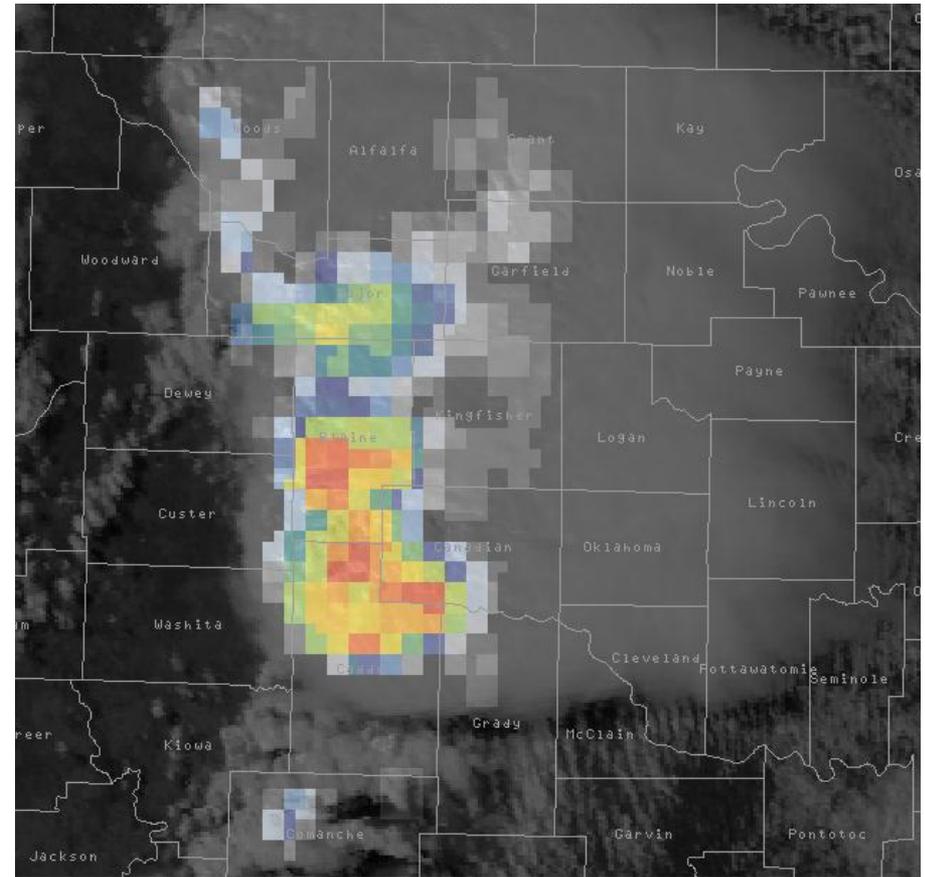




Lightning Data in the Proving Ground & Hazardous Weather Testbed:

GOES-R Geostationary Lightning Mapper (pGLM)



Kristin Calhoun, Chris Siewert, Darrel Kingfield, Geoffrey Stano, Eric Bruning, T. Smith, G. Stumpf, K. Ortega, & V. Lakshmanan

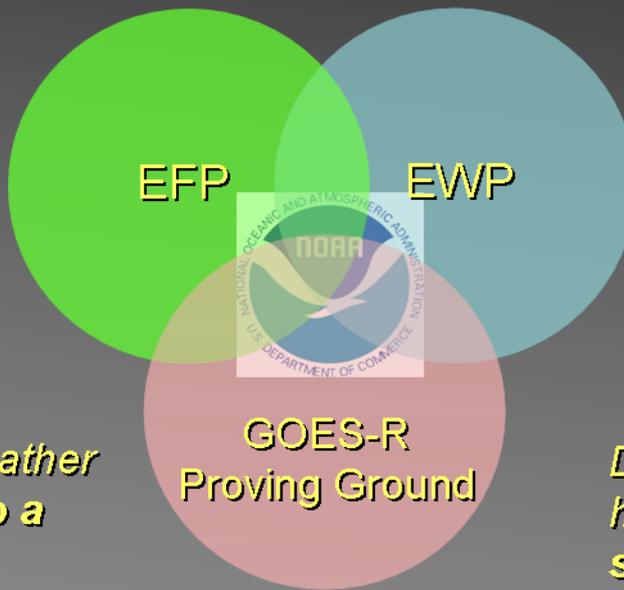


What are the Hazardous Weather Testbed (HWT) & Spring Experiment?



**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



➤ Both a facility and an organization



+ HWT Experimental Warning Program

- **Mission:** to improve NWS warning services by bringing together forecasters and researchers to evaluate new observing platforms, algorithms, and products/services.
- **Goal:** Improve decision support for the prediction of severe convective weather at the “warning scale” (0-3 hours) for all WFOs.

Feedback from experiments used for improvements

Immerse forecasters in a research environment

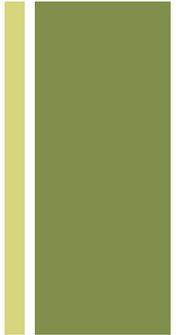
Provide researchers information about operational requirements



+ The Forecaster's Operational Week:

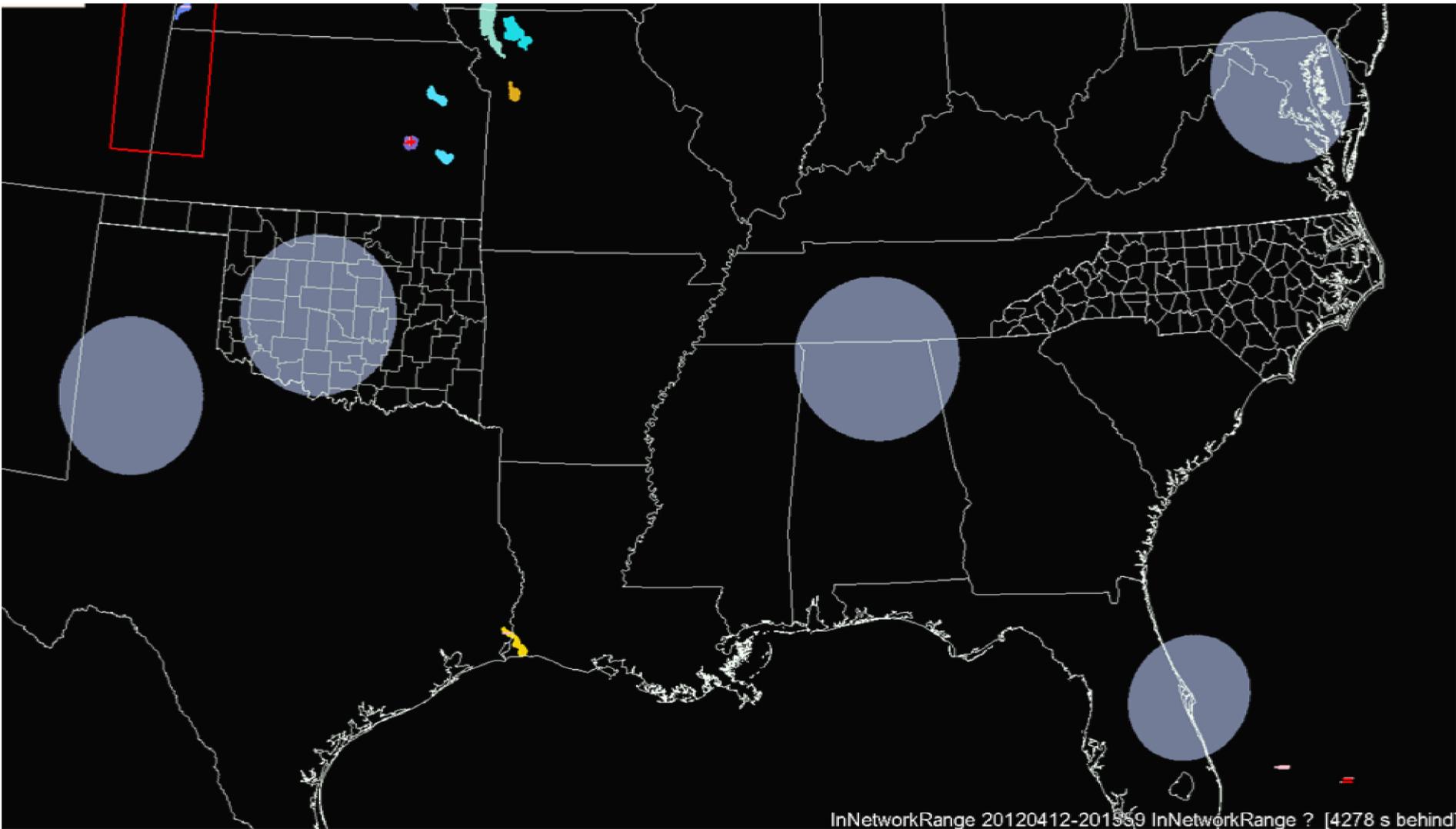
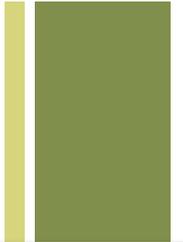
(4-6 NWS forecasters per week, 5-6 weeks)

- The 2012 weekly shift schedule:
 - Mon Noon-8 pm Orientation, review products w/PIs
 - Tue-Thu Noon-10pm Sliding 8-hr shift based on Wx
 - Fri 10a-1p Debriefing and Storm of the Week (WDTB)
- Early forecast shift: Issue Target Area Forecast Discussion
 - GOES-R Nearcast and CI forecasts
 - High Resolution Model Evaluation
- Late Warning Shift: Issue nowcasts/warnings using experimental data
 - GOES-R pGLM product evaluation
 - 3D-Var product evaluation



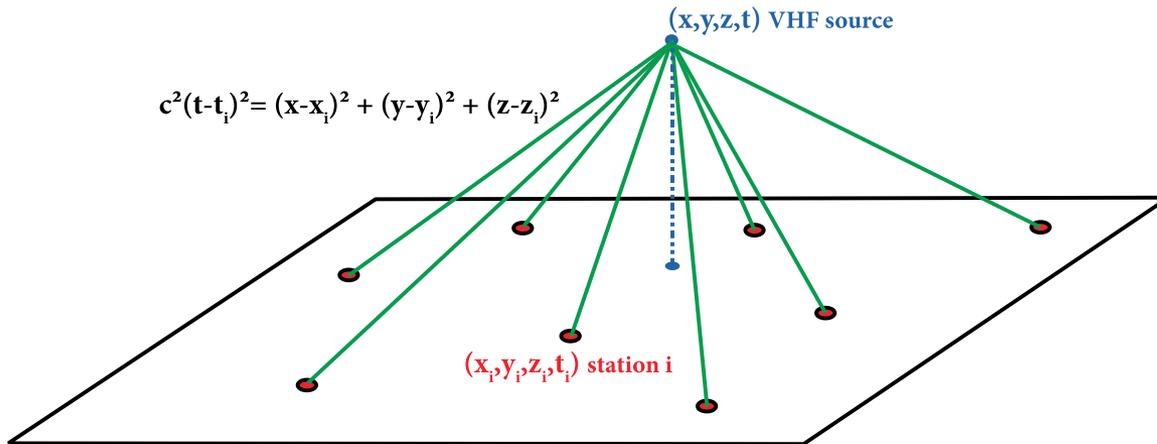
+ Creation of the pGLM product

- LMA network domains

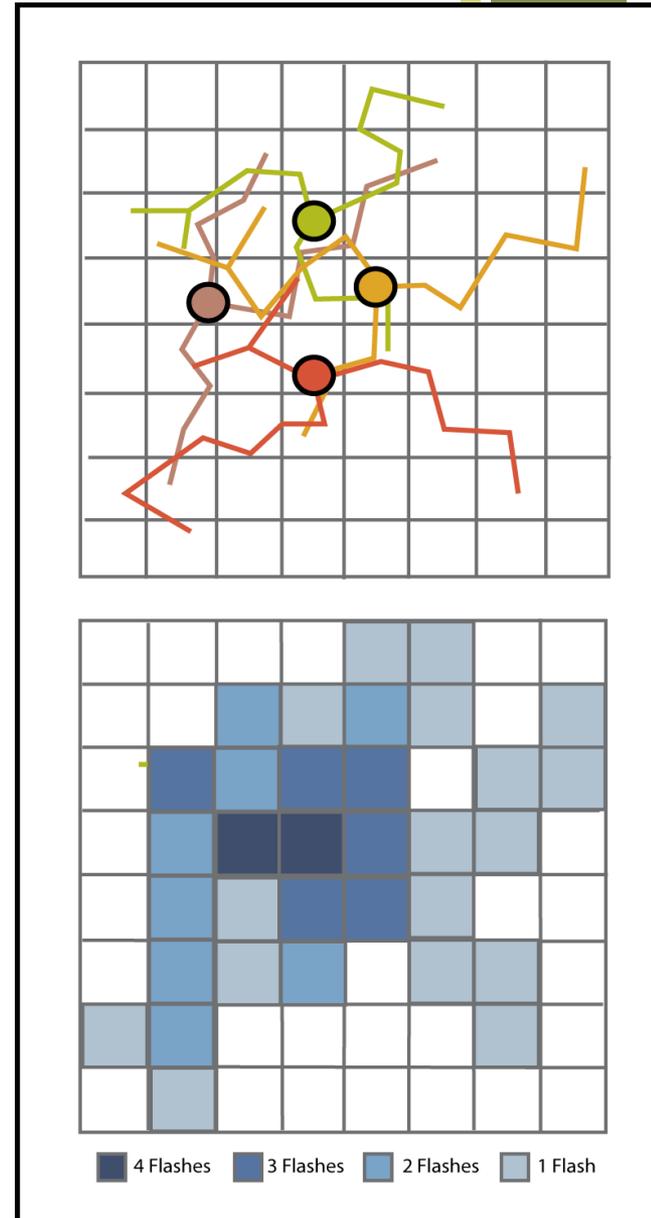


+ Creation of the pGLM product

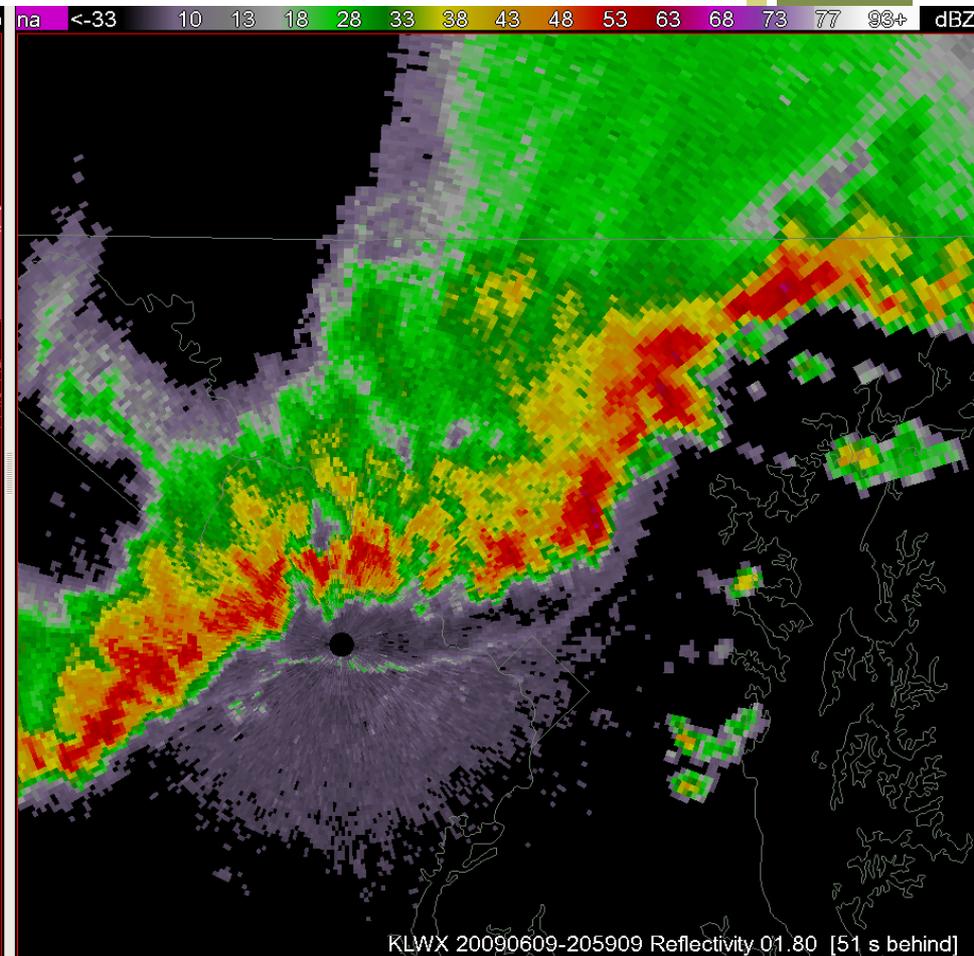
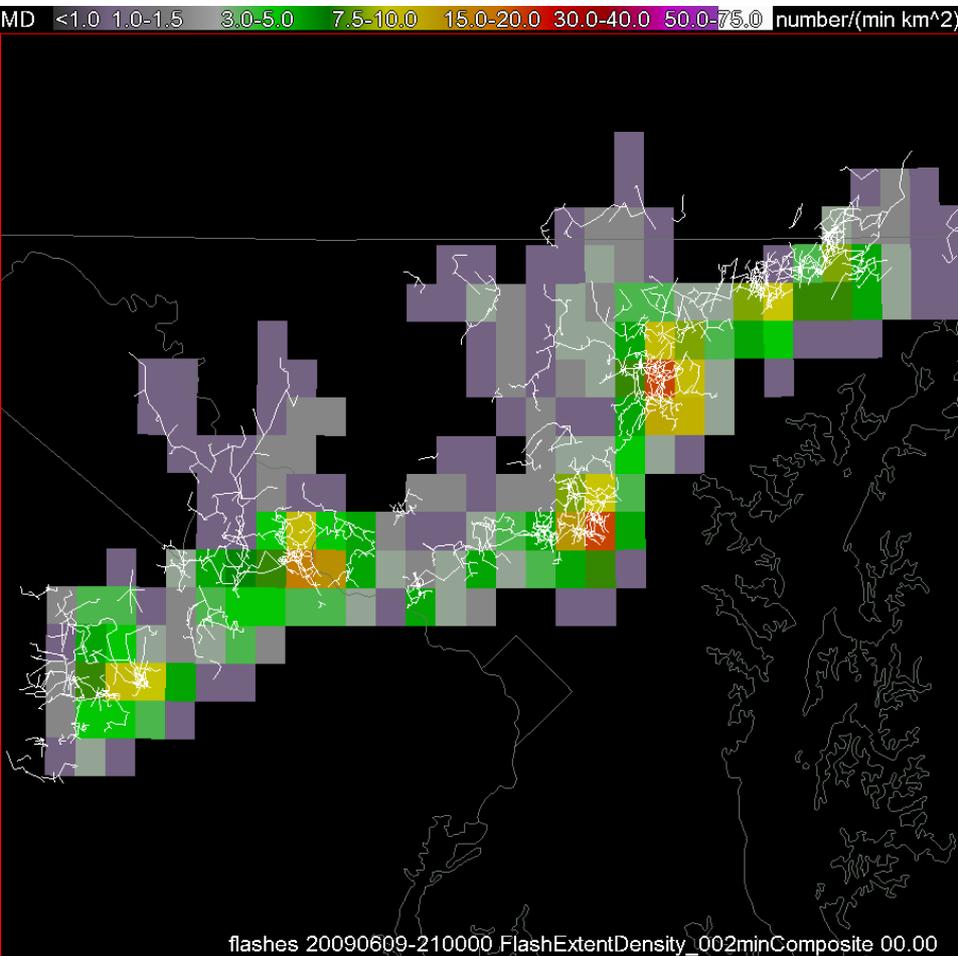
- LMA detects VHF radiation emitted as lightning propagates
- Quality Control:
 - 7 stations, 10 VHF source points per flash
- Flash sorting – real-time – from LMA data
- Flash Extent Density = Flash Footprint
Produced every min, real-time -> AWIPS2



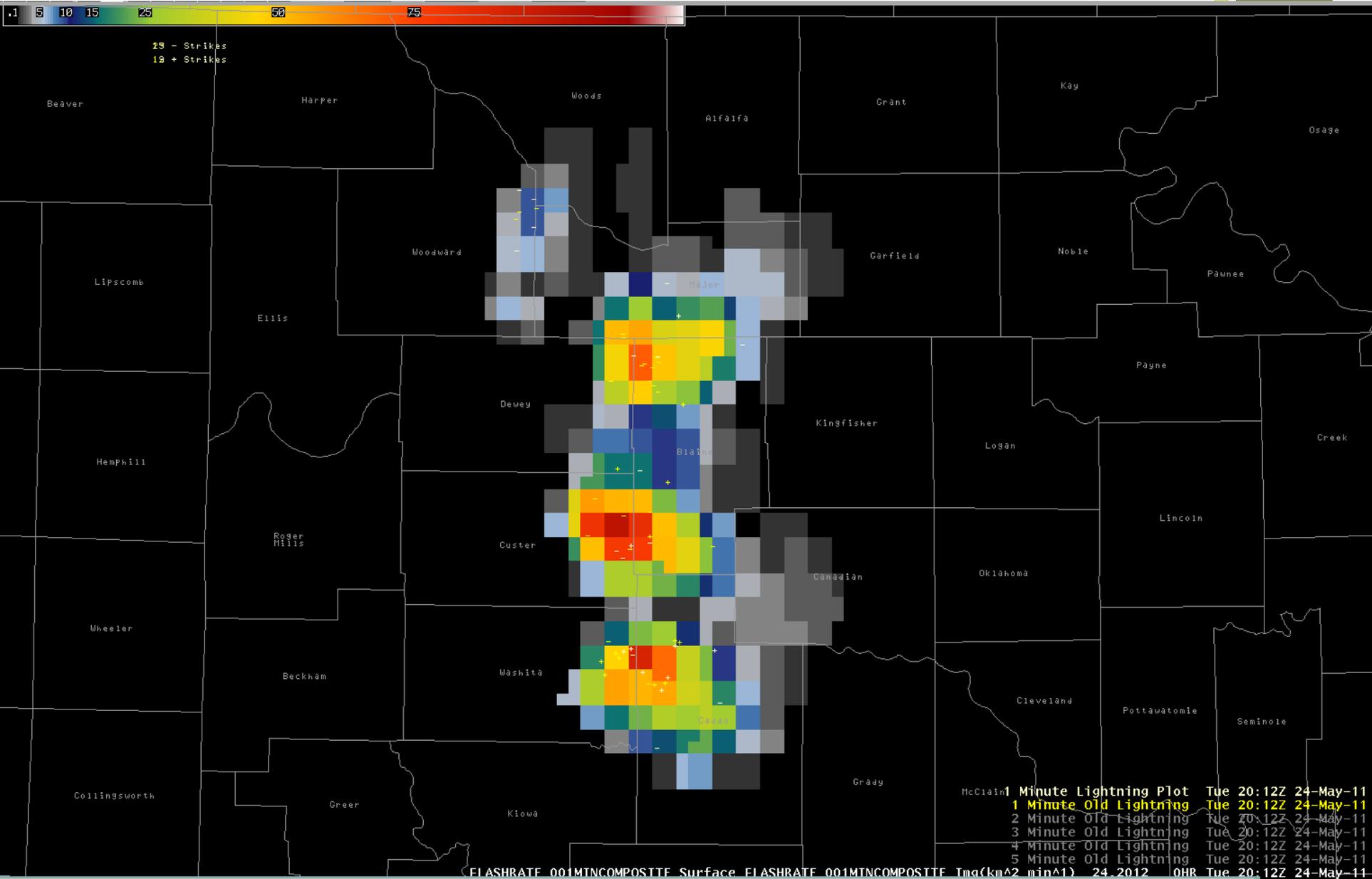
From Hamlin (2004)



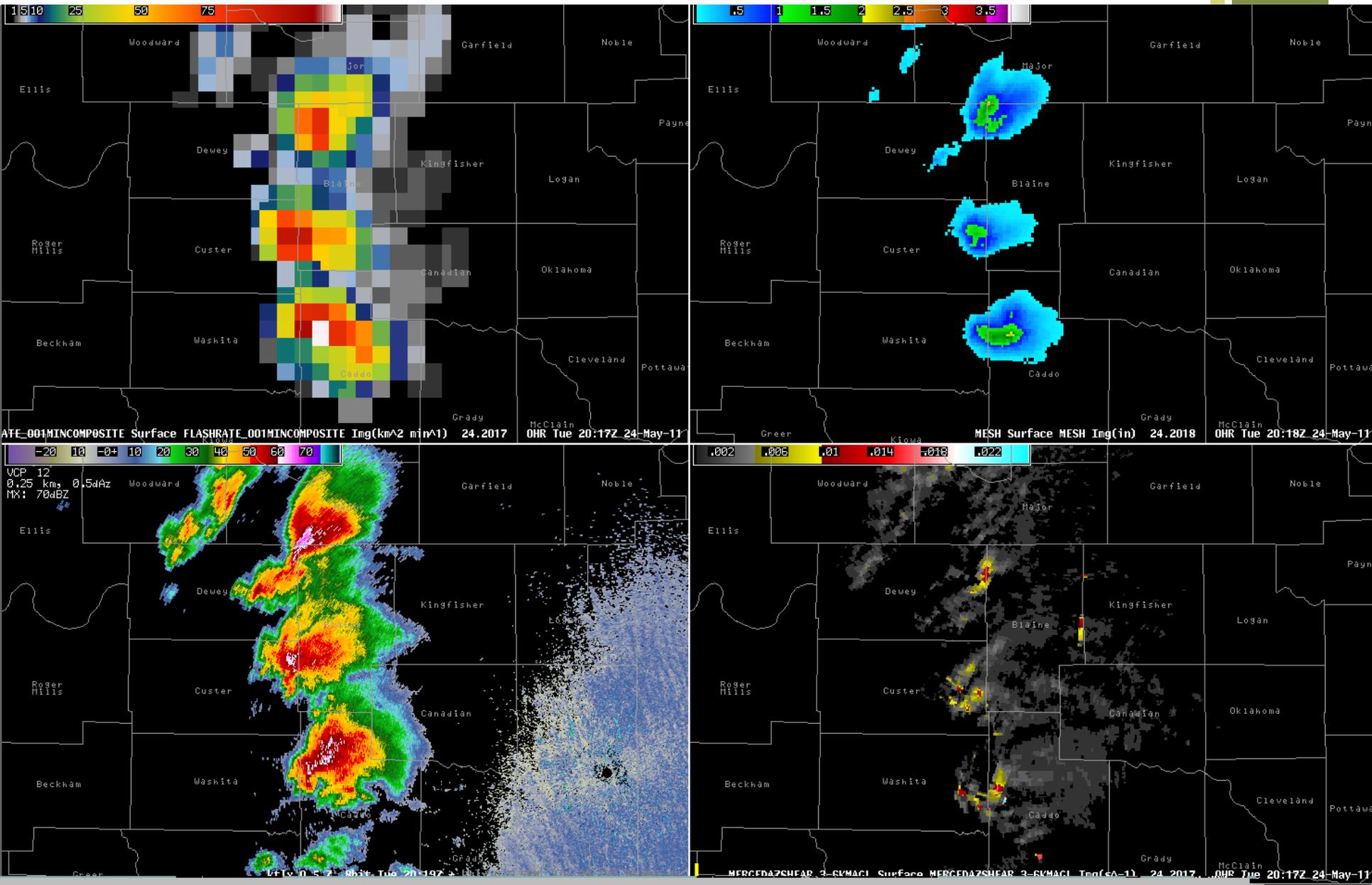
+ Creation of the pGLM product



+ pGLM in AWIPSII – comparison w/NLDN

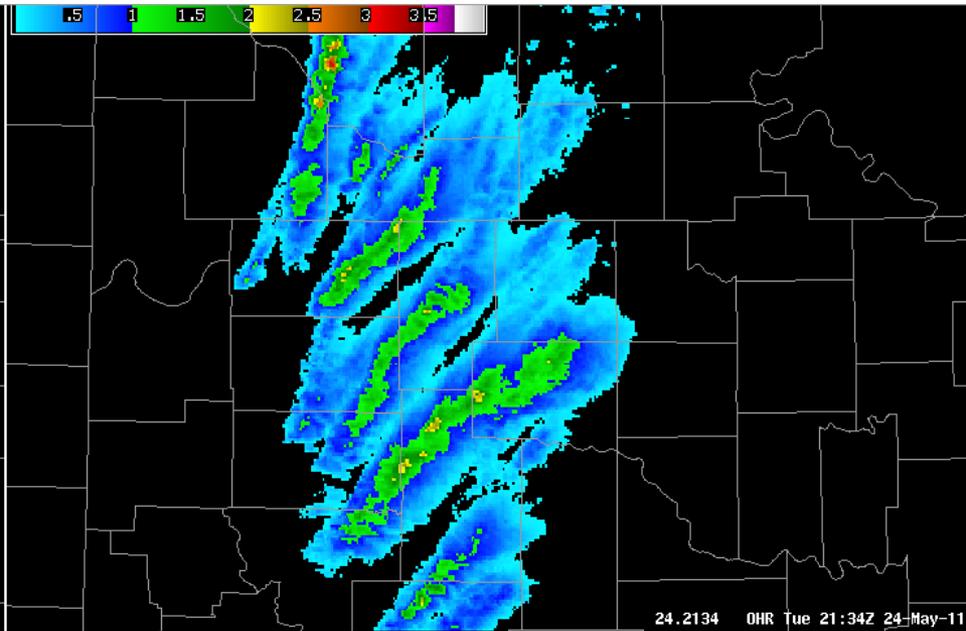
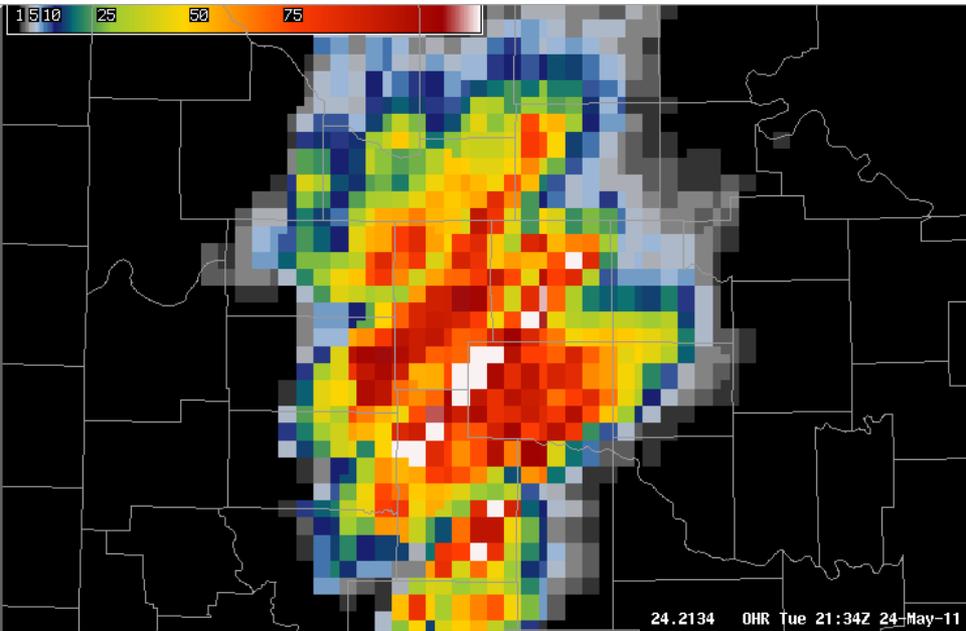
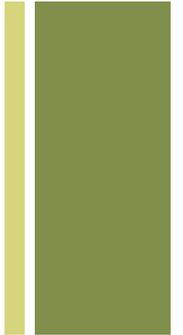


+pGLM in AWIPSII – flash rates of severe storms

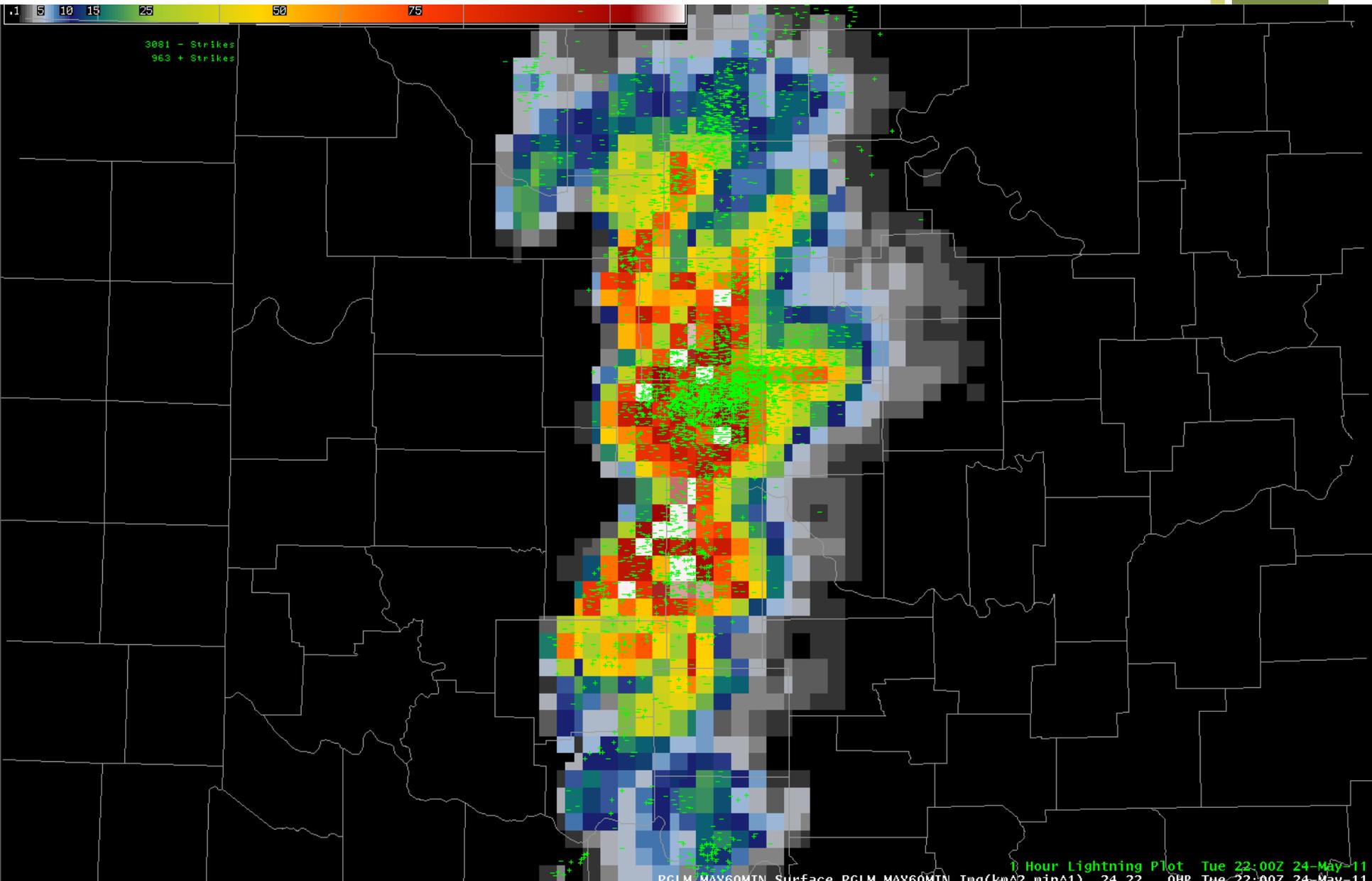




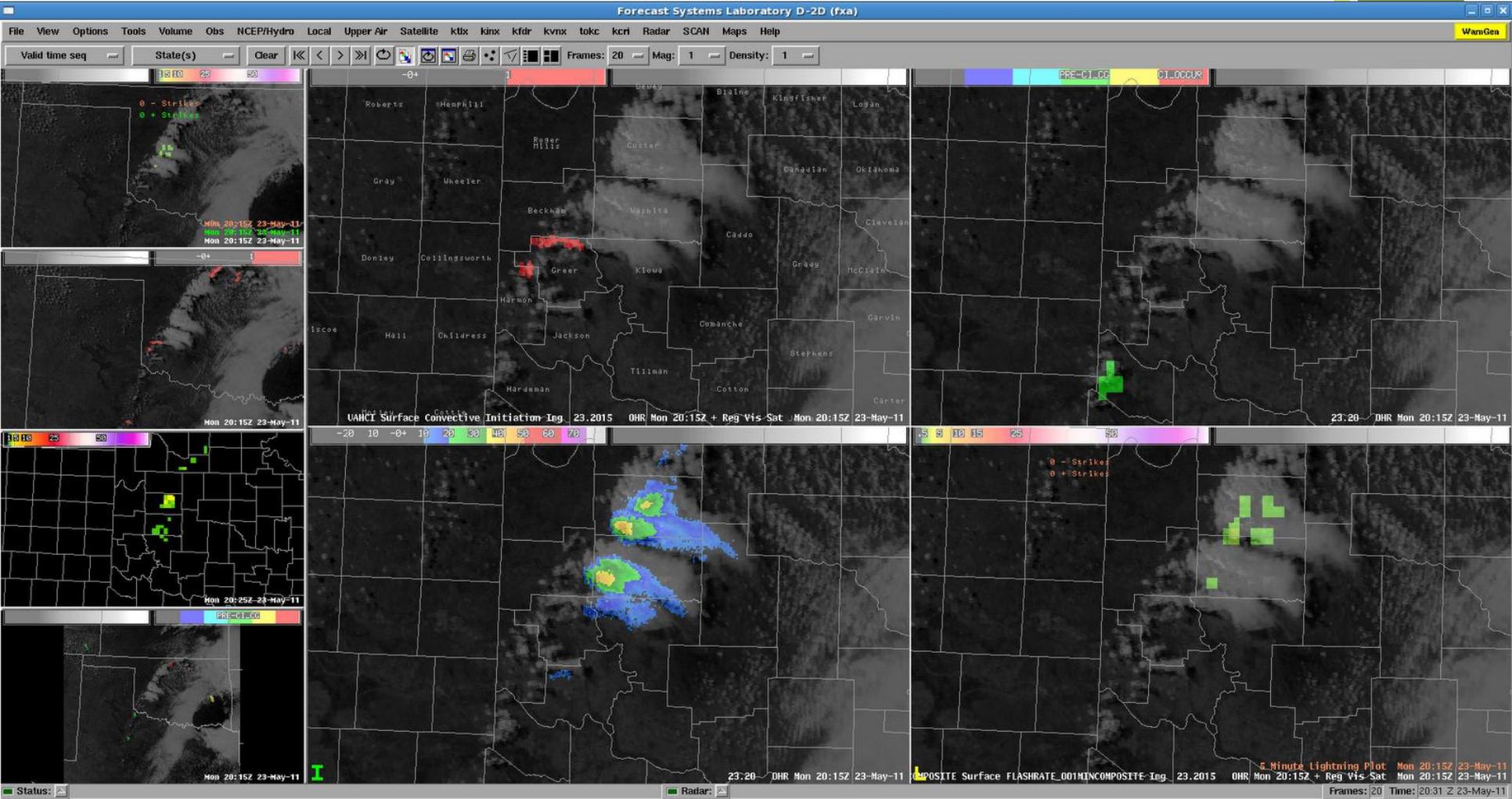
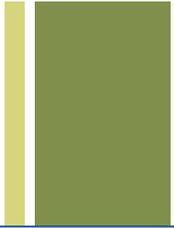
pGLM in AWIPSII – tracks (120 min history)



+ pGLM in AWIPSII – tracks (60 min vs NLDN)



+ Real-time Product Integration: "Ultimate CI"



+ Forecaster Feedback

- “Total lightning data preceded the CG network anywhere from 10-40 minutes. I was able to quickly determine when flash rate was significantly increasing, and then compare with satellite and (3DVAR) updraft/downdraft parameters for a nice big picture.”



- “Coming into the day, I wasn't quite sure when or where to or why to use the data, but after using it I really think it has a lot of functionality and is useful in warning operations. I look forward to it as a product from the GOES-R.”

+ Forecaster Feedback

■ **Lightning Safety**

- “We have a lot of users like golf courses and parks that we may not be paying attention to, especially for lightning safety in stratiform rain regions where people may think that it's just light rain... When I'm in warning operations, I get engaged in the base radar data and pay less attention to everything else. This may help a lot in those situations”
- “Lightning danger for first and last flash and stratiform rain regions... Provides details on which anvils well downstream of main core are electrically active.”

■ **Integration with other products:**

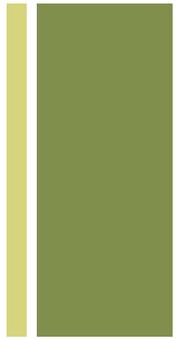
- “When we saw cell mergers there was a rapid increase in flash rate over a 5 minute time period and updraft intensity from the 3D-VAR analysis”

■ **Aviation & Fire Wx – Increased operational efficiency**

- PGLM data can help fill the holes by radar and NLDN. There won't be as much surprise by lightning starts
- Reduced FAR for airport shutdown – (e.g., Demetriades, Holle, Hembury)

+ National Lightning Jump Field Demonstration at the HWT

(coordinated by NWS)



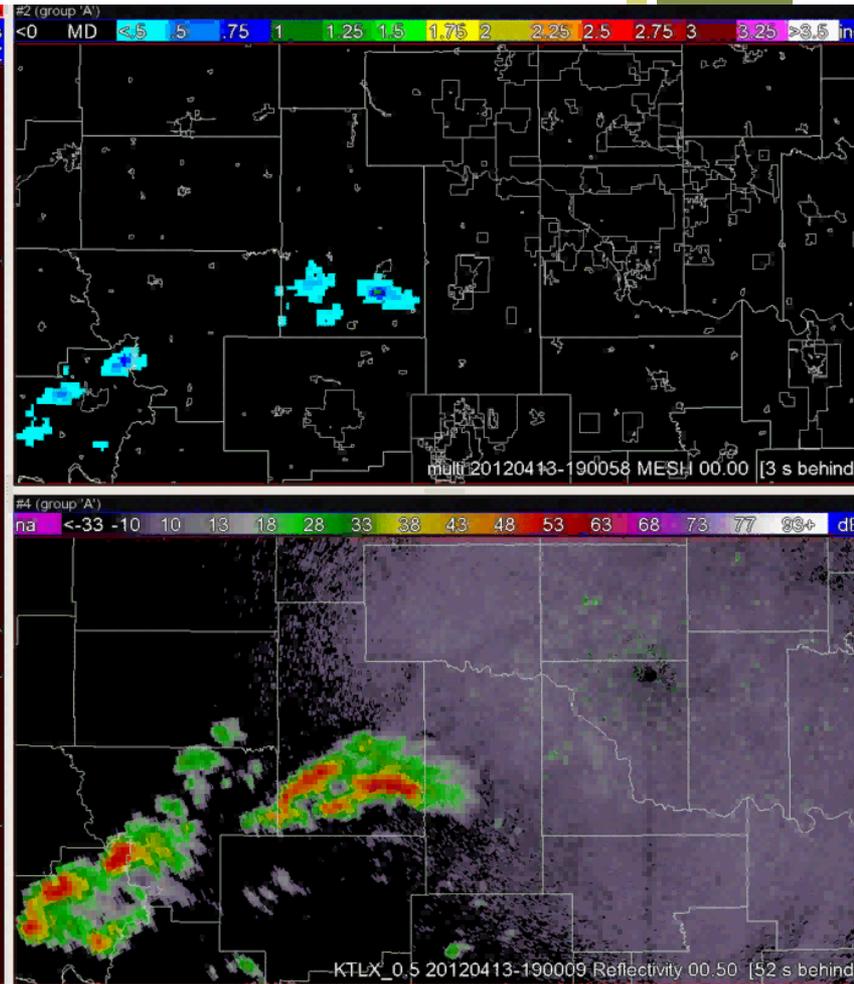
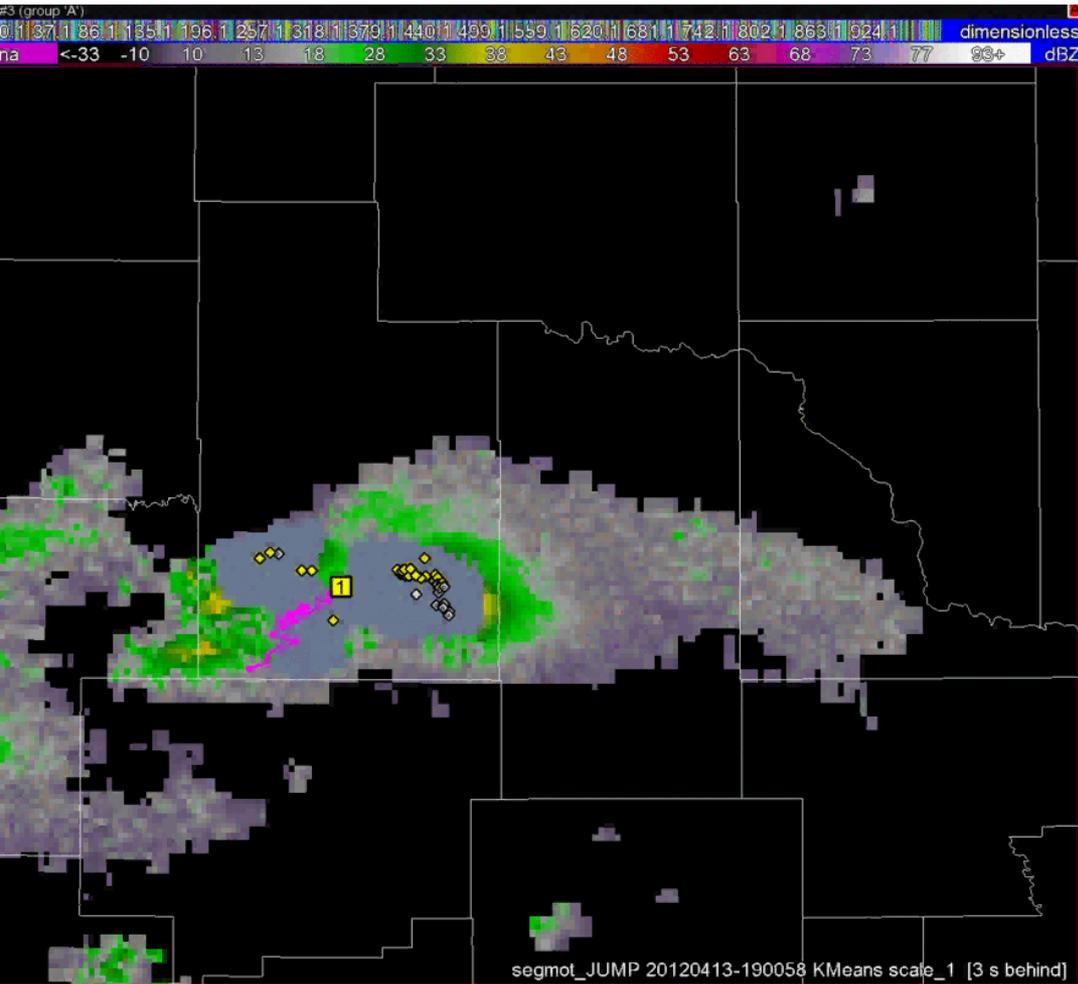
Guidance statement:

- “The Lightning Jump Test (LJT) Project shall run an automated version of the 2σ algorithm using Total Lightning Data (in particular, LMA data) in order to evaluate its performance and effect on watch/warning operations via severe weather verification, with an eye to the future application of the GLM on GOES-R.”

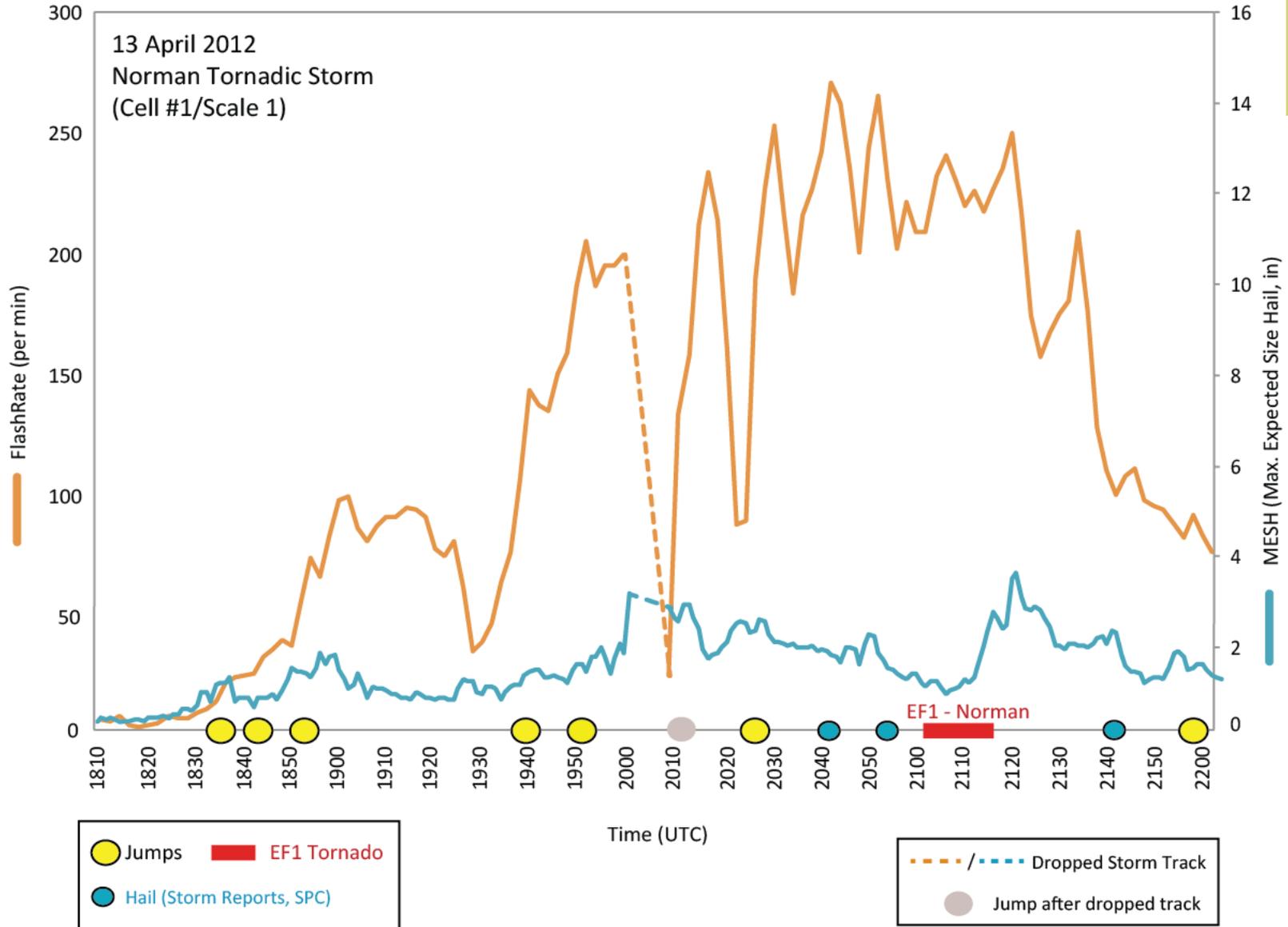
Participant Organizations: NASA/MSFC, NOAA/NESDIS, NOAA/NSSL, NOAA NWS (OST-MDL, OST-SPB, WFOs – MLB, HUN, LWX, LUB), NOAA /SPC, TTU, UA-Huntsville, U of Maryland, OU [25+ participants]

The results of this test are intended to inform the utility of the GLM data from GOES-R.

+ 13 April 2012: Norman tornado

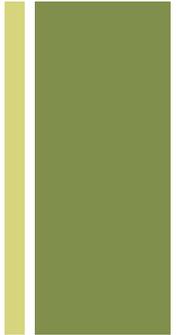


+ 13 April 2012: Norman tornado



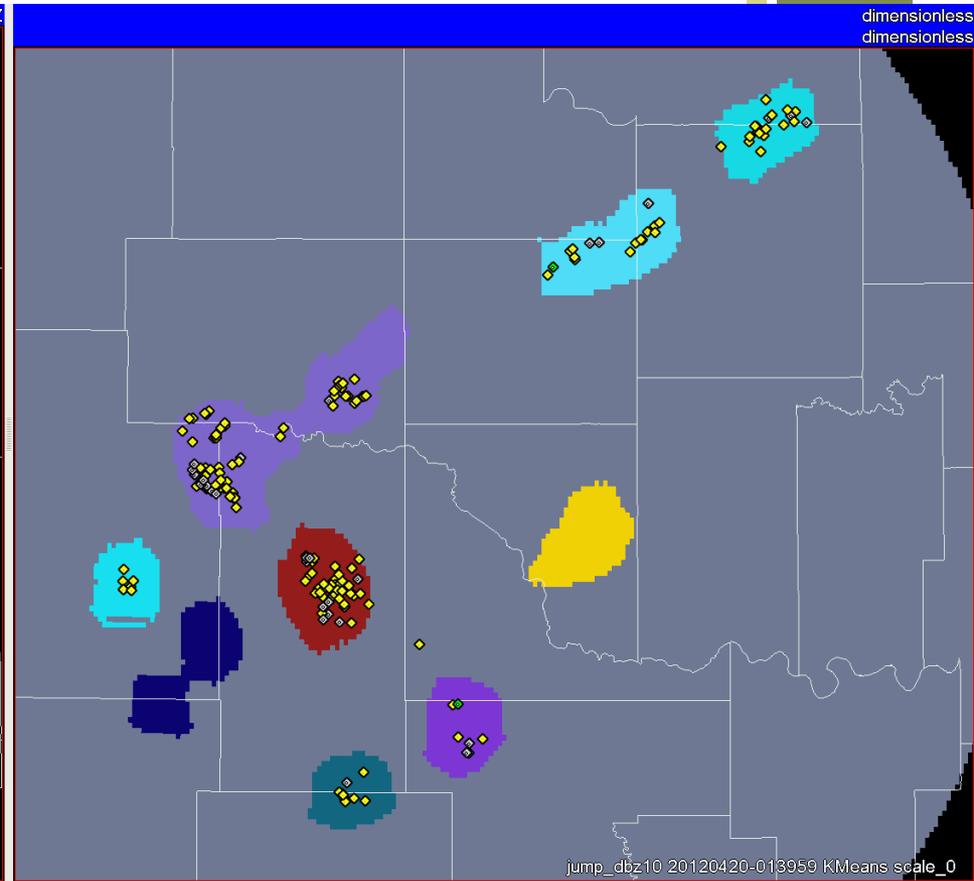
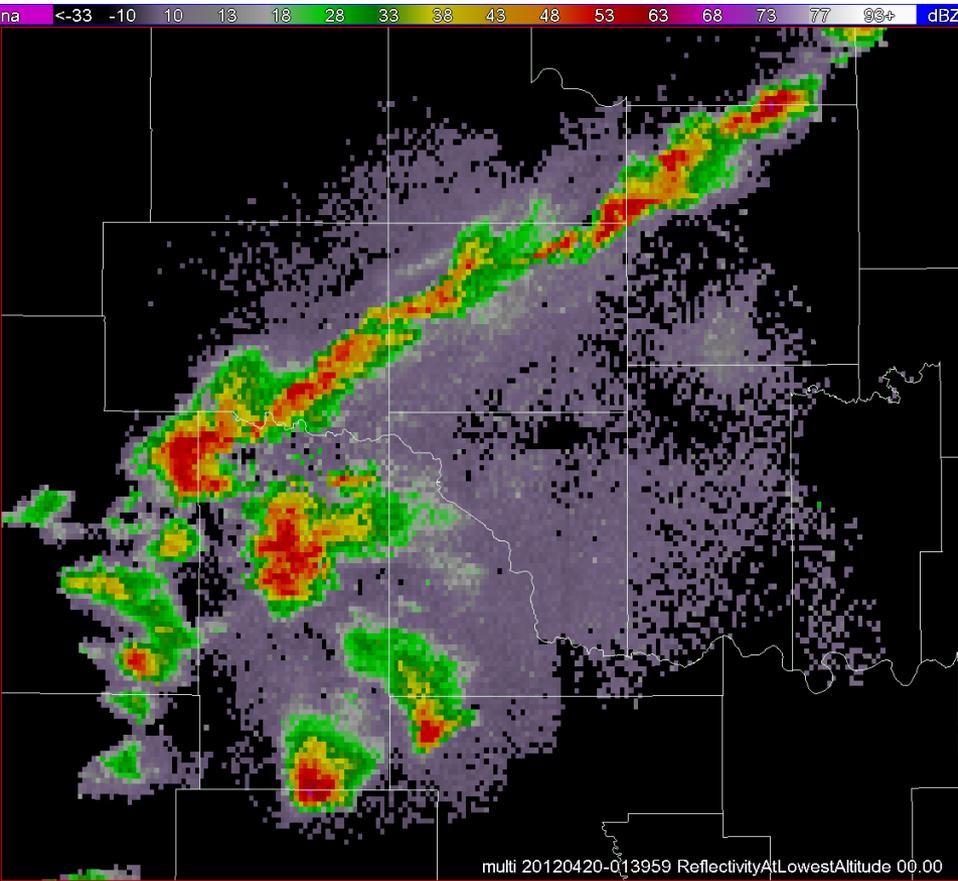
+ Questions:

- Contact: Kristin.Kuhlman@noaa.gov
- Experimental Warning Program: <http://ewp.nssl.noaa.gov/>
- GOES-R proving Ground: <http://goesrhwt.blogspot.com/>
- Real-time LMA:
 - <http://lightning.nmt.edu/oklma/>
 - <http://pogo.tosm.ttu.edu/wtlma/current/>
 - <http://branch.nsstc.nasa.gov/PUBLIC/DCLMA>
 - <http://branch.nsstc.nasa.gov/PUBLIC/NALMA>



+ GLM vs LMA: Flash Extent Density

- In-cloud lightning:



20 Apr 2012: OKLMA 0139 UTC