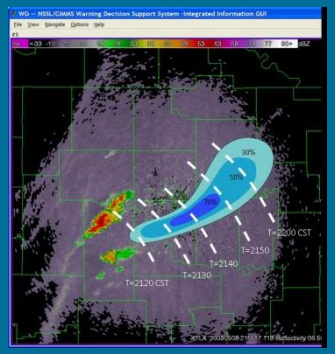
Overview of the NSSL 2012 Experimental Warning Program

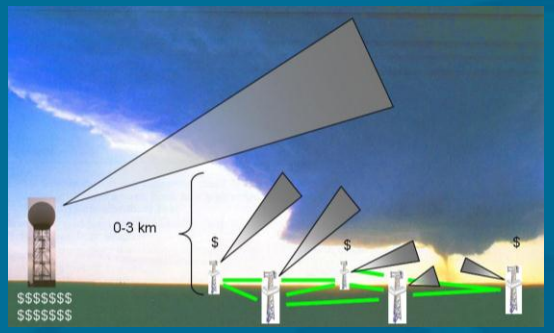
EWP2012

Greg Stumpf, Travis Smith

Hazardous Weather Testbed

Norman, OK

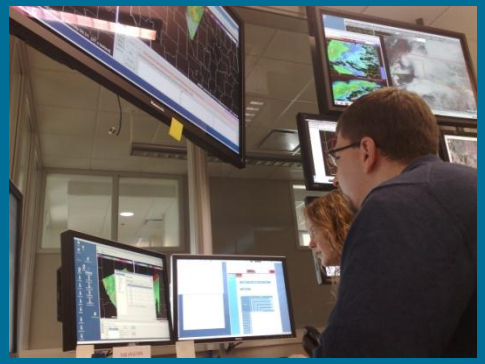




The NOAA Hazardous Weather Testbed

Collaboration

FORECASTERS
RESEARCHERS
DEVELOPERS
TRAINERS
USERS



Evaluation

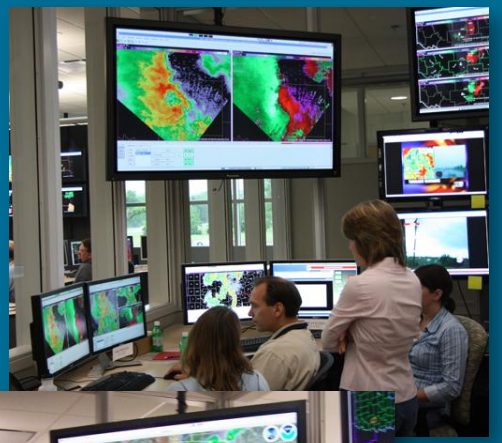
OBSERVING PLATFORMS
NUMERICAL MODELS
ALGORITHMS
PRODUCTS
SERVICES

HWT Motivation

Improve understanding of convective weather hazards

More accurate and timely forecasts and warning services

To protect life, body, well-being, productivity, and property.



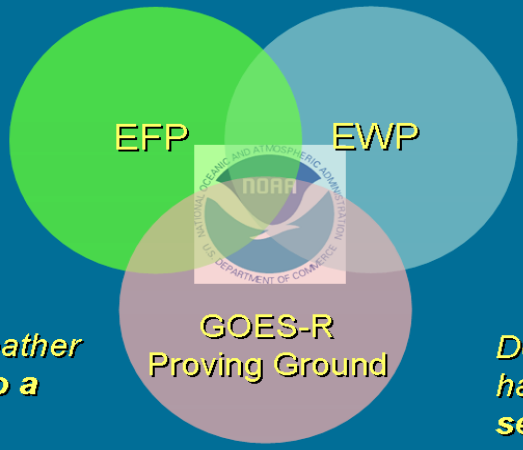
What is the HWT?

Not just a facility…

…but an organization:

Experimental Forecast Program

*Prediction of hazardous weather events from **a few hours to a week in advance***



Experimental Warning Program

*Detection and prediction of hazardous weather events **up to several hours in advance***

HWT Experimental Warning Program (EWP)

- Mission: Improve prediction of severe convective weather at the "warning scale" (0-2 hours).
- Norman has a large community of researchers, operational meteorologists, students, industry.
- But, we serve all National Weather Service WFOs nationwide.

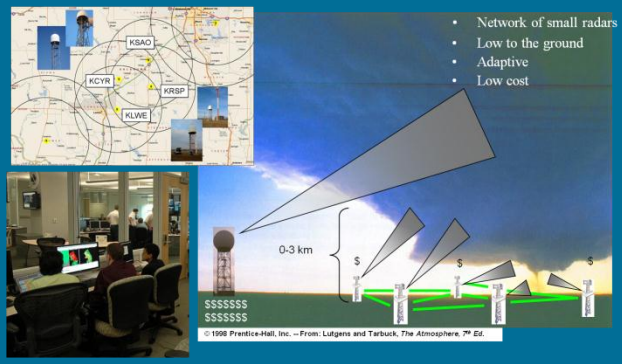
What is tested?

- New sensors:
  - Radar, satellite, lightning, etc.
- New Applications/Algorithms:
  - Multi-sensor integration (MRMS), GOES-R proxies, lightning jump, etc.
- New Methodologies:
  - Best practices, new concepts, products, services
  - Social Science integration

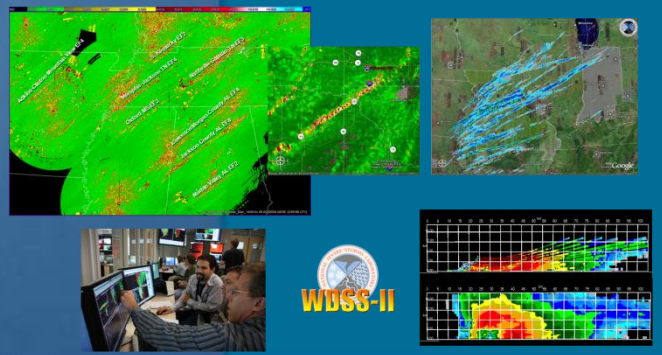
Former EWP Experiments

2007 - 2011

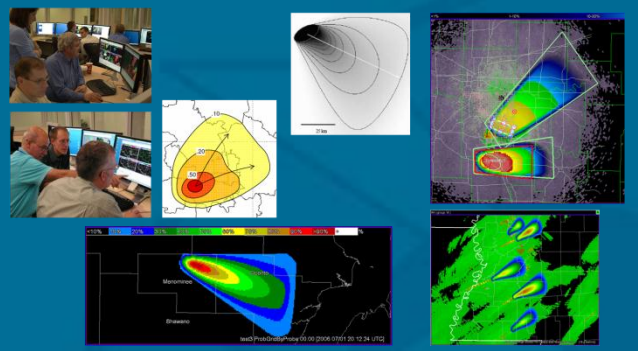
Collaborative Adaptive Sensing of the Atmosphere (CASA)



WDSSII Multiple-Radar Multiple-Sensor Applications



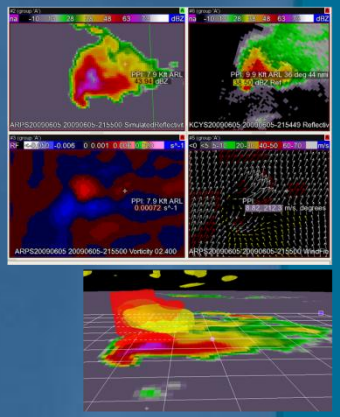
Probabilistic Hazard Information (PHI)

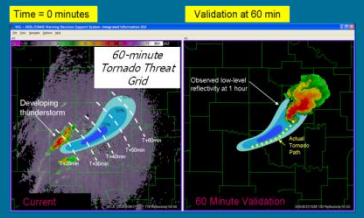


Current EWP Experiments

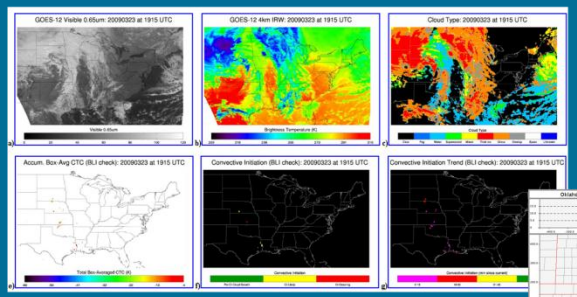
2012

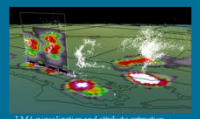
"Warn On Forecast" 3DVAR Radar Assimilation

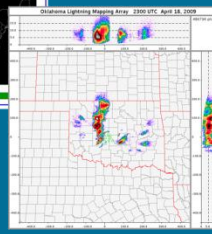




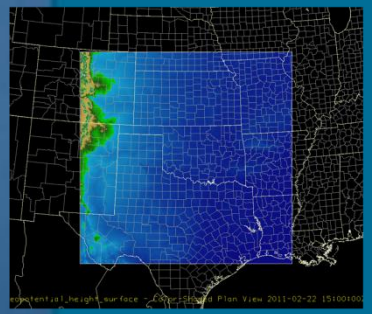
GOES-R / PGLM

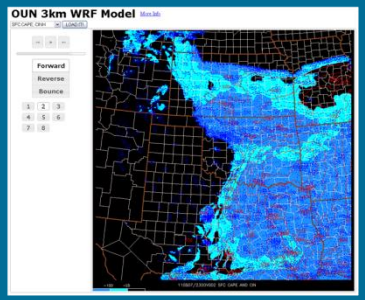






OUN WRF

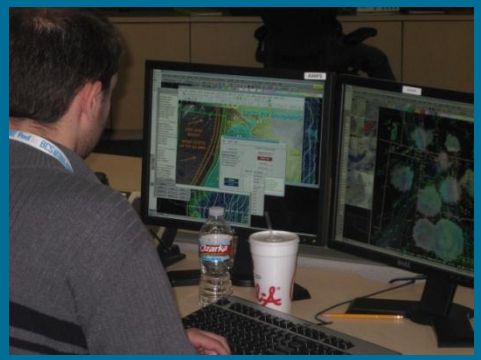




Phased Array Radar Innovative Sensing Experiment (PARISE)

EWP2012 Timeline

- Spring Experiment (May, Jun):
  - GOES-R Satellite
  - OUN-WRF Local high-resolution modeling
  - Warn-On-Forecast (WOF) real-time data assimilation
  - 4-6 forecasters per week
- Summer Experiment (Jun, Jul, Aug):
  - Phased Array Radar Innovative Sensing Experiment (PARISE)
  - 2 forecasters per week
  - Independent of spring experiment
  - Project still under development
    - Will have significant component devoted to forecaster decision making and cognitive task analysis



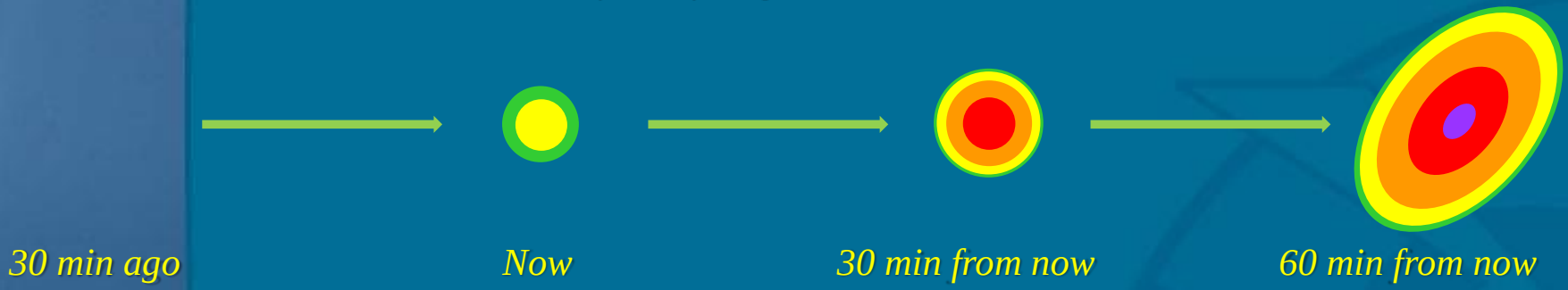
Spring Experiment

- 5 weeks (7 May, 14 May, 21 May, 4 June, 11 June)
- 4-6 forecasters per week
- Will be evaluating all components simultaneously
- Using AWIPS2 for the first time
- Get forecasters to think about how products are used in nowcast and warning decision making.
- Not necessarily trying to “compete” with warning issuance.

"Warn On Forecast" (WOF)

- Today: Warn based on detection and extrapolation

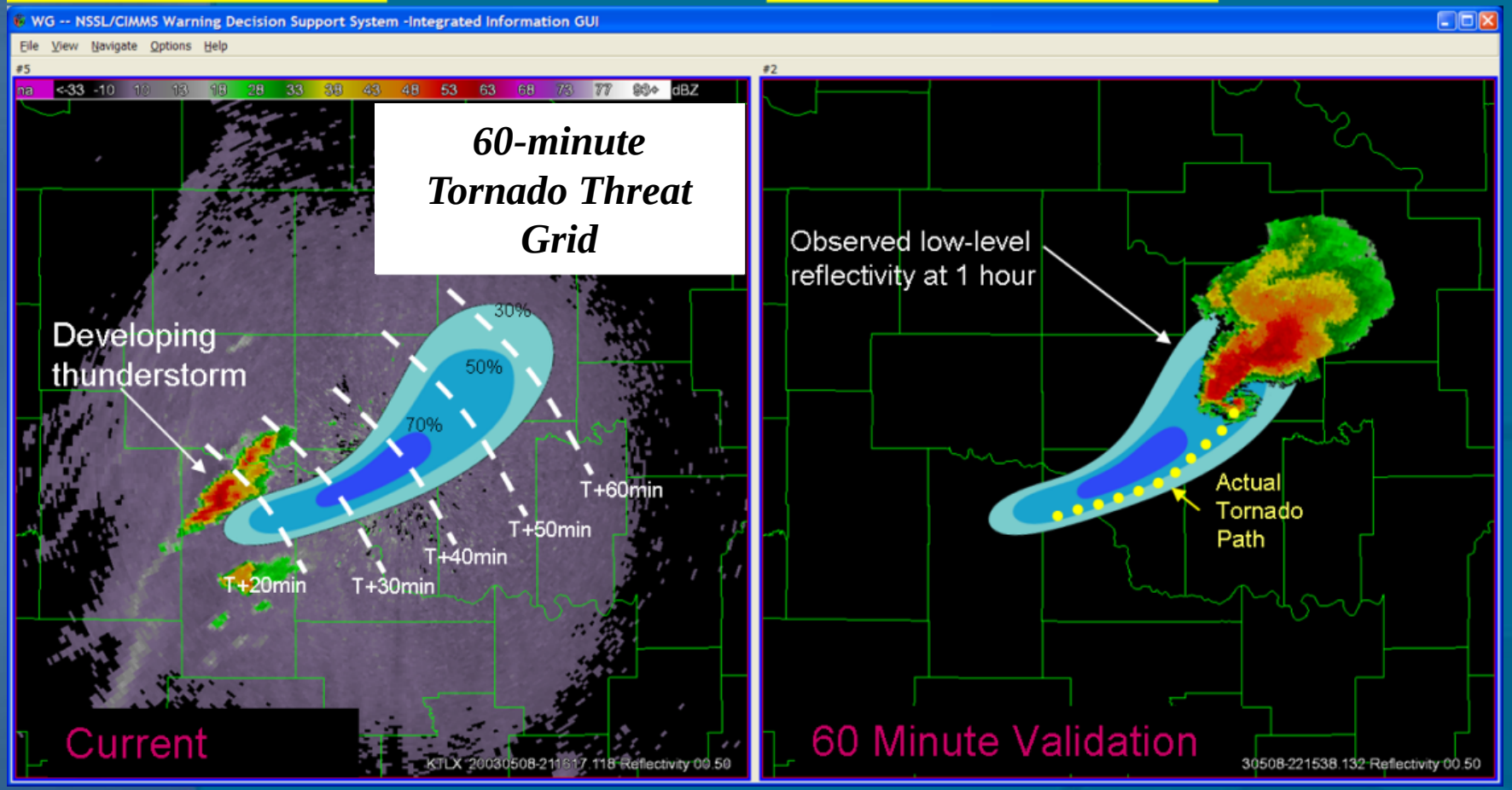
- Tomorrow: Warn aided by very high-resolution storm-scale models



"Warn On Forecast" (WOF)

Time = 0 minutes

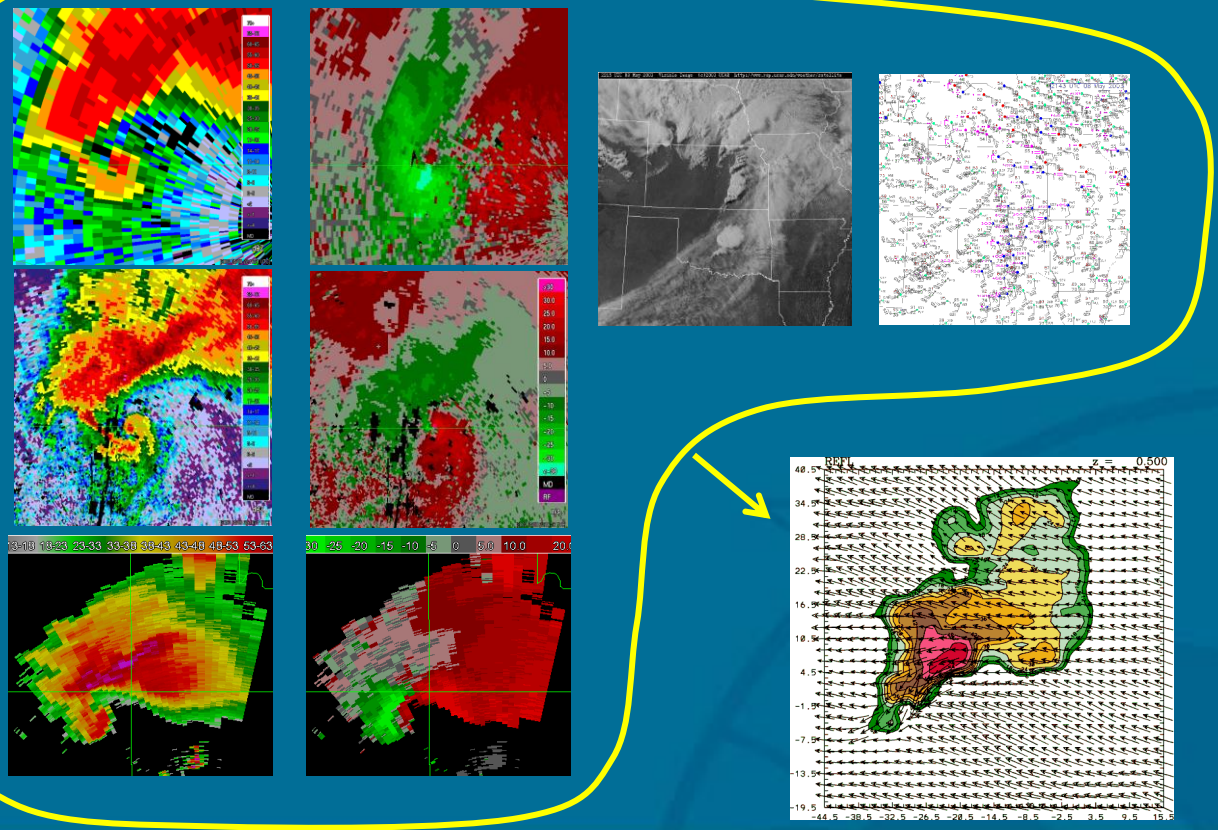
Validation at 60 min



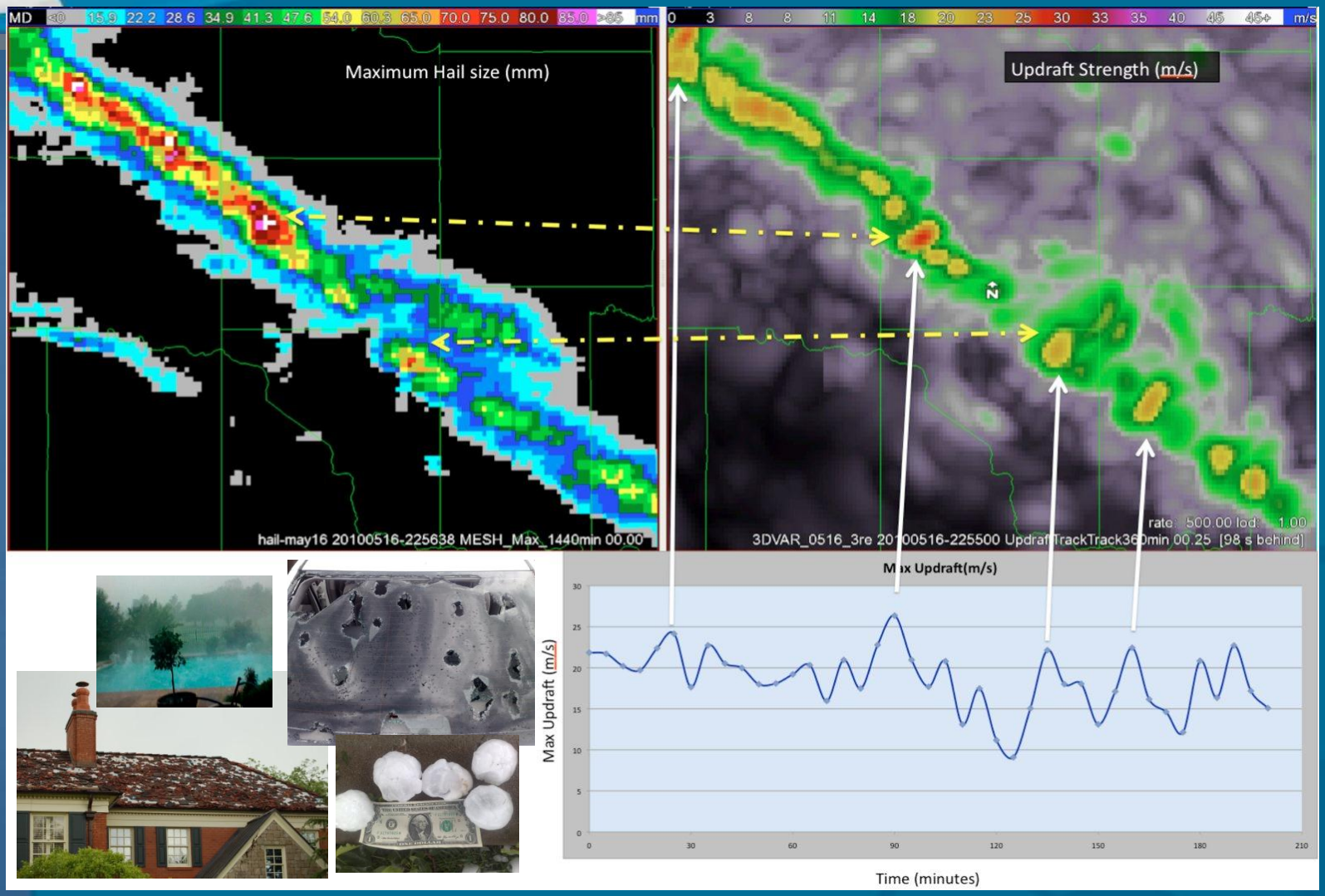
Real-time 3D data assimilation (3DVAR)

- The ultimate multi-sensor data integration – data assimilation
  - Combine multi-sensor data with numerical models, in a physically-realistic manner.

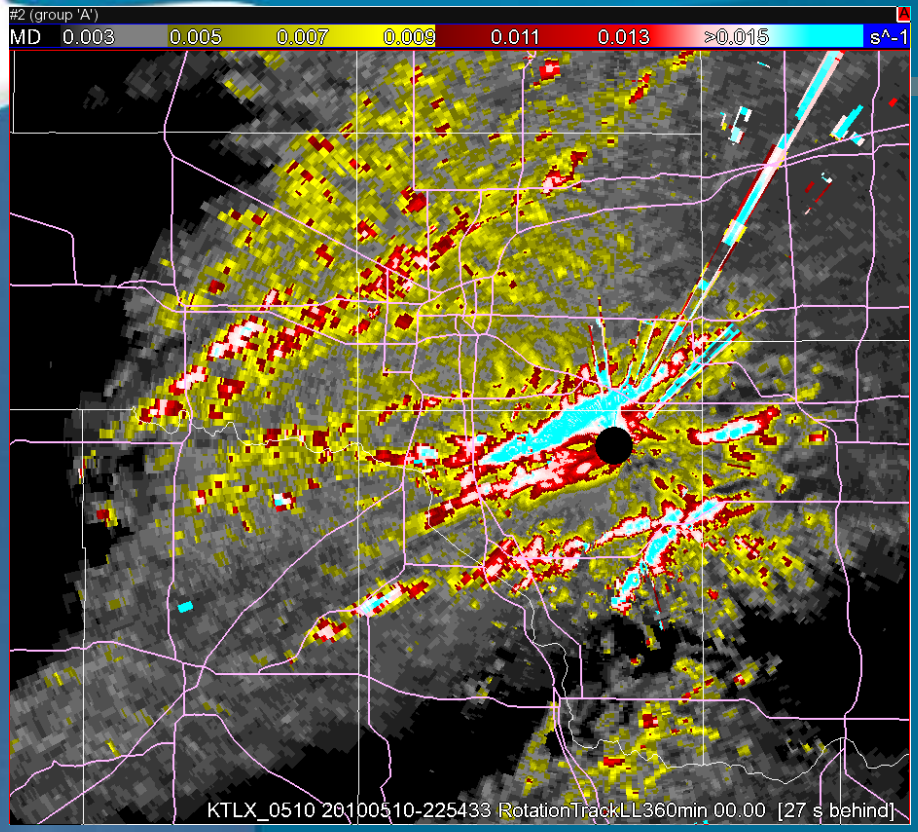
- New types of products:
  - 3D wind fields
  - Simulated Reflectivity
  - Updraft strength
  - Vorticity

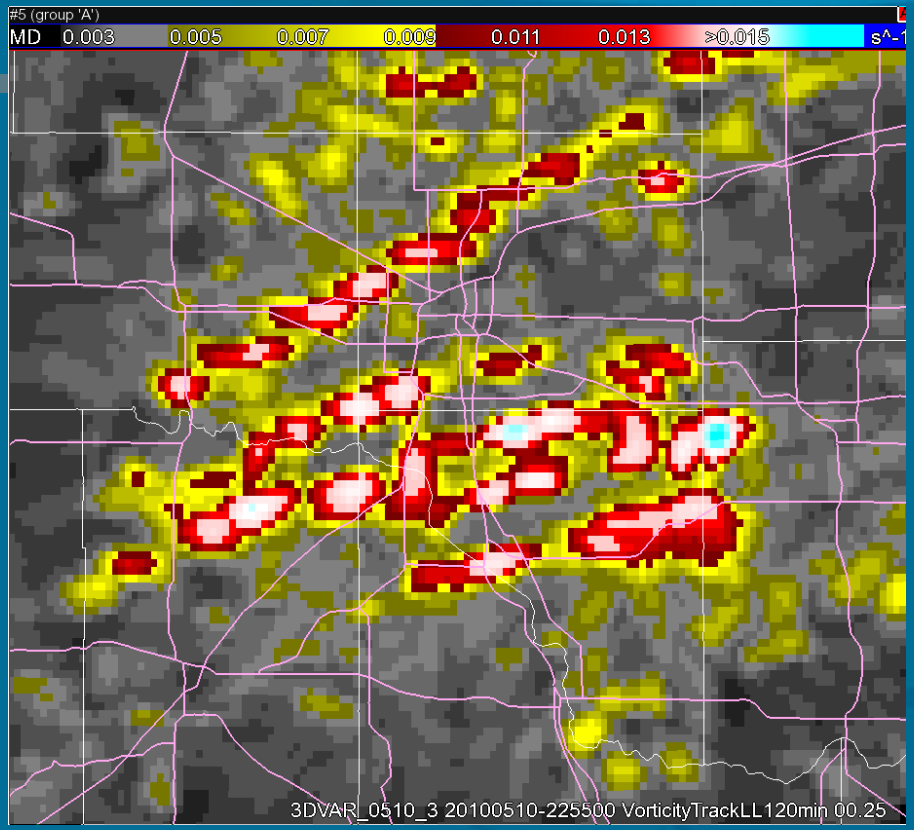


May 16, 2010 Hail Storm / OKC: Hail Size vs. Updraft Intensity



May 10, 2010 Oklahoma Tornadoes: Radar Shear vs. Vorticity



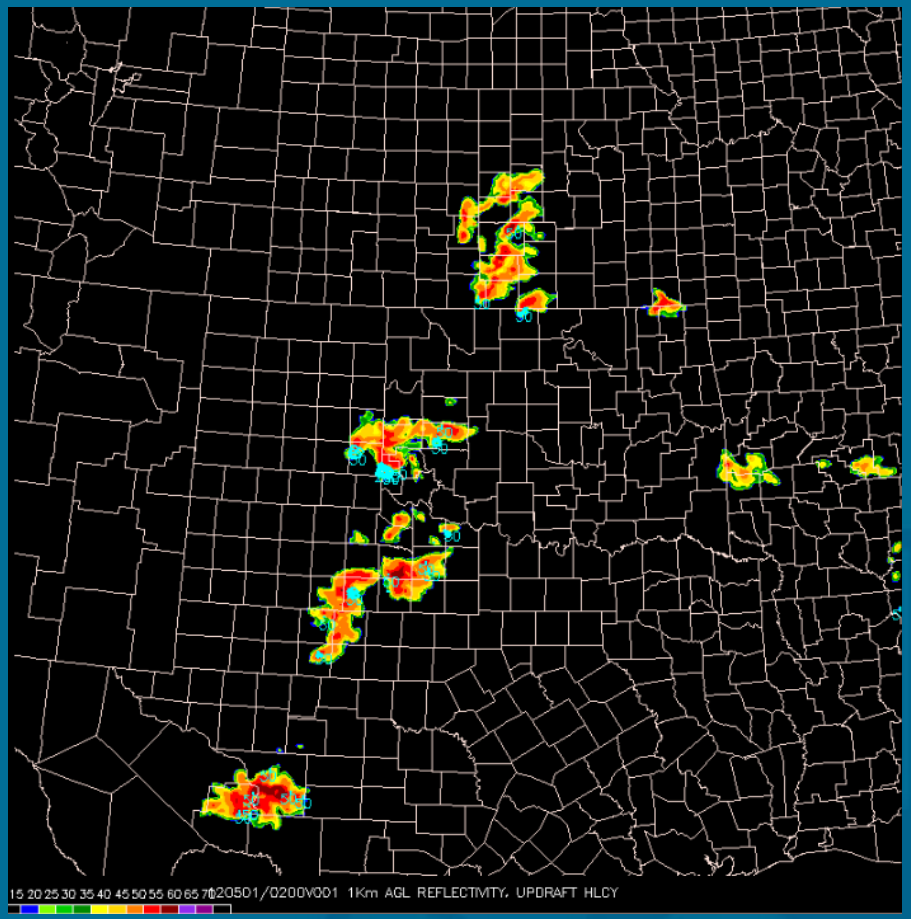


KTLX azimuthal shear track
0-3 km MSL

3DVAR assimilation
vorticity track
0-3 km MSL

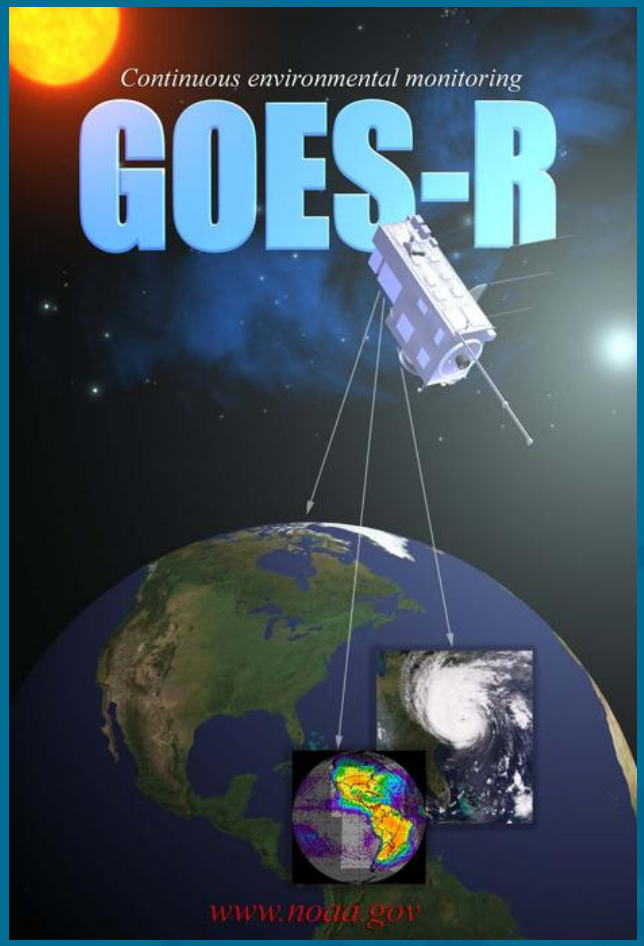
OUN WRF

- Specs:
  - 3-km grid
  - Hourly cycle
  - 15 fcst intervals out to 8 h
- Products:
  - Composite Reflectivity
  - 1-km Reflectivity
  - Instantaneous Updraft Helicity
  - Maximum Hourly Updraft Helicity
  - Maximum Hourly Column Hail
  - 10-m Wind Speed

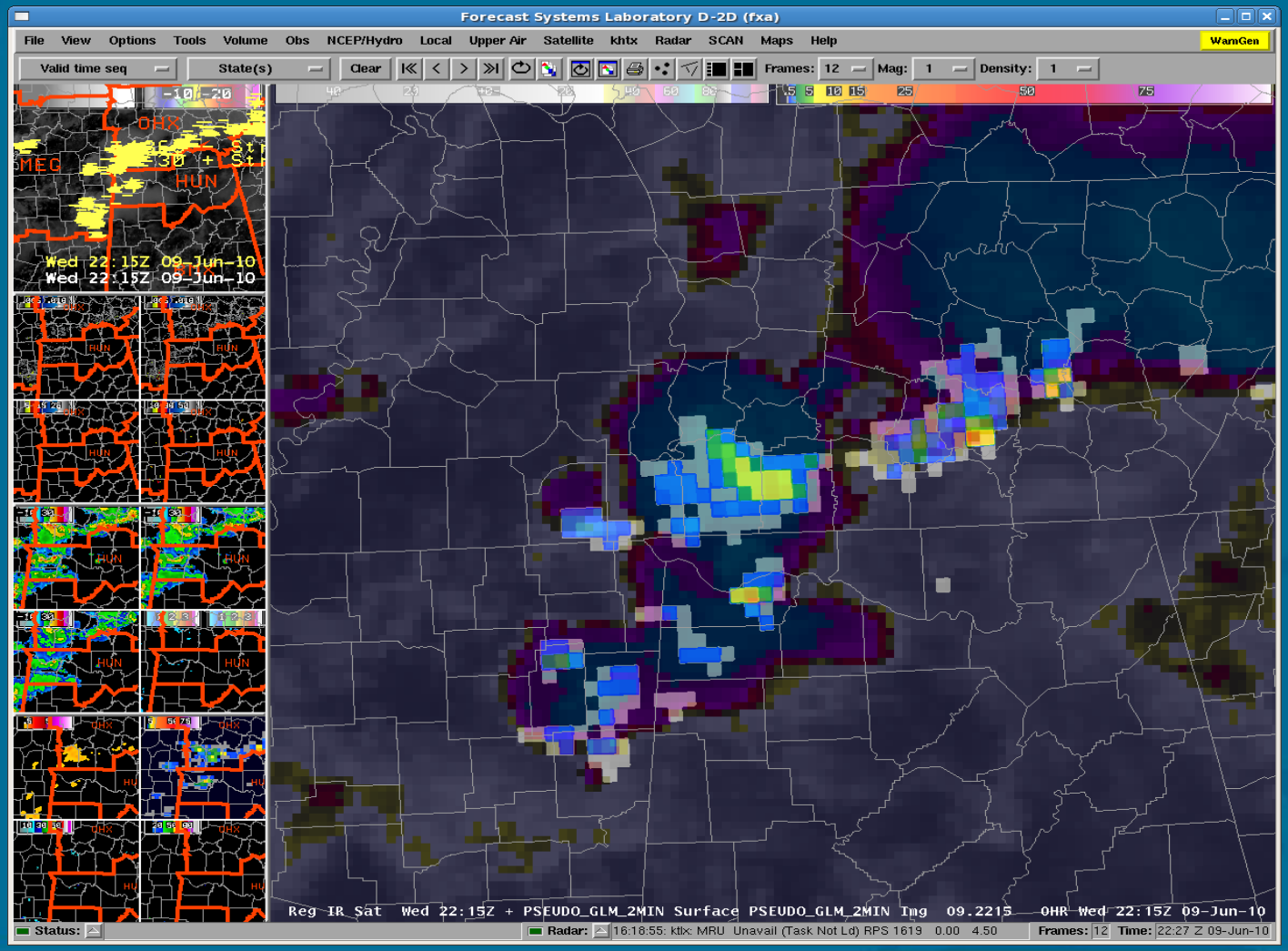


Geostationary Operational Environmental Satellite – R series

- To determine readiness of GOES-R "baseline" and "option-2" products prior to launch of the satellite
  - Develop training for users
  - Prepare for display within AWIPS2

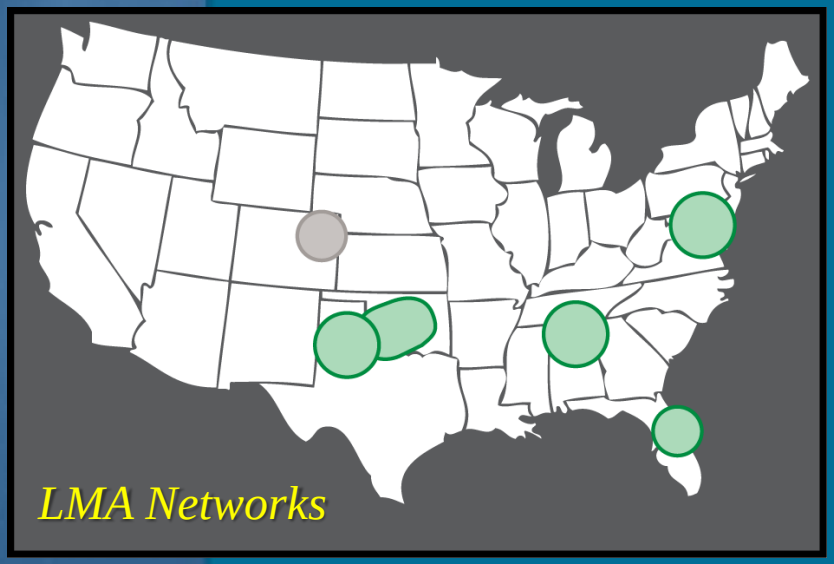


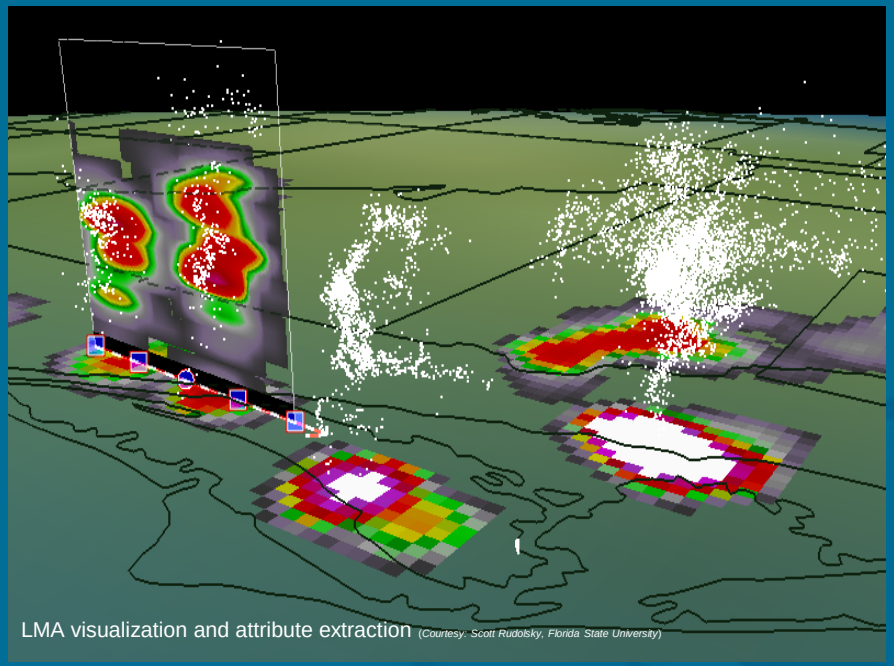
Pseudo-Geostationary Lightning Mapper (PGLM)



3D Lightning Mapping Array (LMA)

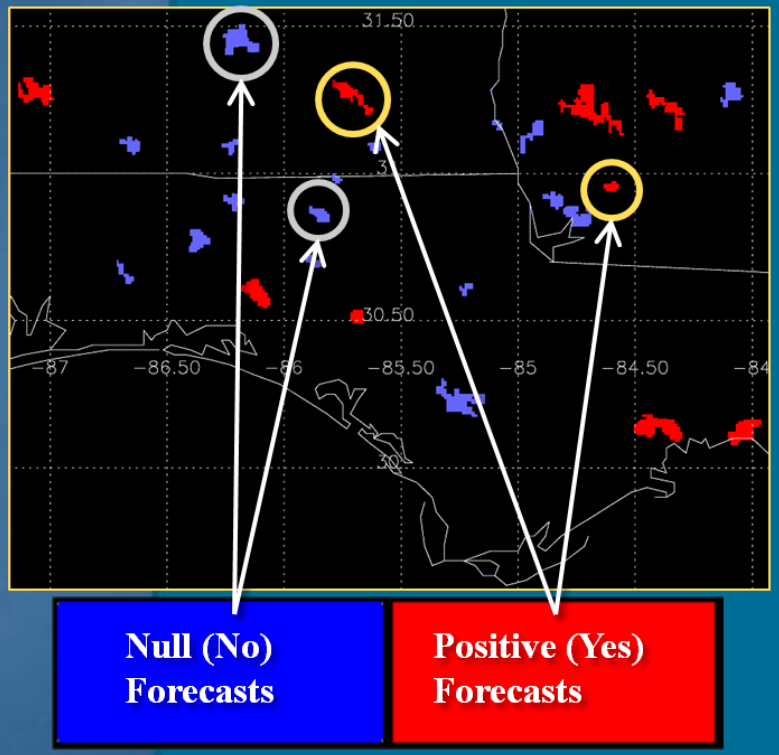
- Cloud-to-ground + intra-cloud = **total lightning**
- Used to create PGLM proxy



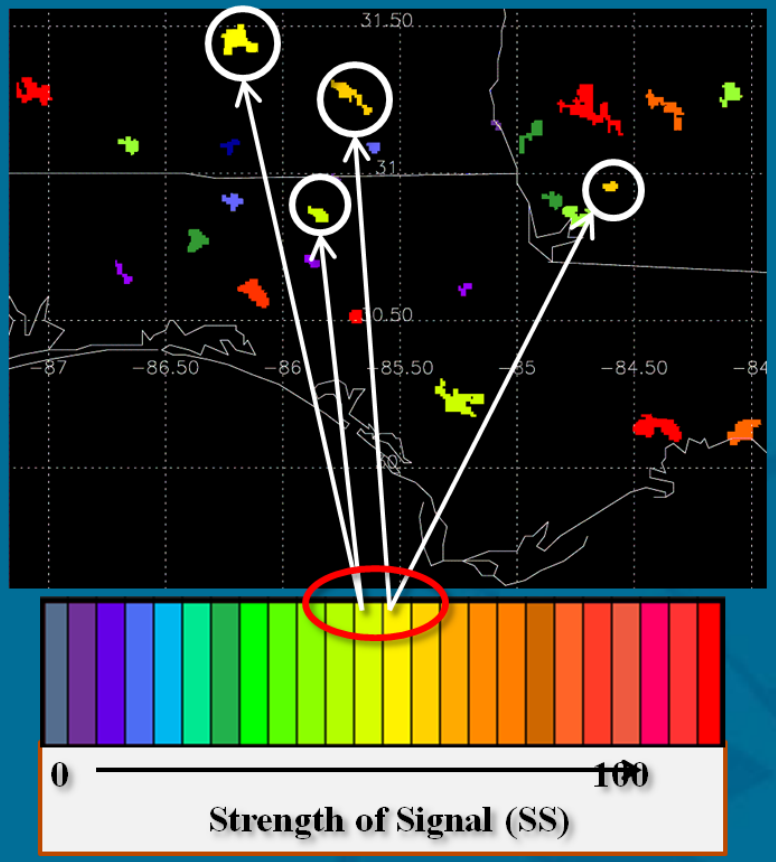

LMA visualization and attribute extraction (Courtesy: Scott Rudolsky, Florida State University)

UAH Convective Initiation: "SATCAST"

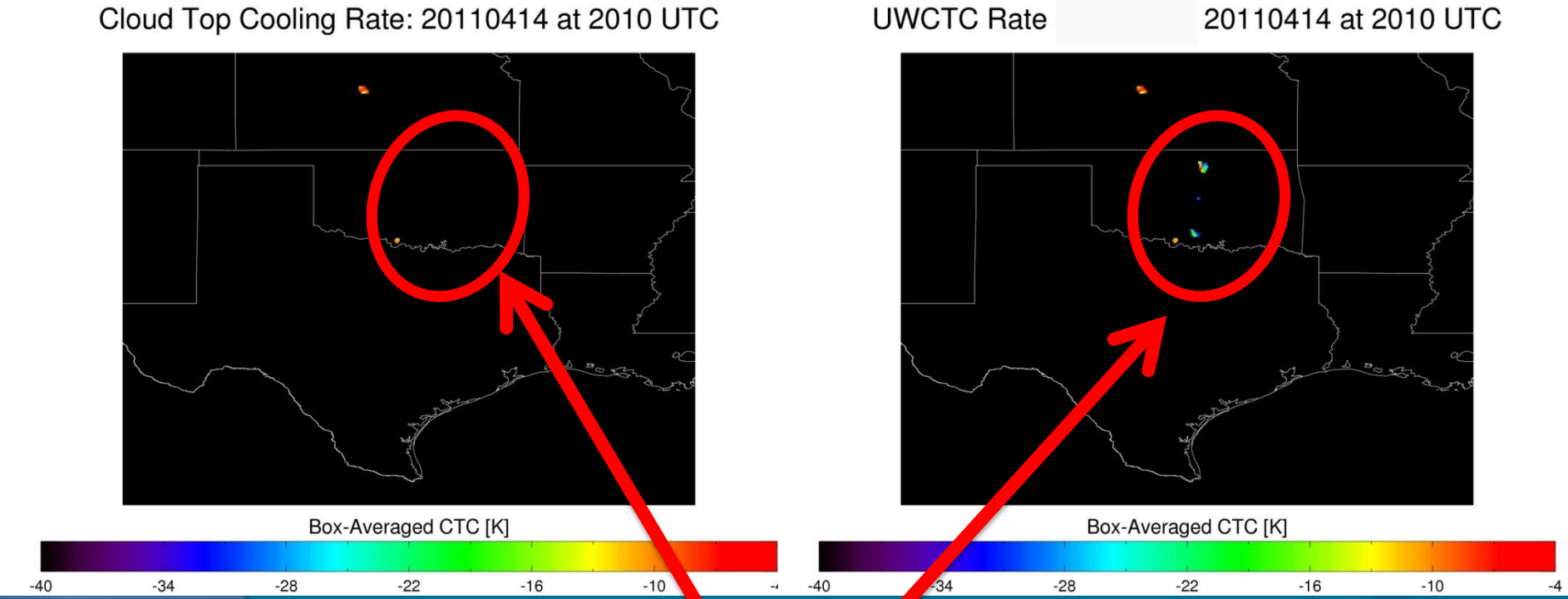
Previous Version of SATCAST



Newest Version of SATCAST

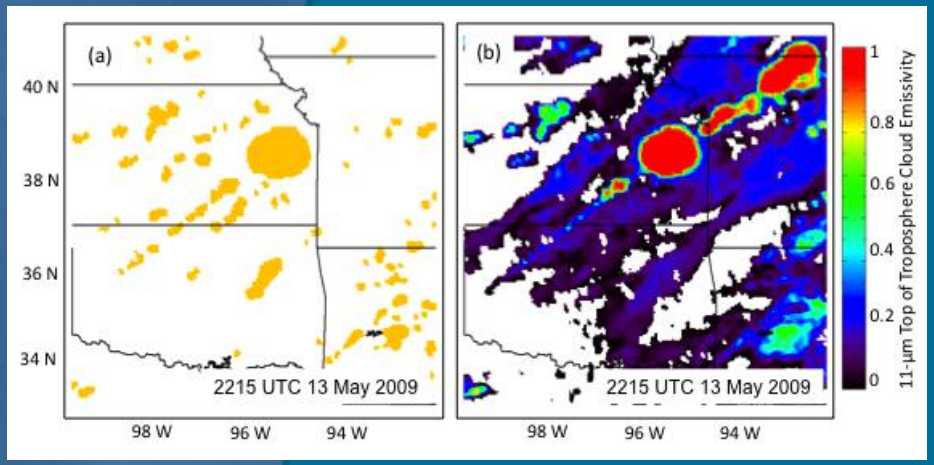


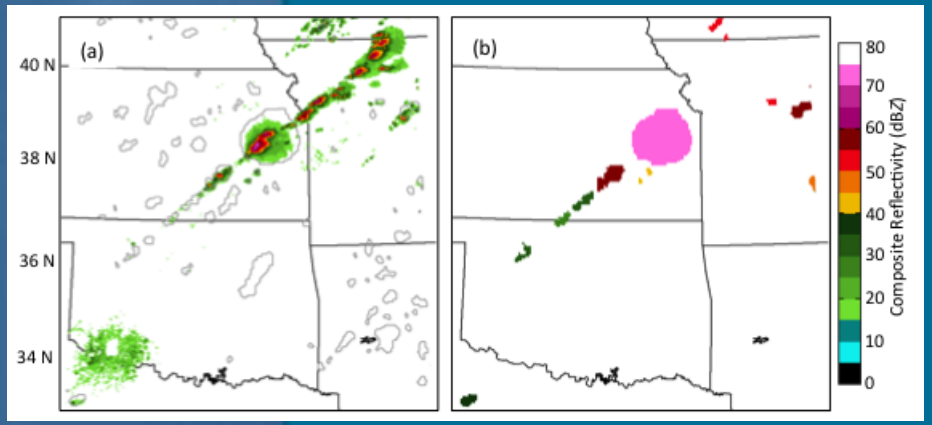
UW Convective Initiation – Cloud Top Cooling: Detection in Cirrus-covered areas

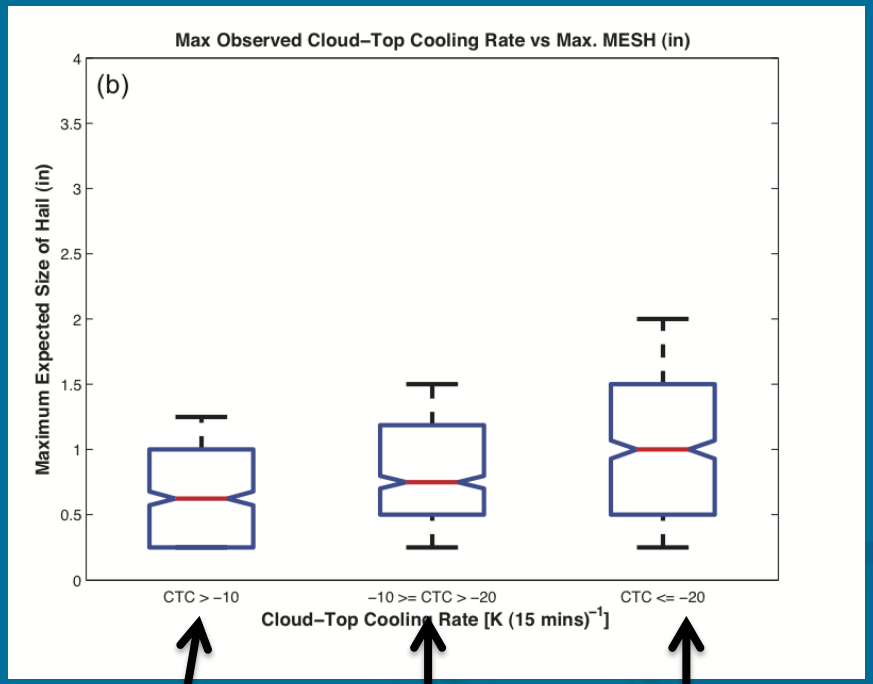


Thin cirrus above developing convective line prevents detection of vertically growing convective clouds; addition of cloud optical depth allows diagnosis of valid UW-CTC rates

UW Convective Initiation – Cloud Top Cooling: Relating CTC to Radar/MRMS products







Weak UW-CTC > -10

Moderate UW-CTC -10 >= CTC > -20

Strong UW-CTC <= -20

New for EWP in 2012 (Spring Experiment only)

- Added an EWP training shift (a 6th day; 8h supernumerary):
  - Taken at WFO within two weeks prior to travel to Norman
  - Training materials posted online
  - WES Virtual Machine Case on DVD, job sheets online
- "Flex" shifts
  - On Tue, Wed, Thu only
  - Start time between 12pm and 3pm; finish 8 hours later
  - Time determined at the end of previous day shift
  - Based on expected timing of severe using Day2 outlook.
  - Allows for greater flexibility to capture weather events.
- EWP2012 Webinars
  - More later…

Monday Schedule

1200p	Convene to NSSL Dev Lab (NWC2820)
1200p	Welcome and Introductions
1215p	EWP2011 Orientation Briefing
100p	Break
115p	Convene in HWT Operations Area for on-hands AWIPS2 Familiarization and procedure building
315p	Break
345p	Real-time warning operations in HWT Operations Area
???p	Dinner Break (time chosen based on wx)
715p	Fill out feedback survey
745p	Day 2 forecast discussion to choose tomorrow's "flex" shift time
800p	Adjourn

Tue-Wed-Thu "Flex" Shift Schedule

- Determined at the end of the previous day's operations shift, based on expected timing of weather
- Start time anywhere between 12 – 3pm
- Finish 8 hours later
- Dinner break time will be based on wx activity
- Forecasters fill out feedback surveys 45 minutes before end of shift
- Day 2 "flex" shift time decision made in last 15 minutes of current shift.

Friday Schedule

1000am	Convene in Dev Lab
1000am-1140am	Weekly debrief (Dev Lab)
1140am	Break to grab lunch, move to WDTB Conference Room
1200pm-100pm	EWP2012 Weekly Webinar (WDTB Conference Room)
100pm	Operations End for the week

EWP2012 Weekly Webinars

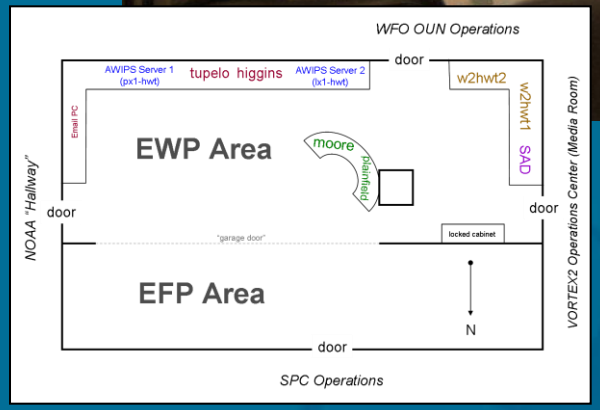
- A summary of that week's experience, presented by the NWS participants.
- Each forecaster has 5 minutes to discuss their key takeaway that week.
- Audience: WFO/CWSU peers, RHQ, NWHQ, funding agencies.
- Facilitated by WDTB (similar to dual-pol "Storm of the Month").
- Remainder of the hour will be devoted to Q&A.
- Each Friday from 12-1 CDT (1-2 EDT) from the NWC in Norman.

EWP Personnel

- Forecasters/Evaluators
- Weekly Coordinator (WC)
- Webinar Facilitator (WDTB)
- Project Scientists
- EWP Officers
  - Travis Smith (co-Team Leader)
  - David Andra (co-Team Leader)
  - Greg Stumpf (Operations Coordinator)
  - Darrel Kingfield (IT Coordinator)

EWP Technology in the HWT

- NWS Advanced Weather Interactive Processing System 2 (AWIPS2):
  - Can emulate any forecast office nationwide
  - Displays experimental products
  - Issue experimental warnings
- Situational Awareness Display (SAD)
  - Television feeds
  - Streaming storm chaser dash cams
  - etc…



EWP Web Presence

- External (public)
  - http://ewp.nssl.noaa.gov
  - Content:
    - General Information about the EWP
    - Past experiment information
- Internal (private)
  - https://secure.nssl.noaa.gov/projects/ewp2012/
    - NOAA LDAP user and password
  - Content:
    - The EWP Blog
    - Operations Plans
    - Training Materials
    - Schedules (Google Calendar)
    - Other useful links