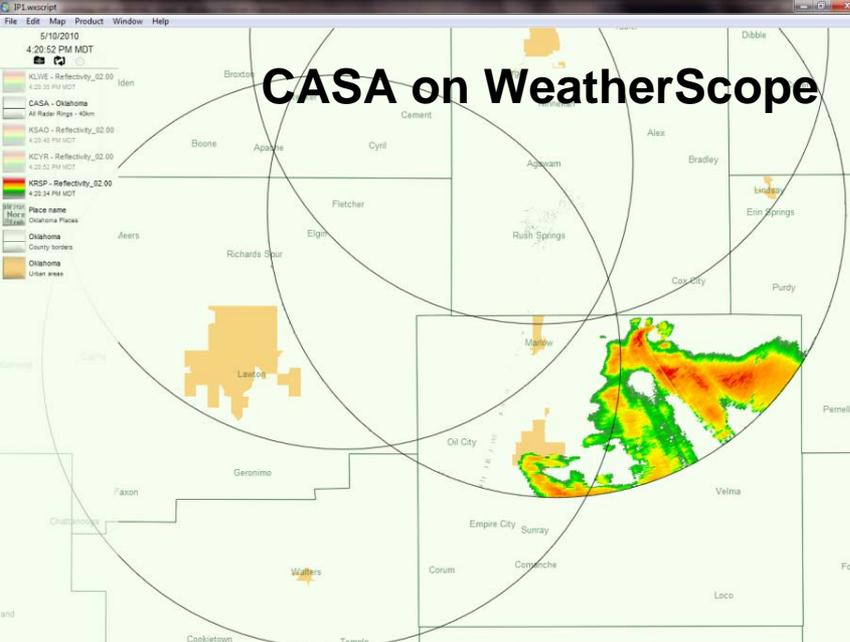


- casaalert** CASA Information  
 We're back! There's storm increasing along the dry line near chickasha.  
 10 May
- casaalert** CASA Information  
 2 Se Norman media reports TOR 05:33 PM CDT funnel cloud observed descending rapidly at 532 pm from NWC. damage&touchdown E of NWC along 9.  
 10 May
- casaalert** CASA Information  
 yikes! tornado warning here! we saw some rotation!  
 10 May
- casaalert** CASA Information  
 This is the velocity image <http://twitpic.com/1mscis>  
 10 May
- casaalert** CASA Information  
 anticyclonic rotation in reflectivity (near bray) <http://twitpic.com/1msbcv>  
 10 May
- casaalert** CASA Information  
 Storm near Bray moving at NE at 70 knots moving towards western garvin county.  
 10 May
- casaalert** CASA Information  
 anti-cyclonic rotation near bray in northern stephens county. strong left moving supercell with 65 knot winds at 2,600 ft.  
 10 May
- casaalert** CASA Information  
 50 knots winds near Duncan on Rush Springs radar  
 10 May
- casaalert** CASA Information  
 3dvar is showing severe winds south of mustang, north of bridgecreek. The town of tuttle and east can expect winds of 60 kts

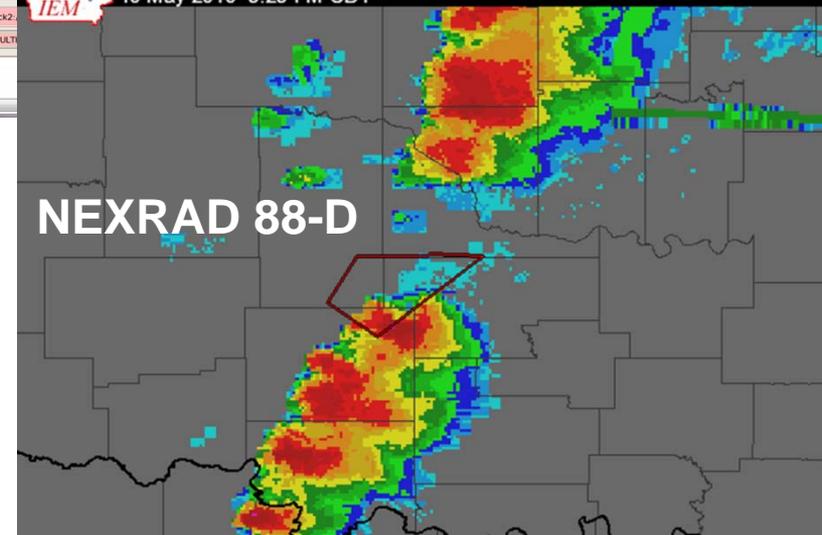
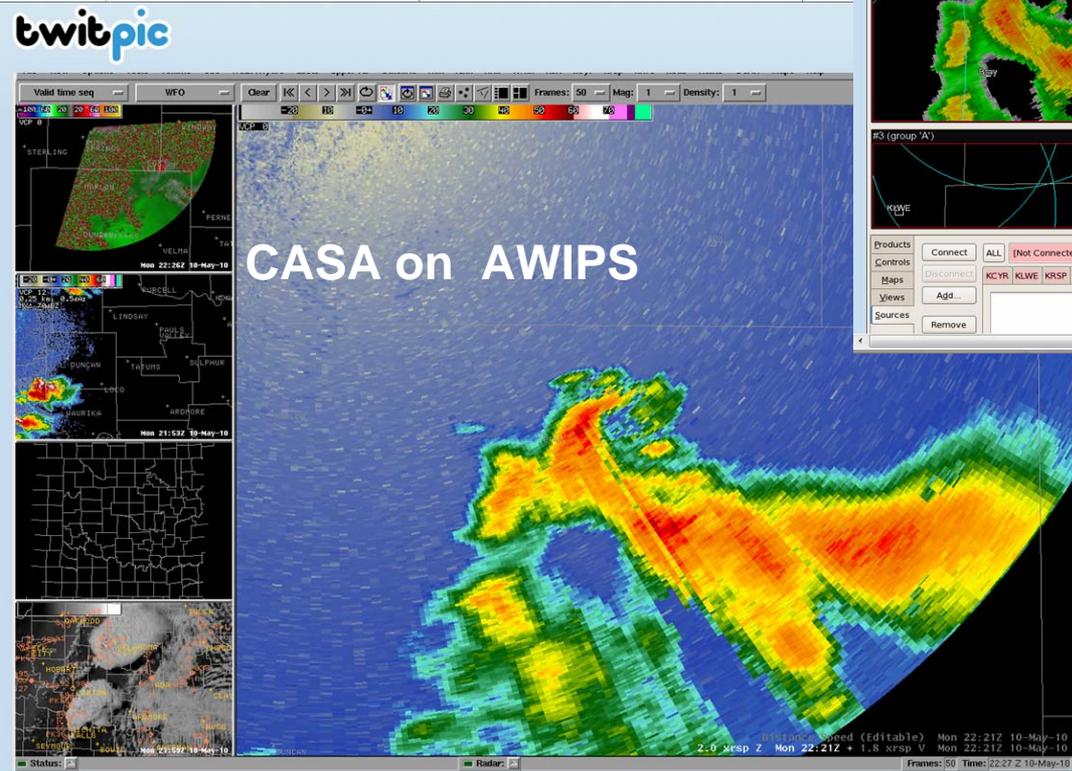
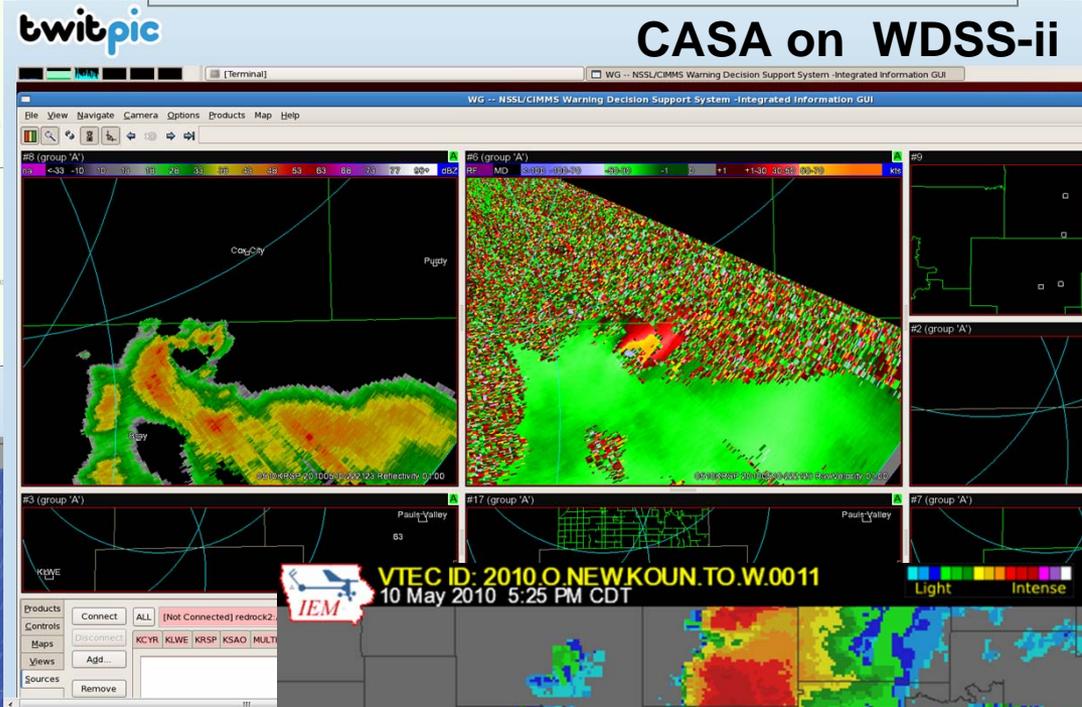


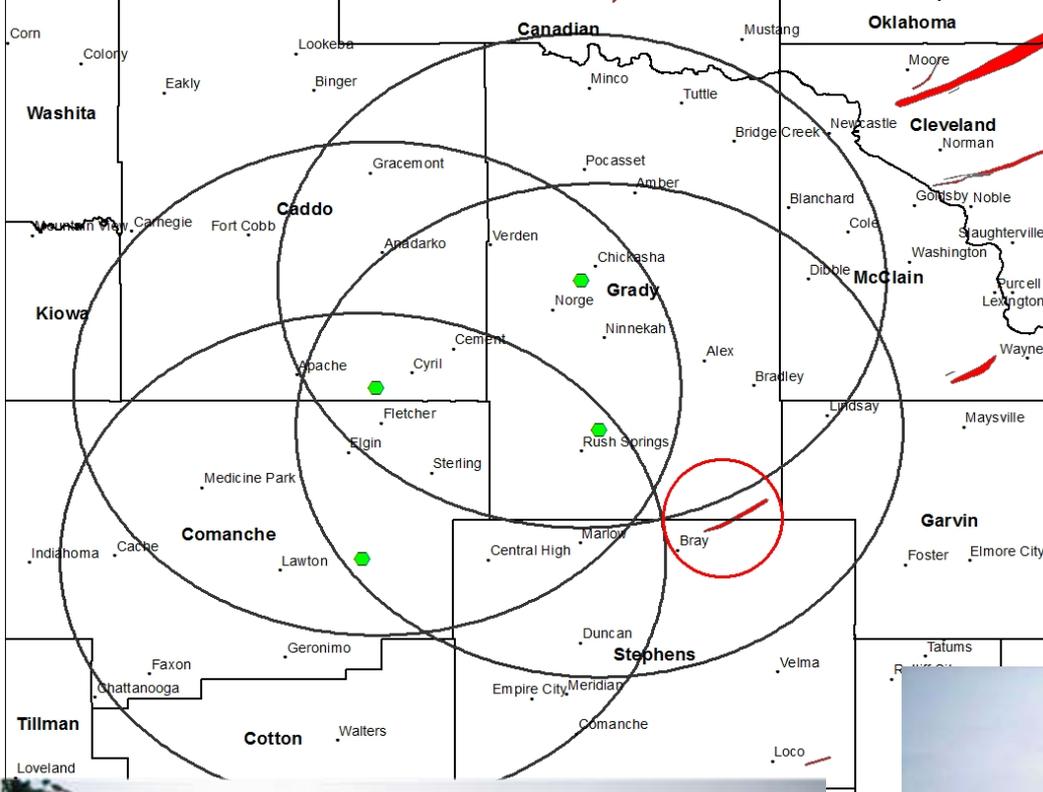
- [19:44:40] <academia-ellen.j.bass@nwschat.weather.gov/Office> Good afternoon, this is Steve Nelson, this week's CASA testbed forecaster. Isolated thunderstorms are developing rapidly along the dryline which extends from just west of Woodward to Cheyenne to west of Altus. One dangerous storm was centered just east of Woodward moving northeast at 50 mph and will not affect the CASA testbed area. Another intensifying storm was located in Custer county and will move into northern Blaine county. This storm will likely become severe in the next 45 to 60 minutes. The dryline has been moving rapidly east in the last 2 hours and will move into the CASA testbed area between 4 and 5pm with additional thunderstorm development expected. The atmosphere is very unstable with CAPE values between 2000 and 3000 J/kg. Vertical wind shear is extremely strong with 0-1km storm-relative helicity values of 400 to 600 m<sup>2</sup>/s<sup>2</sup>. The values are very favorable for long-lived supercell thunderstorms with rotating updrafts. Tornadoes will be possible, especially after 4pm. Very large hail (up to 3" in diameter) is also likely with any supercell thunderstorms. The storms should move out of the CASA testbed area by 8 pm as the threat shifts east of I-35. Spotter activation should be in progress and be prepared for isolated, rapidly-moving severe thunderstorms moving from southwest to northeast at 40 to 50 mph. Additional discussions will be provided as the storms move into the testbed area. Steve
- [19:52:54] <academia-ellen.j.bass@nwschat.weather.gov/Office> Channel 5 is showing a wall cloud north of the test bed
- [20:04:28] <nws-steinen.nelson@nwschat.weather.gov/53ae6a18> ping
- [20:05:11] <nws-steinen.nelson@nwschat.weather.gov/53ae6a18> Hello everyone. Finally got Pidgin installed and working on my laptop.
- [20:22:06] <nws-steinen.nelson@nwschat.weather.gov/53ae6a18> The 20Z KOUN special sounding shows a fairly strong capping inversion still in place. Cap is likely weaker along the dryline but appears strong enough to inhibit most convection.
- [20:39:17] <academia-ellen.j.bass@nwschat.weather.gov/Office> OUN chat is showing a tornado report
- [20:41:58] <nws-steinen.nelson@nwschat.weather.gov/53ae6a18> Brief tornado reported 4 miles southwest of Wakita in Grant county (far northcentral OK)
- [20:47:02] <nws-paul.t.schlatter@nwschat.weather.gov/laptop> KOUN, the DualPol NWS prototype is up and running now
- [20:53:26] <academia-ellen.j.bass@nwschat.weather.gov/Office> Convective initiation in the test bed south of Ft. Cobb on NEXRAD just ahead of the dryline
- [21:02:15] <academia-ellen.j.bass@nwschat.weather.gov/Office> [\(Link\)](#) initiation in test bed
- [21:04:56] <academia-don.j.rude@nwschat.weather.gov/Office> OUN issues SIGNIFICANT WEATHER ADVISORY <[\(Link\)](#)> for Caddo, Canadian, Grady [OK] till 4:45 PM CDT

<http://twitter.com/casaalert>



- EF-1 between Bray and Cox City
- 6 mile path
- TOR warning 5:25 pm CDT
- Anti-cyclonic rotation





# *Summary*

- **CASA Benefits:**
  - Provides low-level, high resolution data
  - Complements NEXRAD
  - Supports EM decision-making
  - Increases warning lead time
  - End-to-end operations





**casa**

Engineering Research Center for  
**Collaborative Adaptive Sensing of the Atmosphere**

# Questions



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Jon Tankersley: [emergency@pldi.net](mailto:emergency@pldi.net)



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University of Oklahoma



Colorado State University



University of  
Puerto Rico Mayaguez

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