Engineering Research Center for
Collaborative Adaptive Sensing of the Atmosphere

Lessons Learned: Forecaster and Emergency Manager Communications Using Social Media

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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

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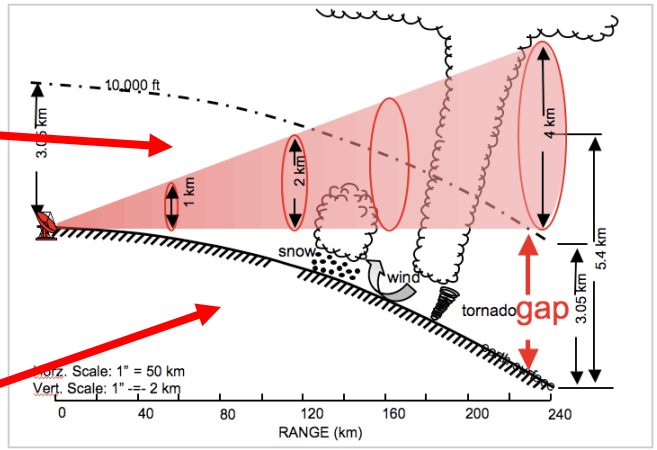
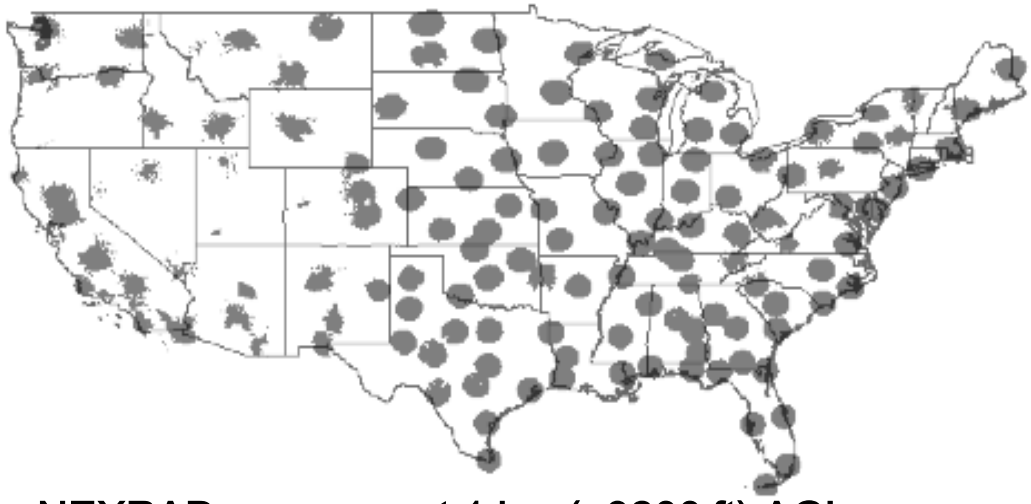
What are the gaps in the current radar system?

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

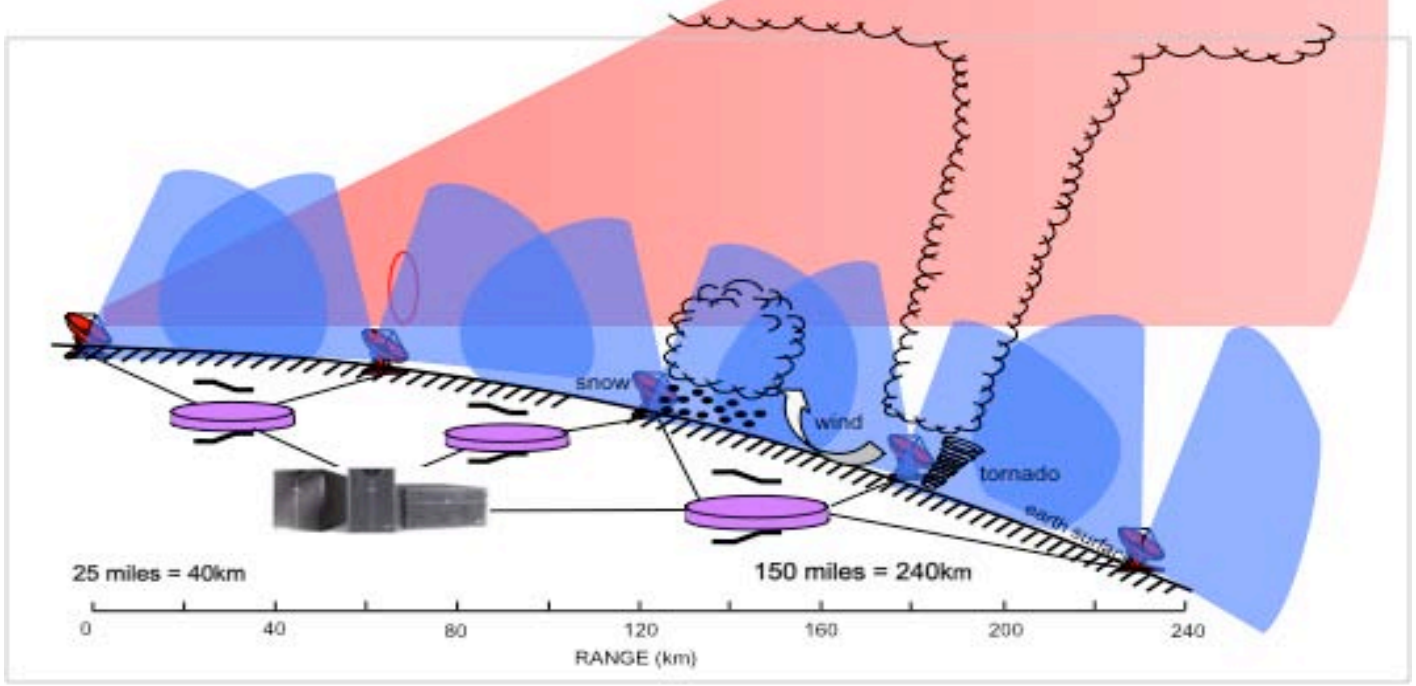




NEXRAD coverage at 1 km (~3200 ft) AGL.

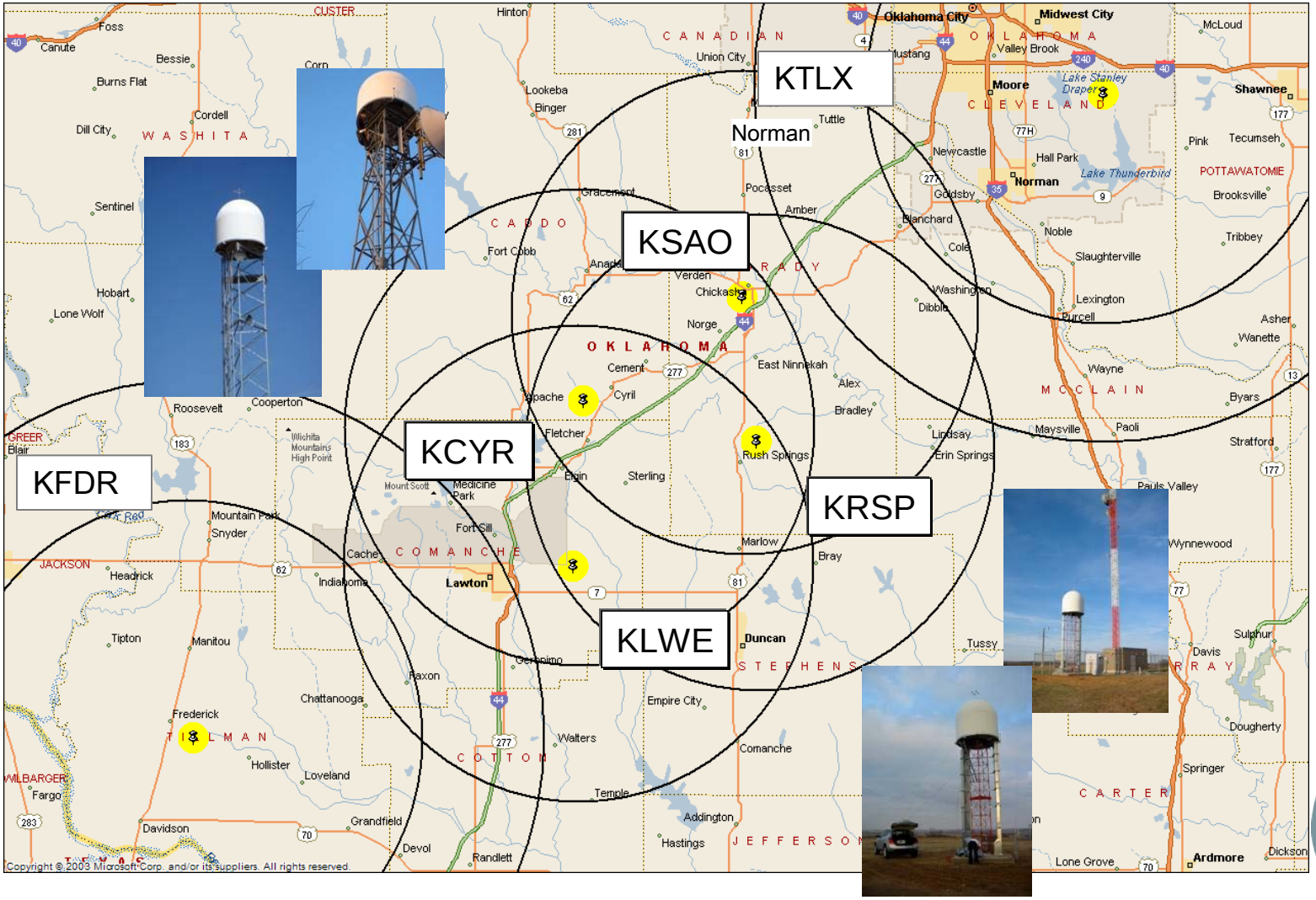
- Low level sensing gap
- Granularity gap
- Update rate gap
- Observation capability gap: wind direction/rain

CASA's Solution: X-band radar networks



Adaptive Radar control

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



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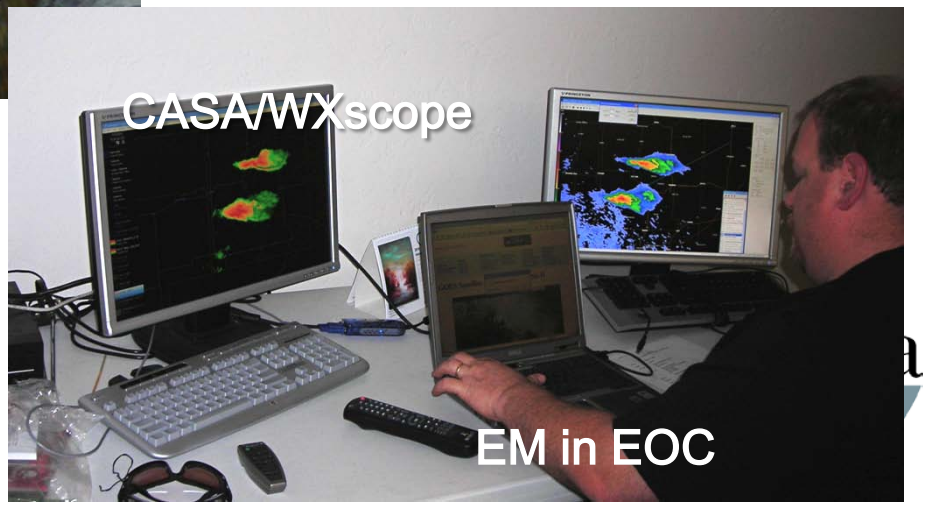
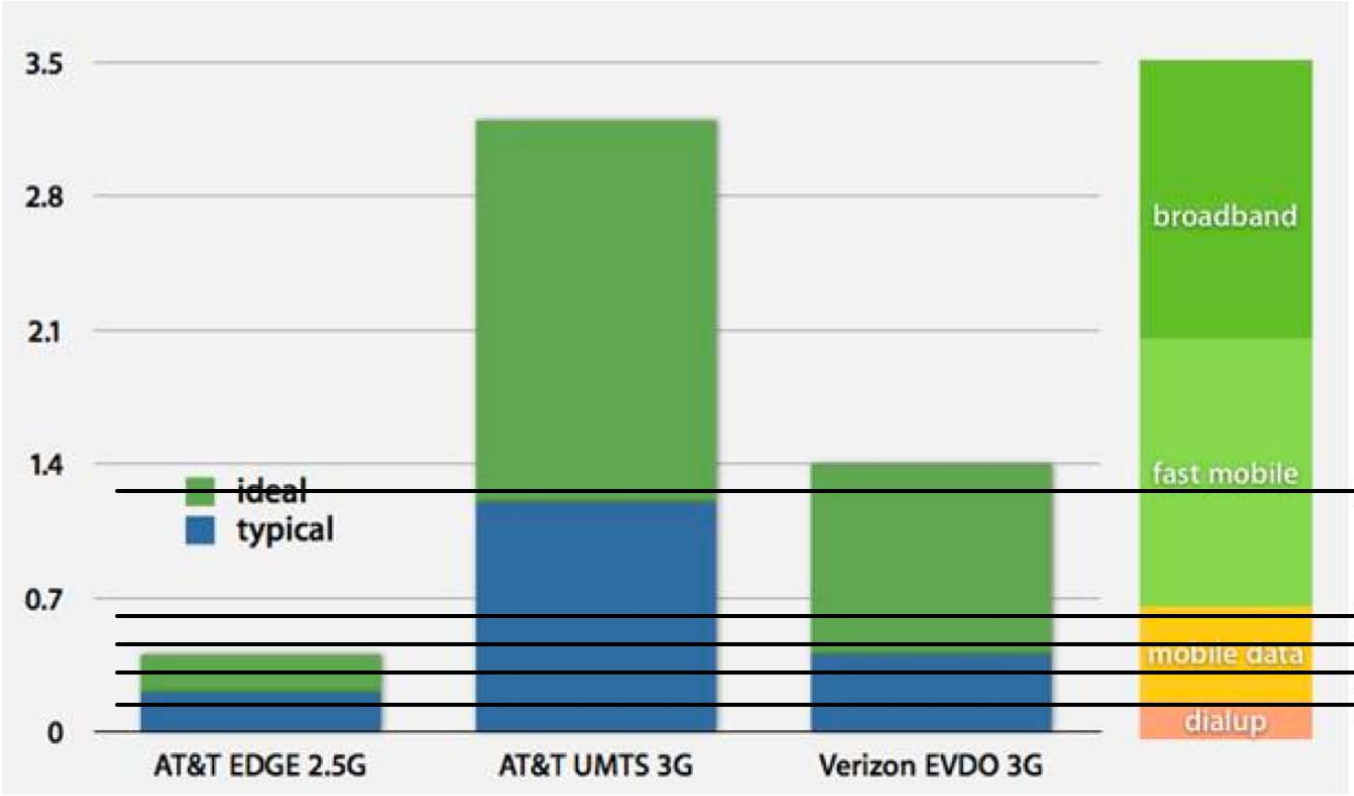
Forecaster Emergency Manager Communication Experiment: NOAA Hazardous Weather Test Bed and Beyond



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

Results of Bandwidth Test



Speed Required by Number of Products

8 products (1.354 Mbps)

4 products (0.677 Mbps)
3 products (0.508Mbps)
2 products (0.339 Mbps)
1 product (0.169 Mbps)

Radar Usage and Training

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

RADAR ACCESS

	OFFICE/EOC	HOME	MOBILE
% 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

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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.

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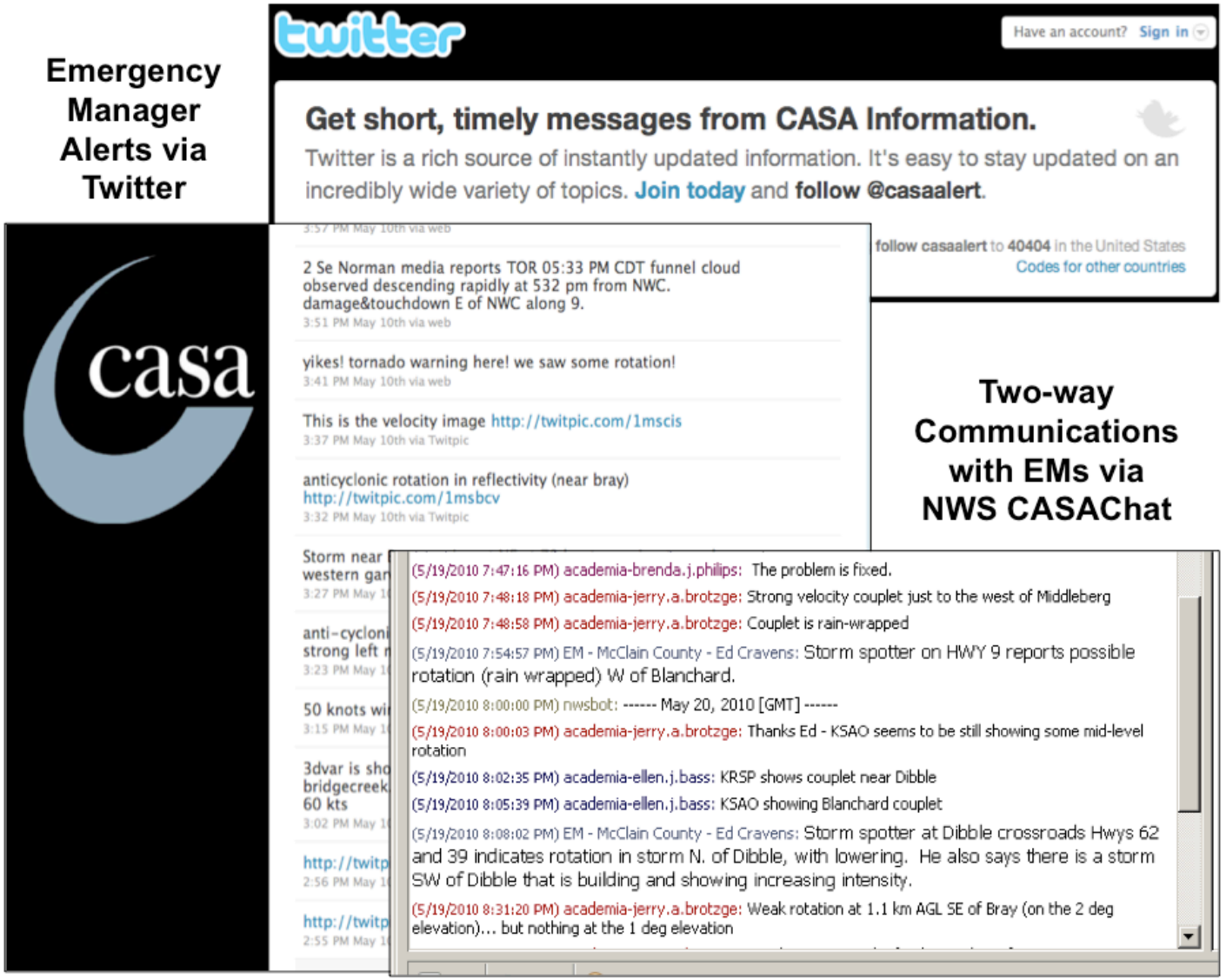
Lesson #3: A diversity of communication mechanisms are needed with consistent messages, so EMs can pick and choose.

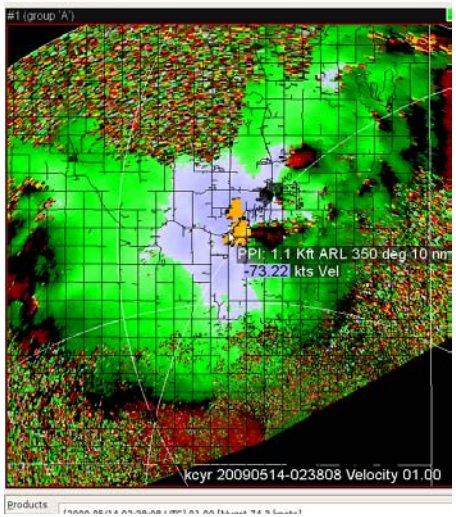
Emergency Manager Alerts via Twitter



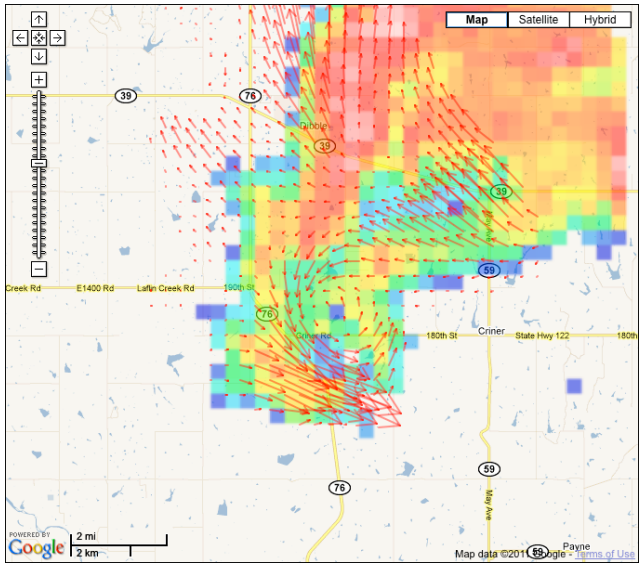
Two-way Communications with EMs via NWS CASAChat

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

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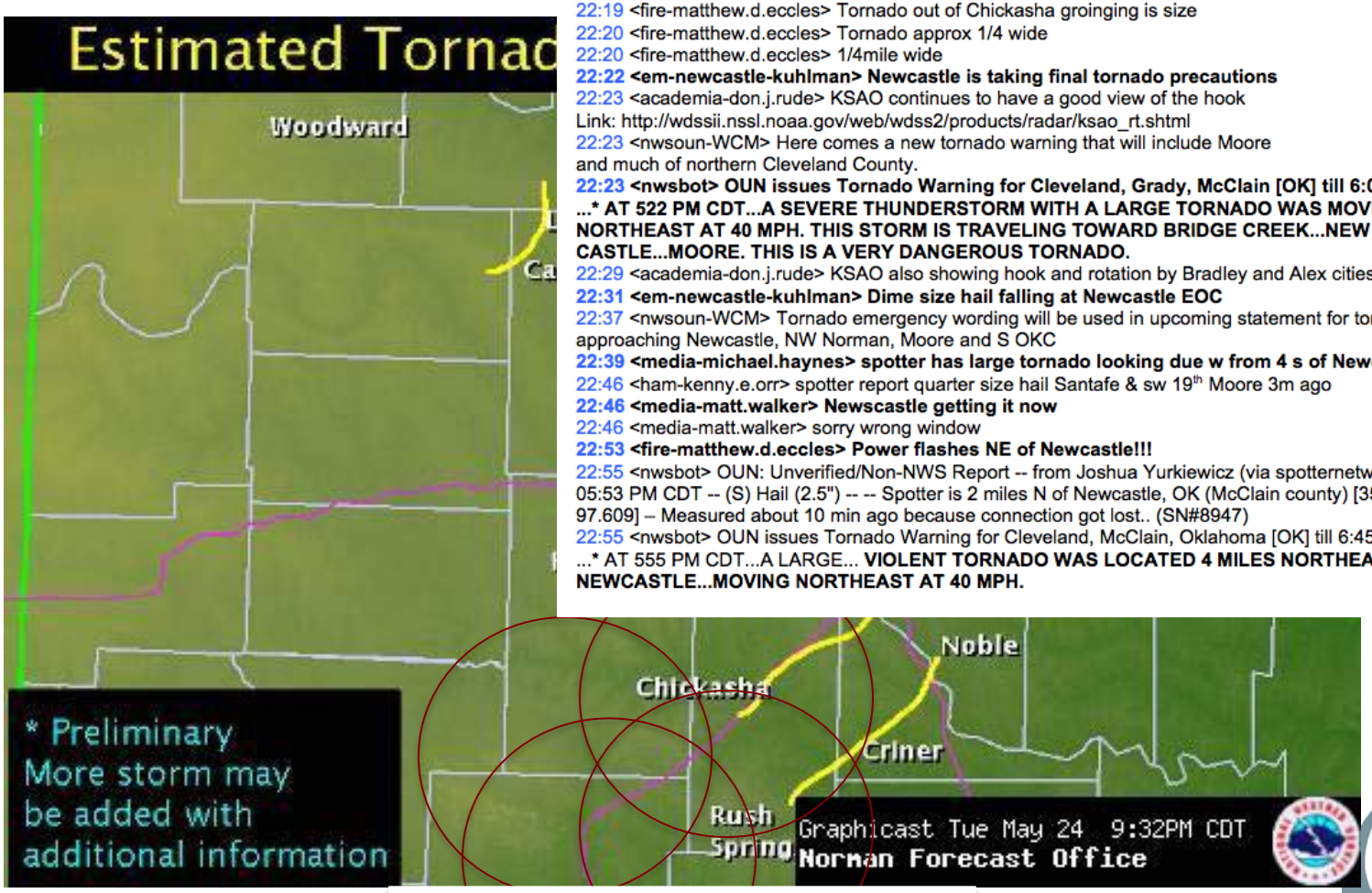
Lesson #4: During an event response is ultimately local; knowledge of a specific community is local.

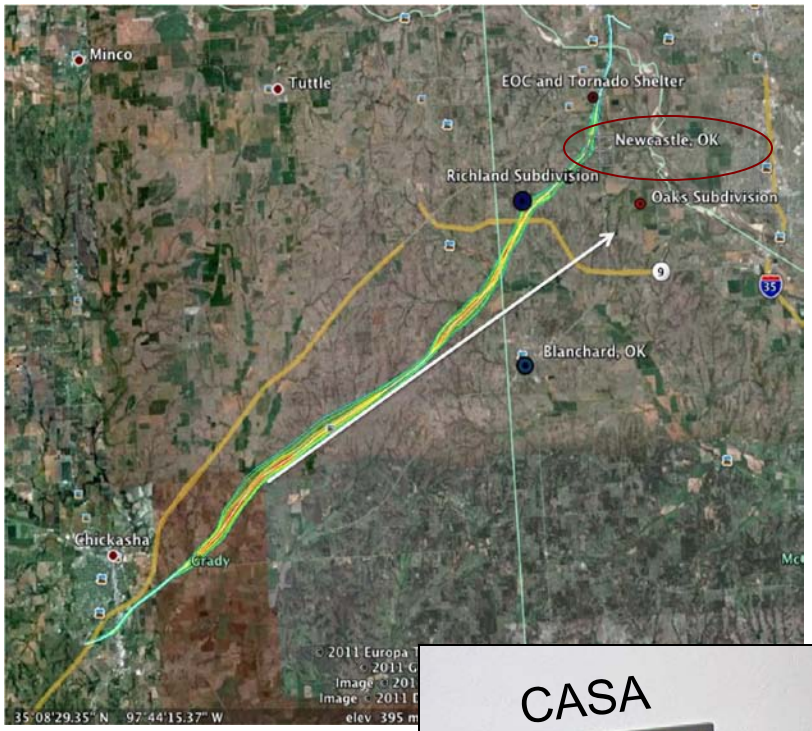
May 24 Tornado Tornado tracks CASA

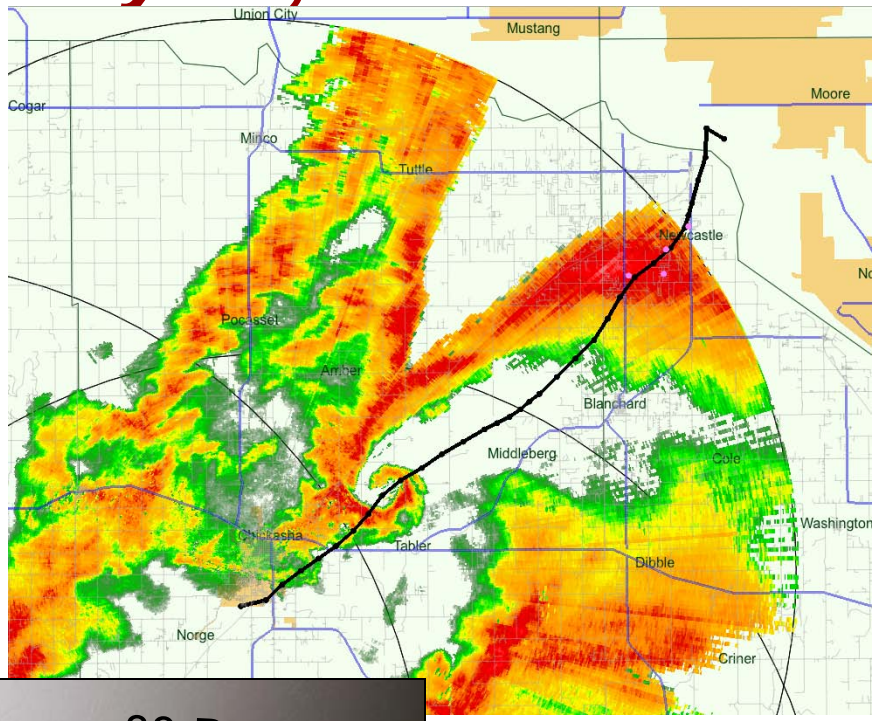


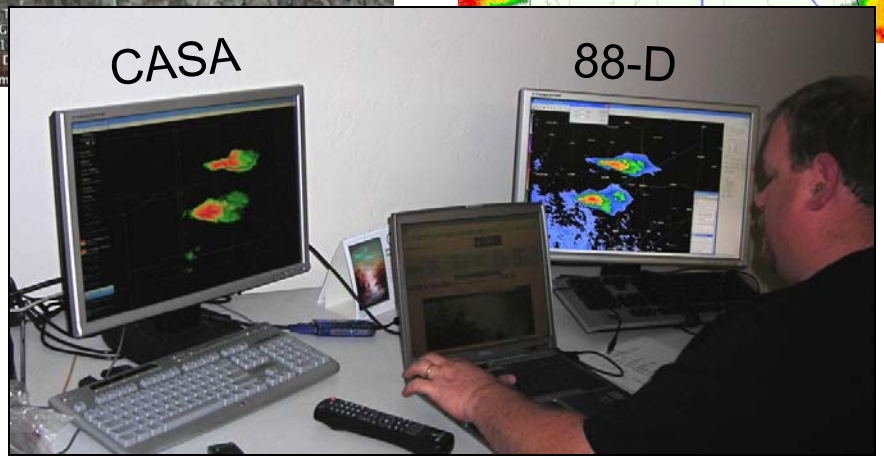
516 PM CDT...A THUNDERSTORM WITH A HISTORY OF PRODUCING TORNADOES WAS LOCATED OVER NORTHEAST PARTS OF CHICKASHA...MOVING NORTHEAST AT 40 MPH. THIS STORM WILL LIKELY TRACK ALONG I-44 TOWARD BRIDGE CREEK AND NEW CASTLE.

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
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 19th Moore 3m ago
22:46 <media-matt.walker> Newscastle 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.**

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







User-centered, multidisciplinary research

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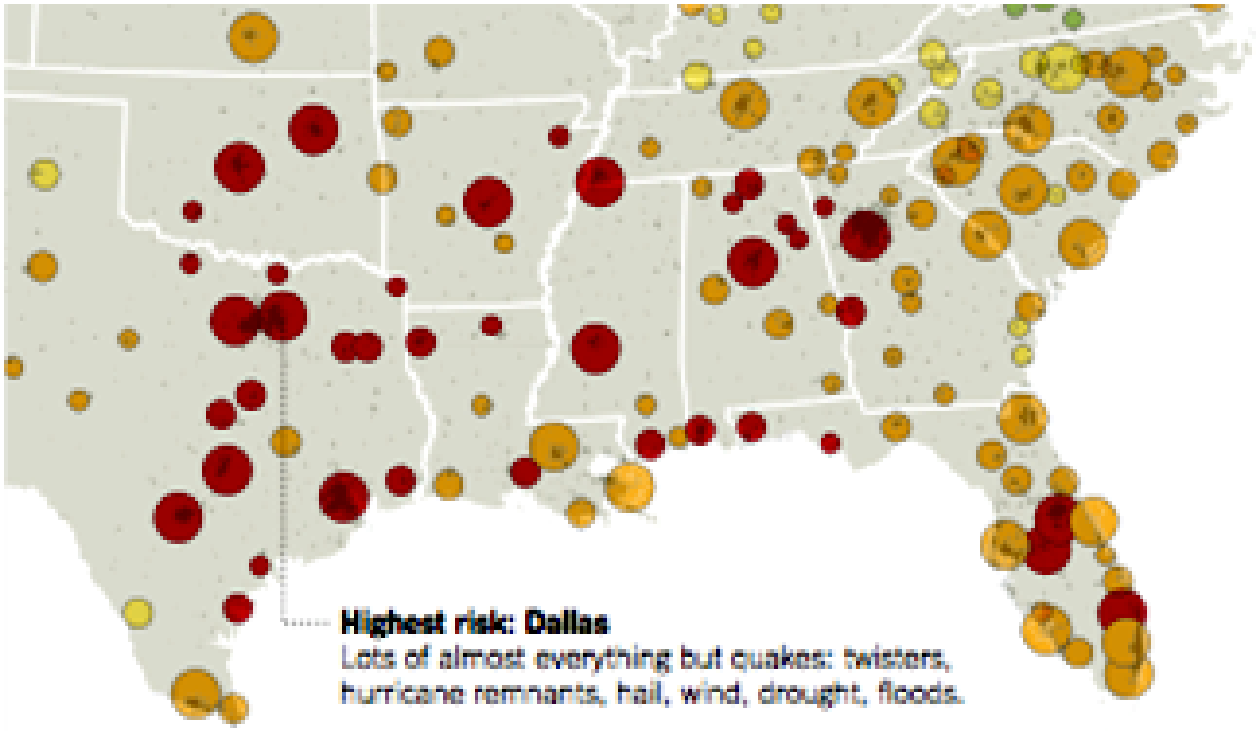
After 5 years in Oklahoma, we're moving to Texas!

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



Metro areas with lowest risk:

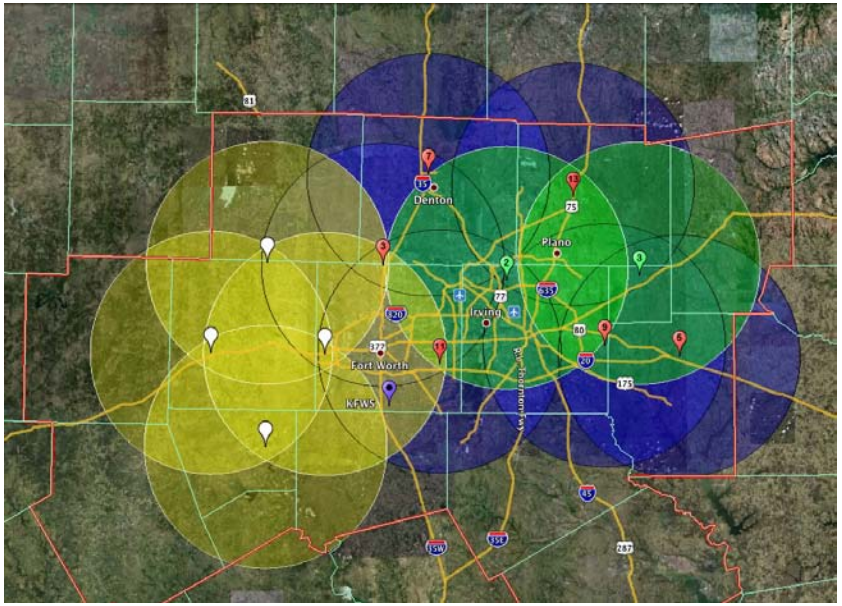
1. Corvallis, Ore.
2. Mt. Vernon-Anacortes, Wash.
3. Bellingham, Wash.
4. Wenatchee, Wash.
5. Grand Junction, Colo.
6. Spokane, Wash.
7. Salem, Ore.
8. Seattle

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

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QUESTIONS