



**casa**

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

# ***Lessons Learned: Forecaster and Emergency Manager Communications Using Social Media***

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Univ. Massachusetts, Univ. Virginia, Univ. Colorado,

Interdepartmental Hurricane Conference  
March 8, 2012



University of  
Massachusetts Amherst



University of Oklahoma



Colorado State University



University of  
Puerto Rico Mayaguez

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# *What is CASA?*

- ❑ National Science Foundation Engineering Research Center, 10 year, \$40 million grant 2003 - 2013
  - ❖ Academic, Government and Private Sector Partners
- ❑ CASA's Focus: End-to-end, X-band radar systems for improved hazard response
- ❑ Research to operations.
- ❑ Year 9 of a 10-year research project
- ❑ Test beds in Oklahoma and Puerto Rico for research and validation

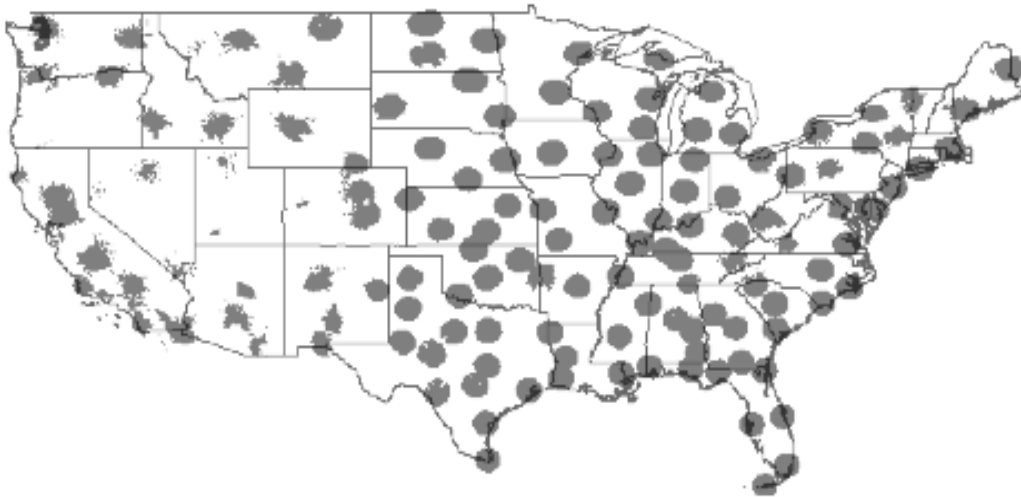
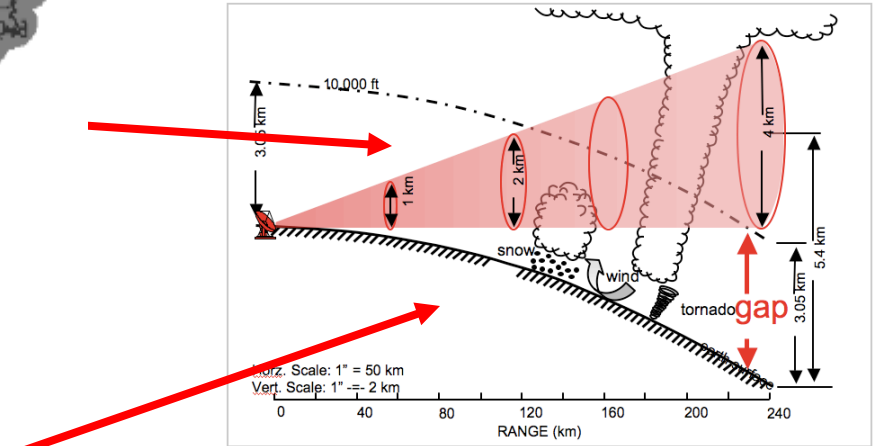
UMASS, CSU, OU, UPRM, UDEL, UVA, UCCS



# What are the gaps in the current radar system?



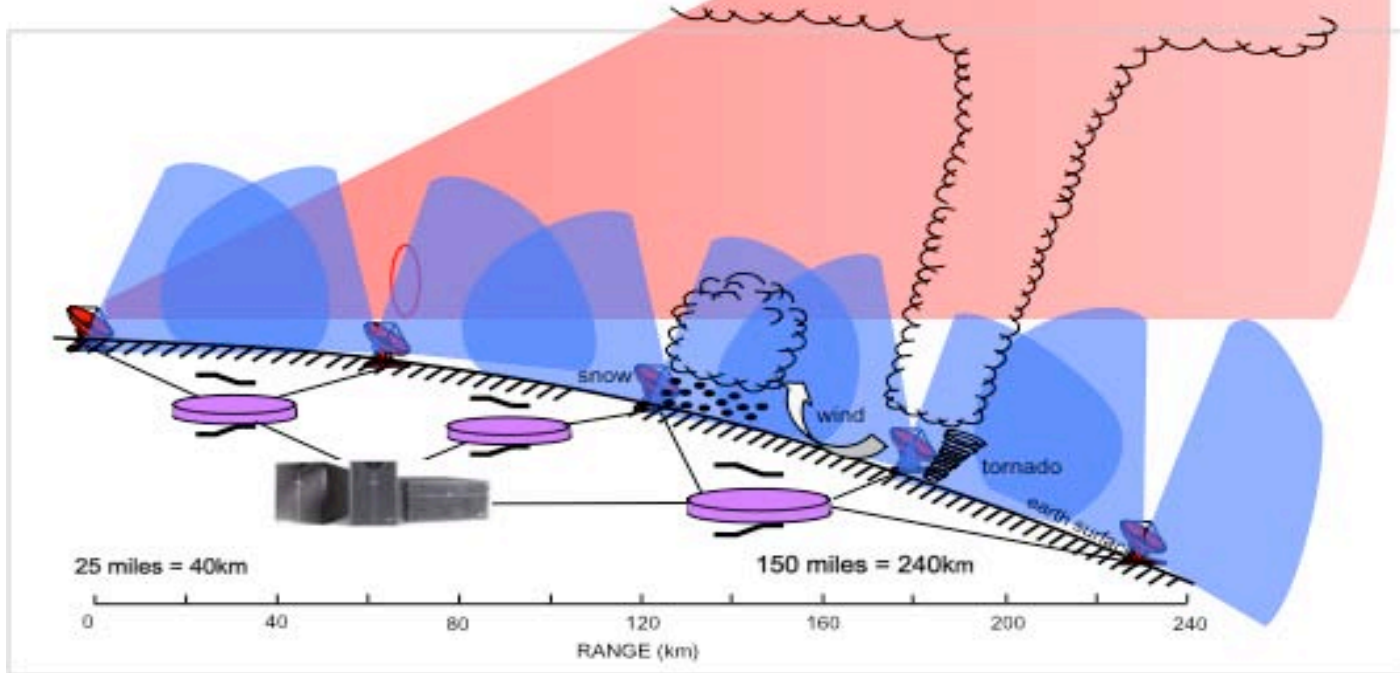
NEXRAD coverage at 3 km (10,000 ft).



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

- Low level sensing gap
- Granularity gap
- Update rate gap
- Observation capability gap: wind direction/rain

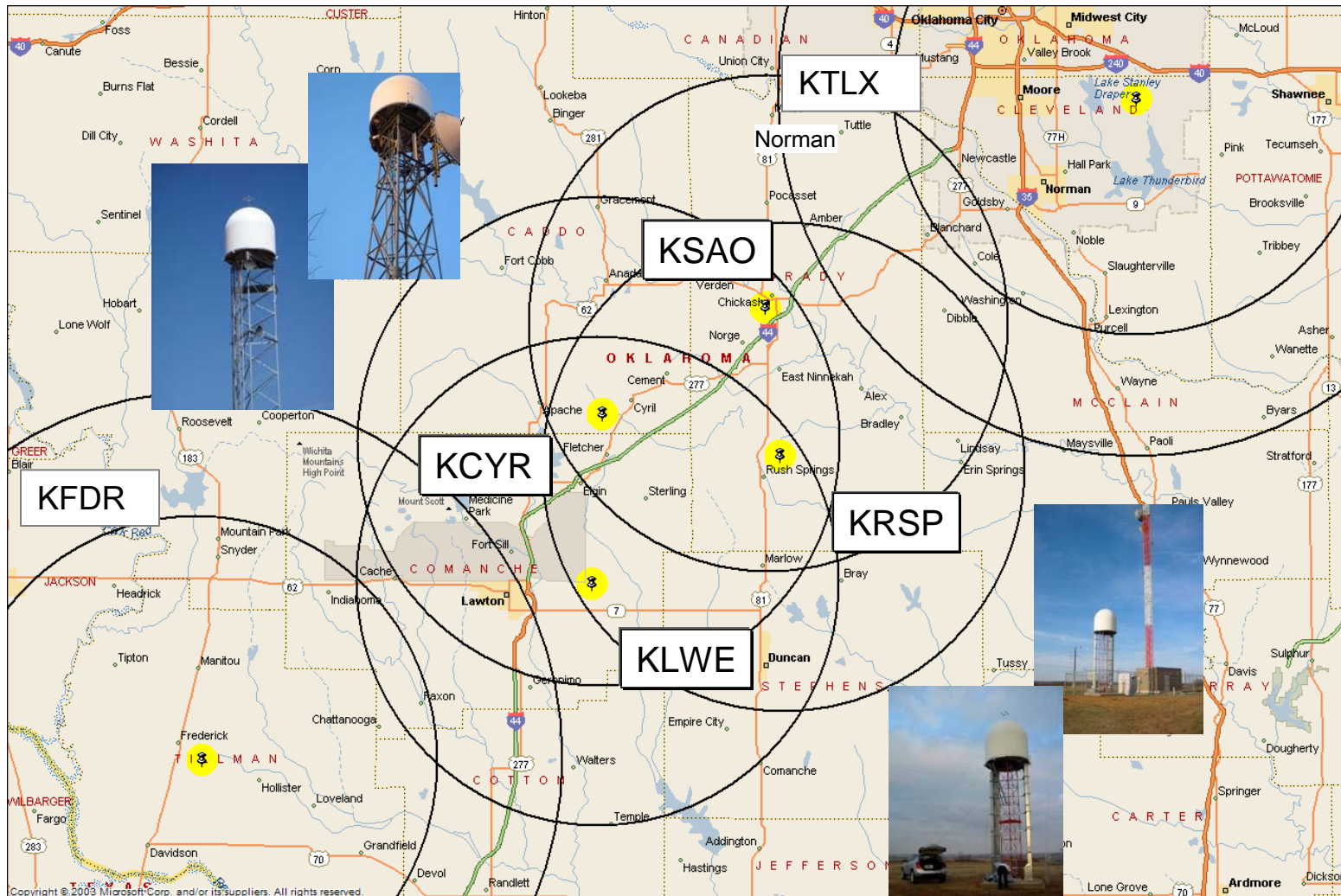
# ***CASA's Solution: X-band radar networks***



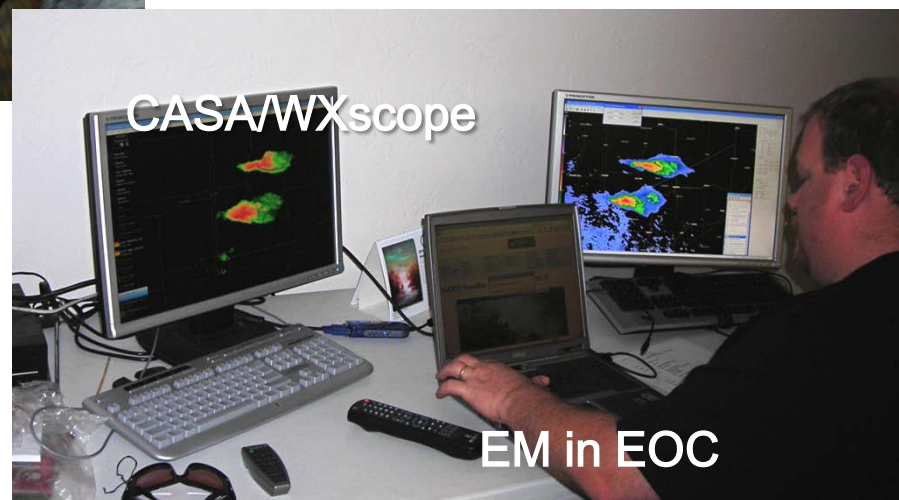
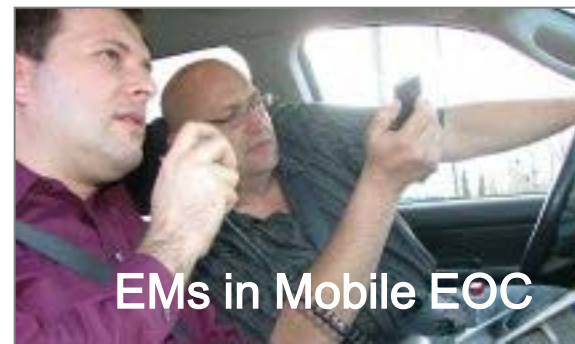
# Adaptive Radar control



# Oklahoma Test Bed – Quasi-Operational Test bed: 2007 - 2011



# Forecaster Emergency Manager Communication Experiment: NOAA Hazardous Weather Test Bed and Beyond

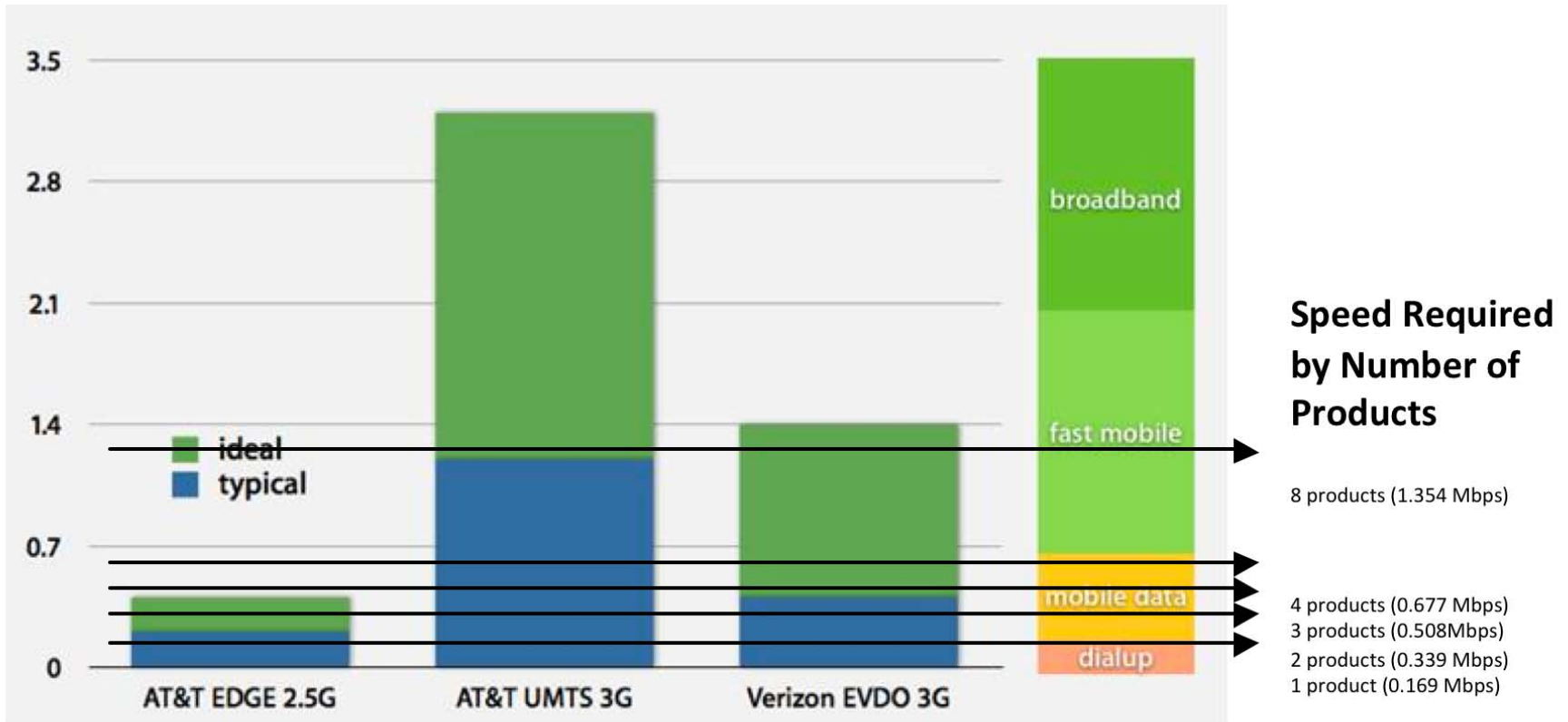


***Lesson #1: EMs have varied access to hardware and bandwidth***





# Results of Bandwidth Test



# ***Radar Usage and Training***

- ❑ 89% report routinely using radar data
- ❑ 70% have been trained in the use of radar

## **RADAR ACCESS**

	<b>OFFICE/EOC</b>	<b>HOME</b>	<b>MOBILE</b>
% EMs who access radar in each location	96%	92%	66%
Primary Device	Desktop 86%	Desktop 50%	Laptop 30%
Primary Connection	DSL 48%	DSL 46%	Mobile Broadband 62%
Primary Problem	Slow/No Data Download 25%	Slow/No Data Download 30%	Slow/No Data Download 26%

***Lesson #2: EMs have varied tasks, varied expertise***



# ***What decisions do EMs make during the phases of a severe weather event? (phases aren't always sequential)***

- ❑ Pre-storm environment (before watch 3 + hours)
  - ❖ Notify spotter network of possible activation
- ❑ Watch (3 -4 hours before an event)
  - ❖ Deployment of spotter network
  - ❖ Anticipate rush hour, school hours, outdoor event (sports etc.)
  - ❖ Activation of EOS (Emergency Operations Center), if necessary
  - ❖ Open public tornado shelter
  - ❖ Note: many institutions, such as schools, hospitals, etc. have their own severe weather operations plan and may work in collaboration with EMs, but make their own decisions.
  - ❖ Feed information from spotter network to NWS, get media info, talk to NWS office

# ***What decisions do EMs make during the phases of a severe weather event? (phases aren't always sequential)***

- ❑ Warning (0 to 20 mins before an event)
  - ❖ Activate warning system: siren, cable interrupt, working with media.
  - ❖ Keep the spotters safe
  - ❖ Information exchange between NWS, spotters, media, EM
  - ❖ Information exchange with institutions.
  - ❖ Dispatch first responders
- ❑ Event/False Alarm/missed event
  - ❖ Dispatch first responders if safe to rescue people
- ❑ Post Event
  - ❖ Dispatch first responders if safe to rescue people
  - ❖ Deactivate warning system.

***Lesson #3: A diversity of communication mechanisms are needed with consistent messages, so EMs can pick and choose.***



## Emergency Manager Alerts via Twitter



twitter

Have an account? [Sign in](#)

**Get short, timely messages from CASA Information.**

Twitter is a rich source of instantly updated information. It's easy to stay updated on an incredibly wide variety of topics. **Join today** and **follow @casaaalert**.

follow casaaalert to 40404 in the United States  
[Codes for other countries](#)

3:57 PM May 10th via web

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.

3:51 PM May 10th via web

yikes! tornado warning here! we saw some rotation!

3:41 PM May 10th via web

This is the velocity image <http://twitpic.com/1mscis>

3:37 PM May 10th via Twitpic

anticyclonic rotation in reflectivity (near bray)

<http://twitpic.com/1msbcv>

3:32 PM May 10th via Twitpic

Storm near western gar

3:27 PM May 10th via web

anti-cyclonic strong left n

3:23 PM May 10th via web

50 knots with

3:15 PM May 10th via web

3dvar is showing bridgecreek 60 kts

3:02 PM May 10th via web

<http://twitpic.com/1msbcv>

2:56 PM May 10th via web

<http://twitpic.com/1msbcv>

2:55 PM May 10th via web

(5/19/2010 7:47:16 PM) academia-brenda.j.phillips: The problem is fixed.

(5/19/2010 7:48:18 PM) academia-jerry.a.brotzge: Strong velocity couplet just to the west of Middleberg

(5/19/2010 7:48:58 PM) academia-jerry.a.brotzge: Couplet is rain-wrapped

(5/19/2010 7:54:57 PM) EM - McClain County - Ed Cravens: Storm spotter on HWY 9 reports possible rotation (rain wrapped) W of Blanchard.

(5/19/2010 8:00:00 PM) nwsbot: ----- May 20, 2010 [GMT] -----

(5/19/2010 8:00:03 PM) academia-jerry.a.brotzge: Thanks Ed - KSAO seems to be still showing some mid-level rotation

(5/19/2010 8:02:35 PM) academia-ellen.j.bass: KRSP shows couplet near Dibble

(5/19/2010 8:05:39 PM) academia-ellen.j.bass: KSAO showing Blanchard couplet

(5/19/2010 8:08:02 PM) EM - McClain County - Ed Cravens: Storm spotter at Dibble crossroads Hwys 62 and 39 indicates rotation in storm N. of Dibble, with lowering. He also says there is a storm SW of Dibble that is building and showing increasing intensity.

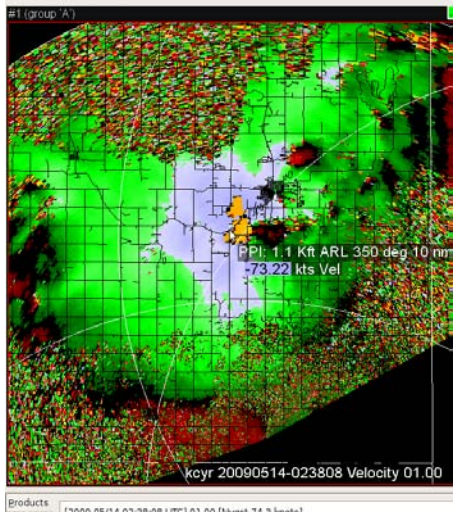
(5/19/2010 8:31:20 PM) academia-jerry.a.brotzge: Weak rotation at 1.1 km AGL SE of Bray (on the 2 deg elevation)... but nothing at the 1 deg elevation

## Two-way Communications with EMs via NWS CASACHat

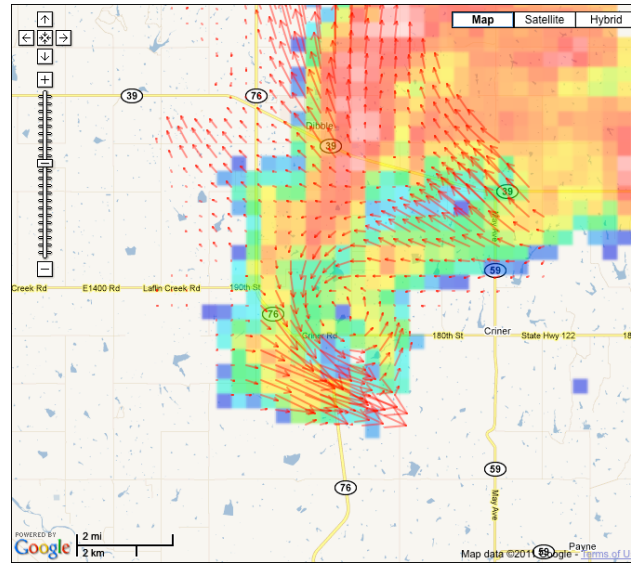


# User Friendly Information

Single Radar  
Data



True Wind  
Products



200m resolution

Text Based Product  
based on user needs

[Alert for 02/04/10 10:40:31 UTC] High Winds centered 3.2 miles W of Fletcher

[Alert for 02/04/10 10:40:31 UTC] High Winds centered 5.1 miles N of Verden

Location-based, low  
bandwidth



***Lesson #4: During an event response is ultimately local; knowledge of a specific community is local.***



# May 24 Tornado Tornado tracks CASA



516 PM CDT...A THUNDERSTORM WITH A HISTORY OF PRODUCING TORNADOES WAS LOCATED OVER NORTHEAST PARTS OF CHICKASHA...MOVING NORTHEAST AT 40 MPH. THIS STORM WILL LIKELY TRACK ALONG I-44 TOWARD BRIDGE CREEK AND NEW CASTLE.

22:18 <fire-matthew.d.eccles> Tornado still on the ground, moving NE of Chickasha

22:19 <fire-matthew.d.eccles> Tornado out of Chickasha groinging is size

22:20 <fire-matthew.d.eccles> Tornado approx 1/4 wide

22:20 <fire-matthew.d.eccles> 1/4mile wide

22:22 <em-newcastle-kuhlman> Newcastle is taking final tornado precautions

22:23 <academia-don.j.rude> KSAO continues to have a good view of the hook

Link: [http://wdssii.nssl.noaa.gov/web/wdss2/products/radar/ksao\\_rt.shtml](http://wdssii.nssl.noaa.gov/web/wdss2/products/radar/ksao_rt.shtml)

22:23 <nwsoun-WCM> Here comes a new tornado warning that will include Moore and much of northern Cleveland County.

22:23 <nwsbot> OUN issues Tornado Warning for Cleveland, Grady, McClain [OK] till 6:00 PM CDT

...\* AT 522 PM CDT...A SEVERE THUNDERSTORM WITH A LARGE TORNADO WAS MOVING NORTHEAST AT 40 MPH. THIS STORM IS TRAVELING TOWARD BRIDGE CREEK...NEW CASTLE...MOORE. THIS IS A VERY DANGEROUS TORNADO.

22:29 <academia-don.j.rude> KSAO also showing hook and rotation by Bradley and Alex cities.

22:31 <em-newcastle-kuhlman> Dime size hail falling at Newcastle EOC

22:37 <nwsoun-WCM> Tornado emergency wording will be used in upcoming statement for tornado approaching Newcastle, NW Norman, Moore and S OKC

22:39 <media-michael.haynes> spotter has large tornado looking due w from 4 s of Newcastle

22:46 <ham-kenny.e.orr> spotter report quarter size hail Santafe & sw 19<sup>th</sup> Moore 3m ago

22:46 <media-matt.walker> Newcastle getting it now

22:46 <media-matt.walker> sorry wrong window

22:53 <fire-matthew.d.eccles> Power flashes NE of Newcastle!!!

22:55 <nwsbot> OUN: Unverified/Non-NWS Report -- from Joshua Yurkiewicz (via spotternetwork.org) @ 05:53 PM CDT -- (S) Hail (2.5") -- -- Spotter is 2 miles N of Newcastle, OK (McClain county) [35.276/-97.609] -- Measured about 10 min ago because connection got lost.. (SN#8947)

22:55 <nwsbot> OUN issues Tornado Warning for Cleveland, McClain, Oklahoma [OK] till 6:45 PM CDT

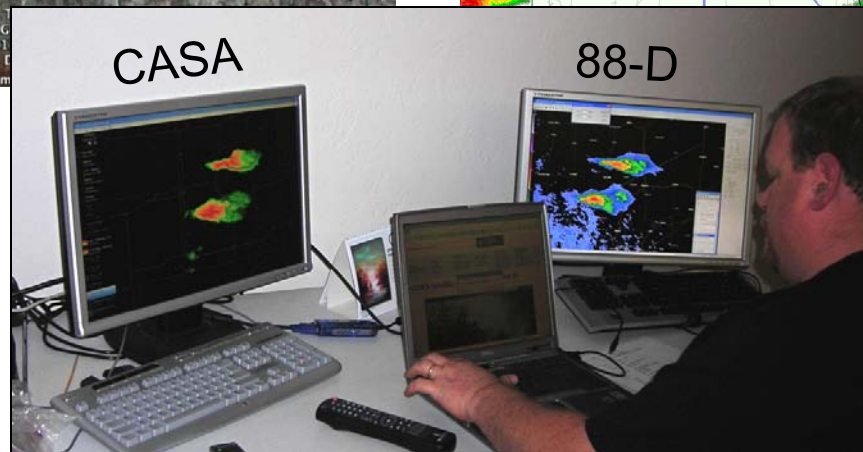
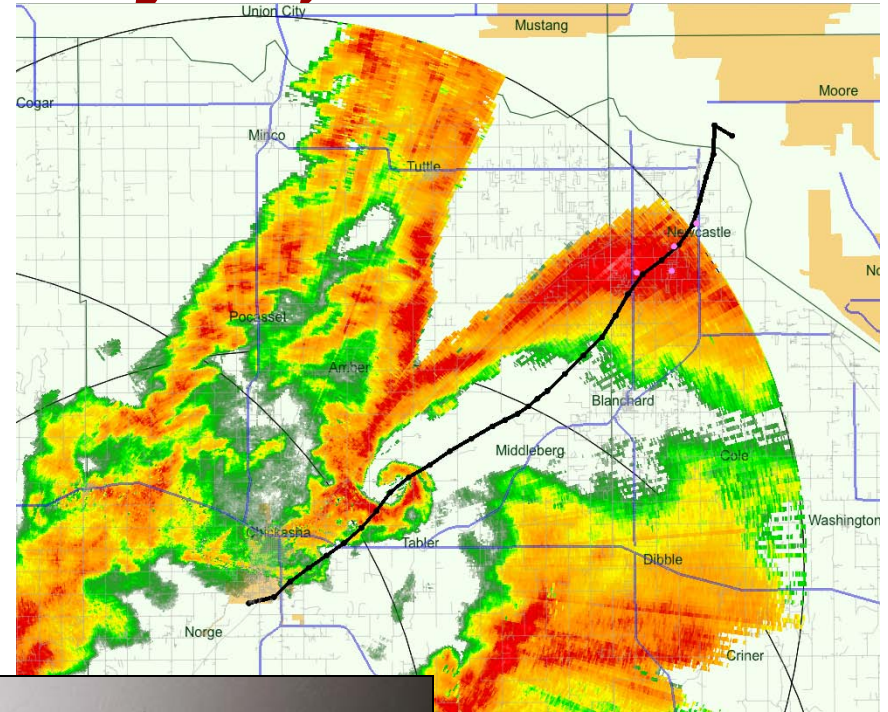
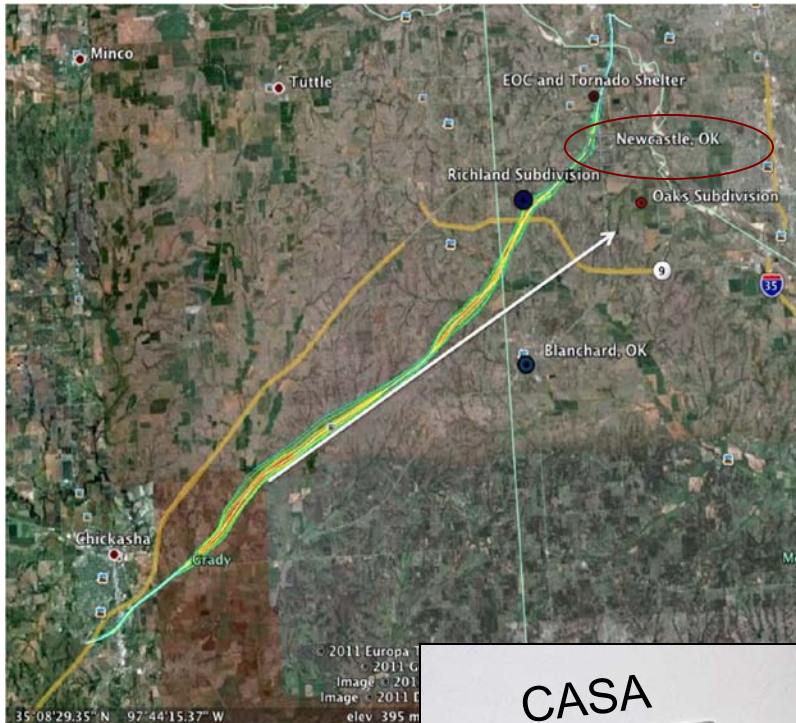
...\* AT 555 PM CDT...A LARGE... VIOLENT TORNADO WAS LOCATED 4 MILES NORTHEAST OF NEWCASTLE...MOVING NORTHEAST AT 40 MPH.

Graphiccast Tue May 24 9:32PM CDT  
Norman Forecast Office



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# *CASA data used for life saving decisions by Newcastle EM on May 24, 2011*



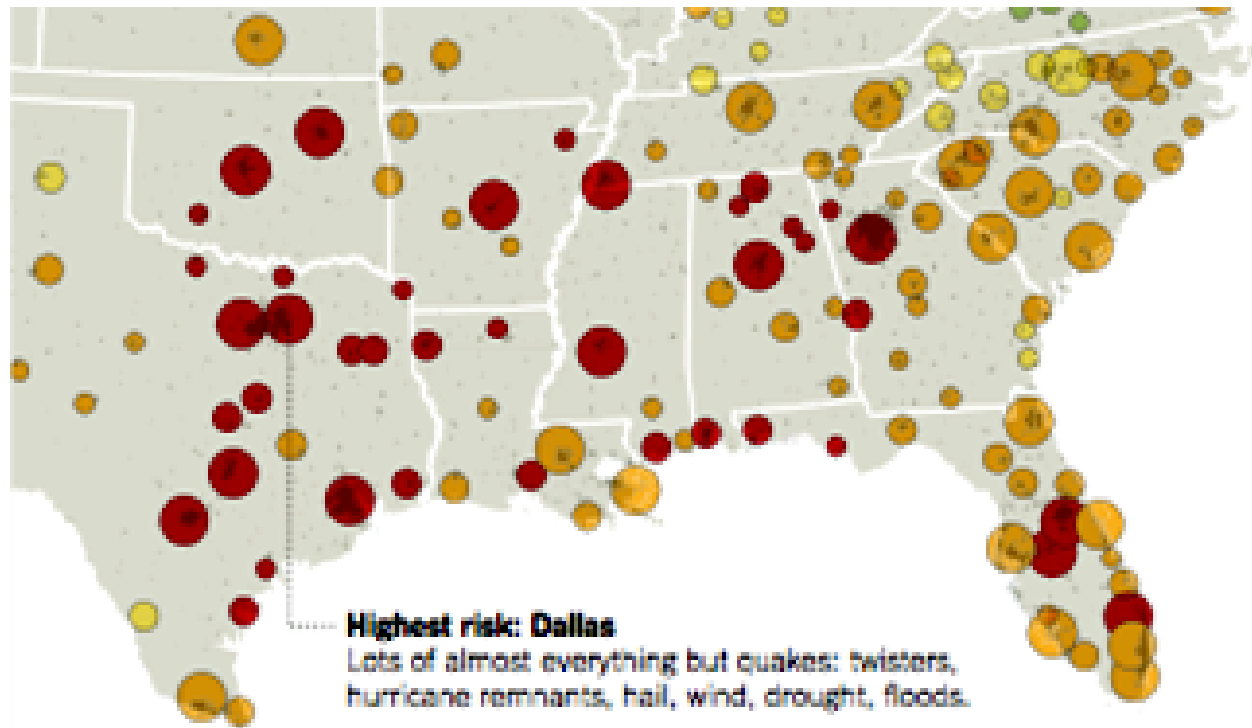
User-centered,  
multidisciplinary  
research



# *After 5 years in Oklahoma, we're moving to Texas!*



Source: NY Times “Some Places are Riskier than others”



**Metro areas with lowest risk:**

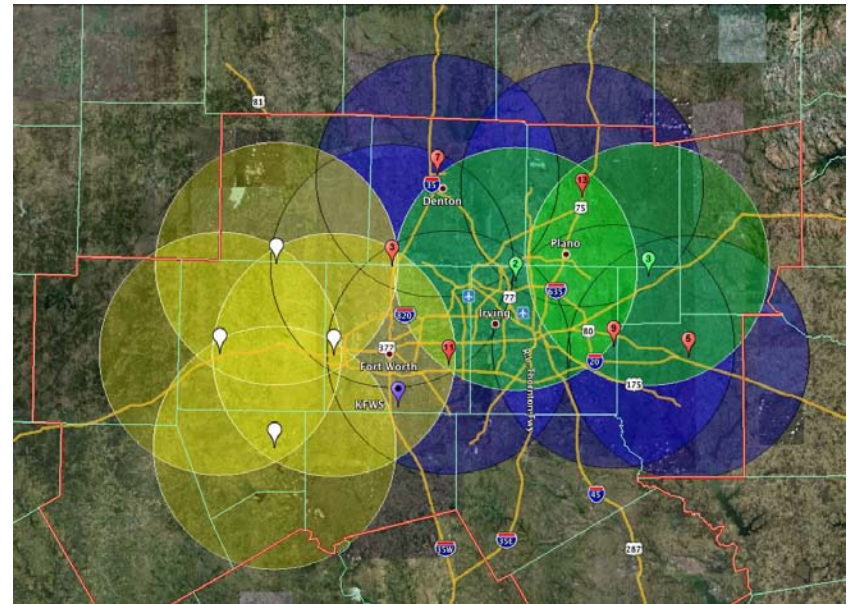
1. Corvallis, Ore.
2. Mt. Vernon-Anacortes, Wash.
3. Bellingham, Wash.
4. Wenatchee, Wash.
5. Grand Junction, Colo.
6. Spokane, Wash.
7. Salem, Ore.
8. Seattle

**Highest risk:**

1. Dallas-Plano-Irving, Tex.
2. Jonesboro, Ark.
3. Corpus Christi, Tex.
4. Houston
5. Beaumont-Port Arthur, Tex.
6. Shreveport, La.
7. Austin, Tex.
8. Birmingham, Ala.

# *Multi-sector Partnership to bring CASA to the Metroplex*

- ❑ North Central Texas Council of Gov'ts:EP
- ❑ Area Emergency Managers
- ❑ University of Texas, Arlington
- ❑ University of North Texas
- ❑ Addison airport
- ❑ National Weather Service



Phase I – 4 radars for Spring 2012

Phase II – 4 additional

Phase III – System Expansion



# ***QUESTIONS***

