



# GOES-R Risk Reduction and Proving Ground R20 Activities

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# GOES-R Proving Ground Evaluations in the HWT

GOES-R synthetic (simulated) imagery

NearCast Model

Convection Initiation

ProbSevere

Overshooting Tops / Cloud-top Cooling

Super Rapid Scan

pseudo-Geostationary Lightning Mapper Imagery

Total Lightning Tracking Tool

Lightning Jump Algorithm

Sounder RGB Airmass

# GOES-R Risk Reduction Projects at NSSL

Applications of concurrent super rapid sampling from GOES-14 SRSOR, radar, and lightning data

Storm Tracking and Lightning Cell Clustering for Data Assimilation and Forecast Applications

Improvements to QPE using GOES Visible ABI and model data

Techniques for Assimilating Geostationary Lightning Mapper Data and Assessment of the Resulting Impact on Forecasts

The GOES-R GLM Lightning Jump Algorithm: A National Field Test for Operational Readiness

Using total lightning data from GLM/GOES-R to improve real-time tropical cyclone genesis and intensity forecasts

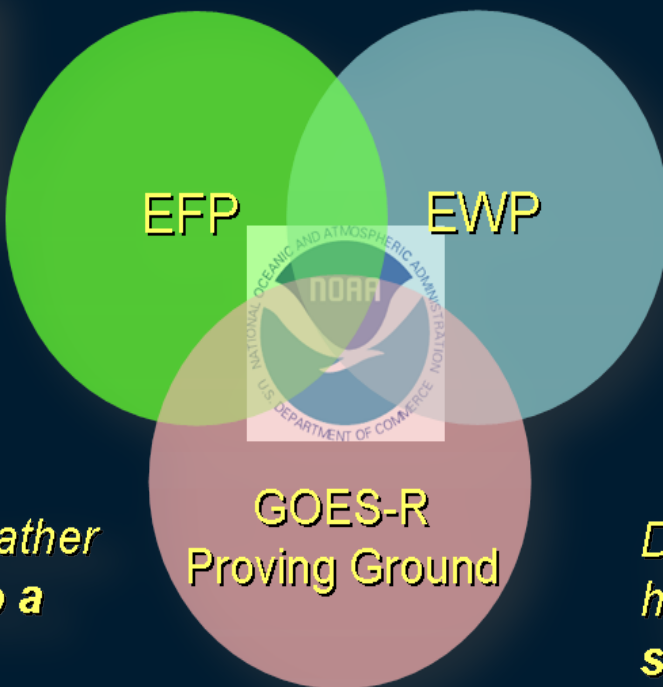






## Experimental Forecast Program

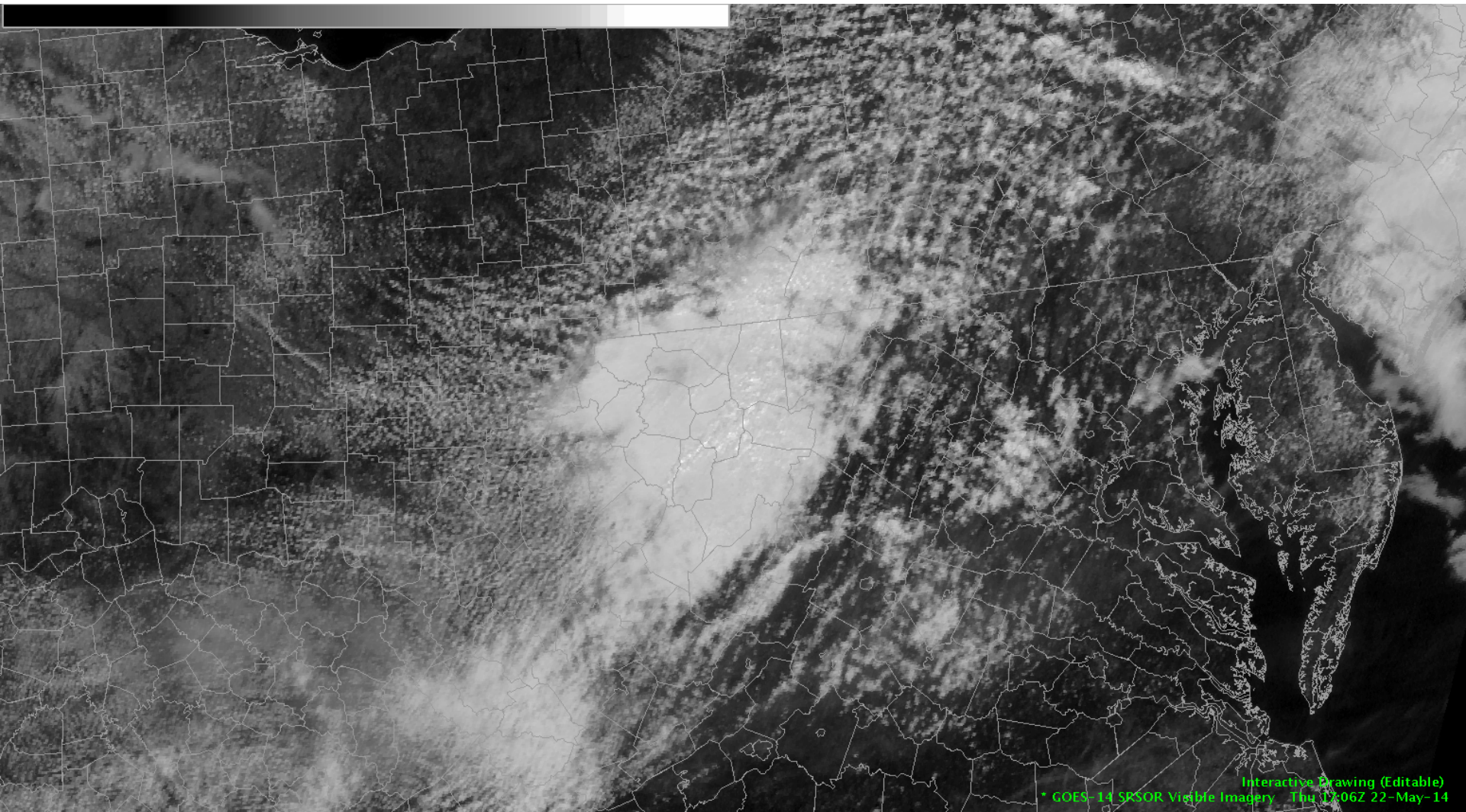
*Prediction of hazardous weather events from a few hours to a week in advance*



## Experimental Warning Program

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

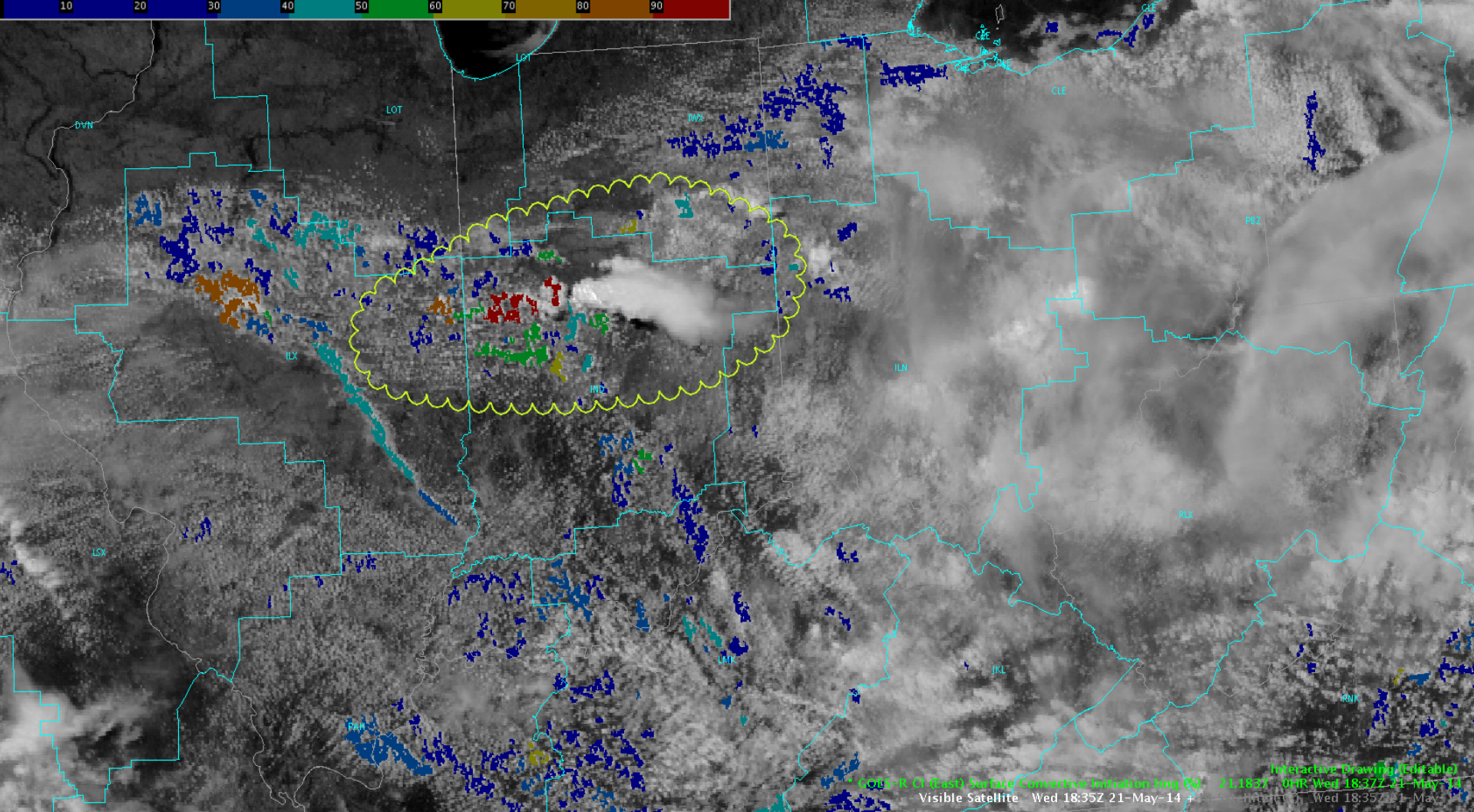




Interactive Drawing (Editable)  
\* GOES-14 SRSOR Visible Imagery Thu 03:06Z 22-May-14







**100% of the forecasters responded “yes” in the survey when asked if they preferred a probabilistic approach to a binary yes/no approach.**

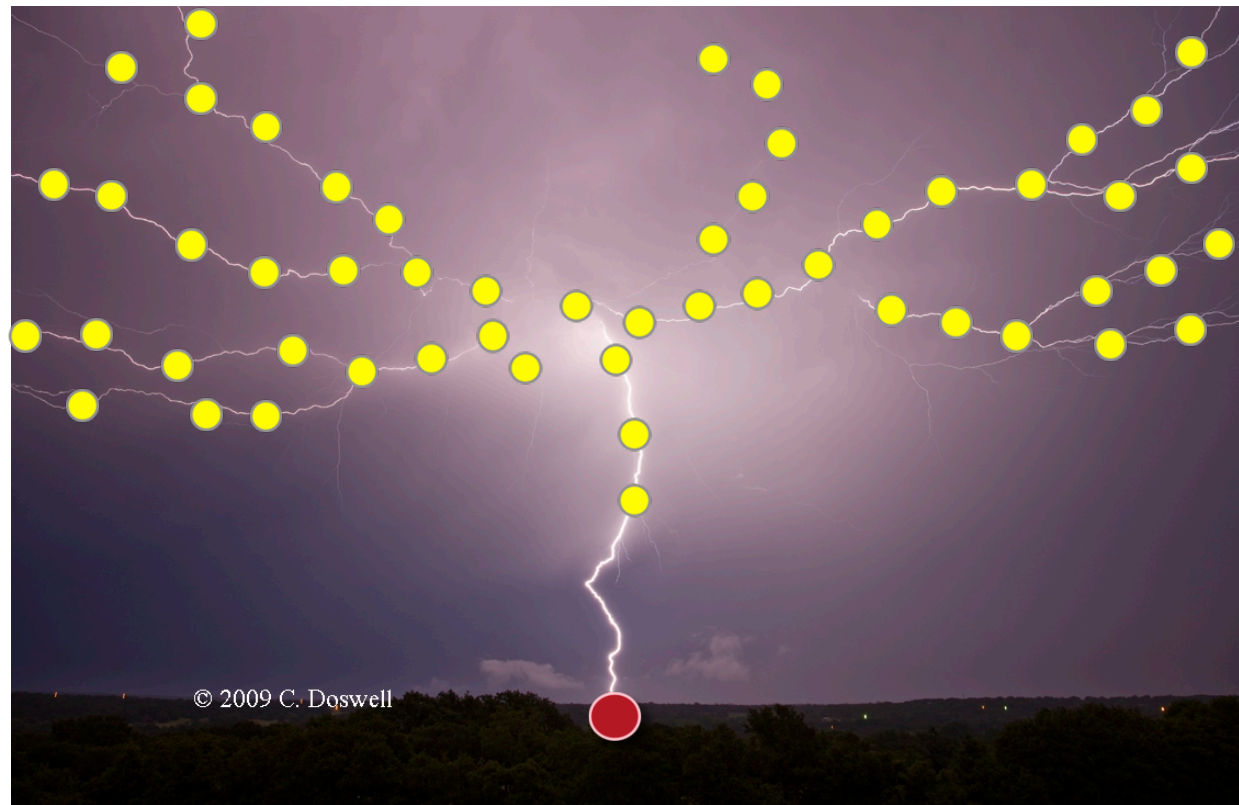
***Applies to R2O in general: provide measures of certainty***





# Creation of a Geostationary Lightning Mapper visualization [pGLM]\*

Use radiation points detected from ground-based lightning mapping arrays (LMAs)

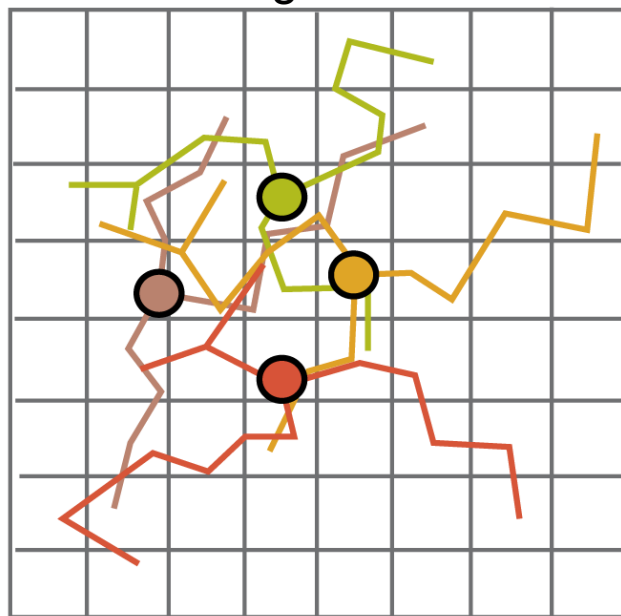


\*Joint effort with NASA – SPoRT

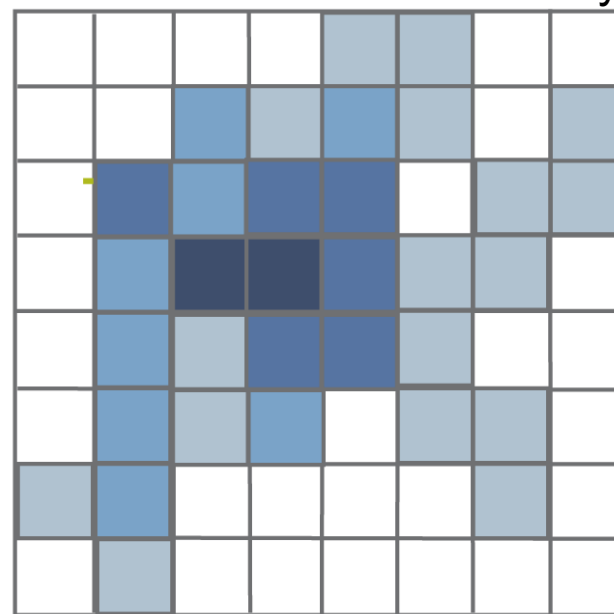


# Creation of a Geostationary Lightning Mapper visualization [pGLM]\*

Flash Sorting



Flash Extent Density



4 Flashes 3 Flashes 2 Flashes 1 Flash

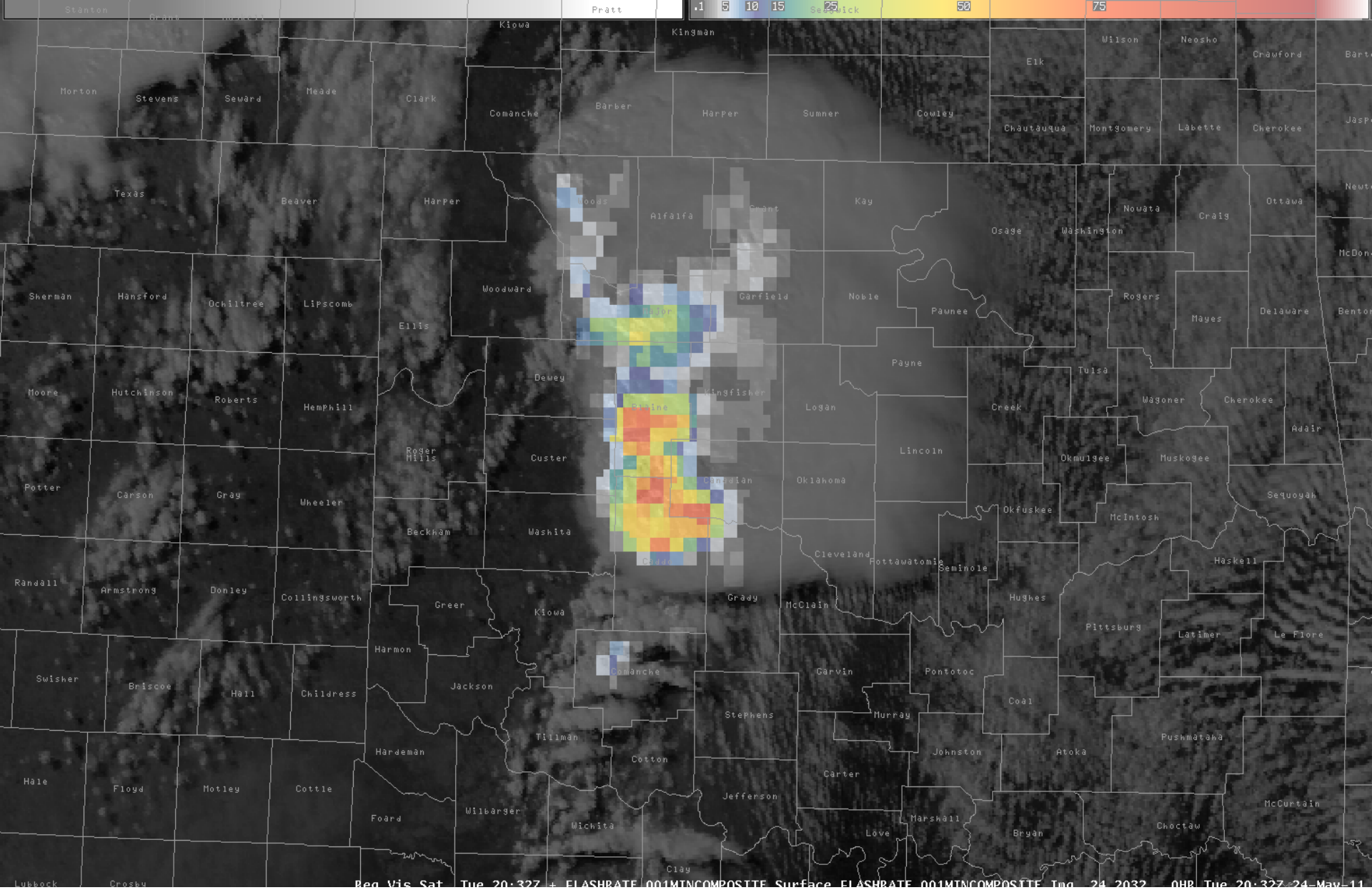
Flash Extent Density = Flash Footprint

Produced every min, real-time -> AWIPS2

\*Joint effort with NASA – SPoRT



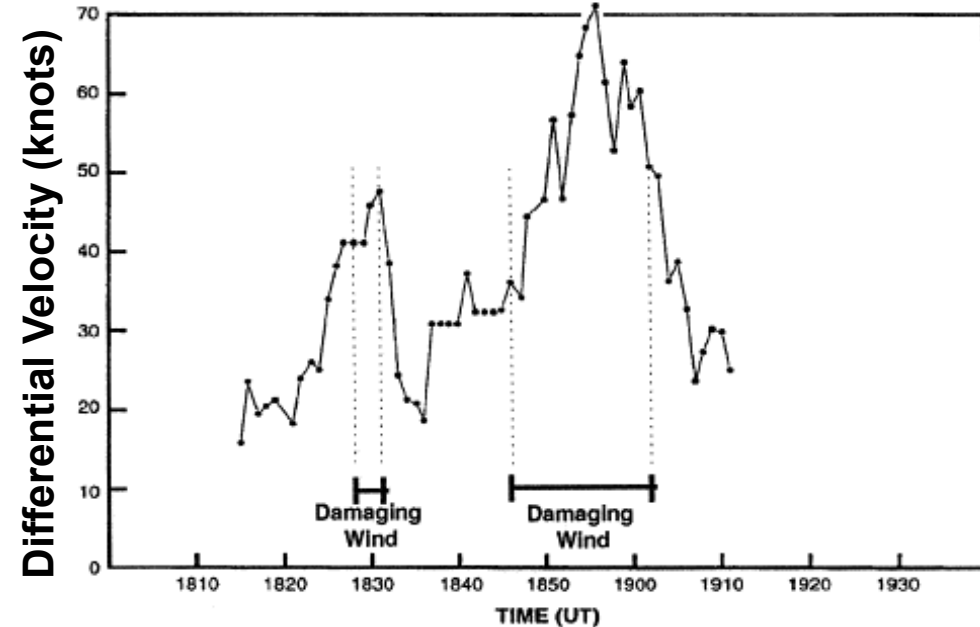
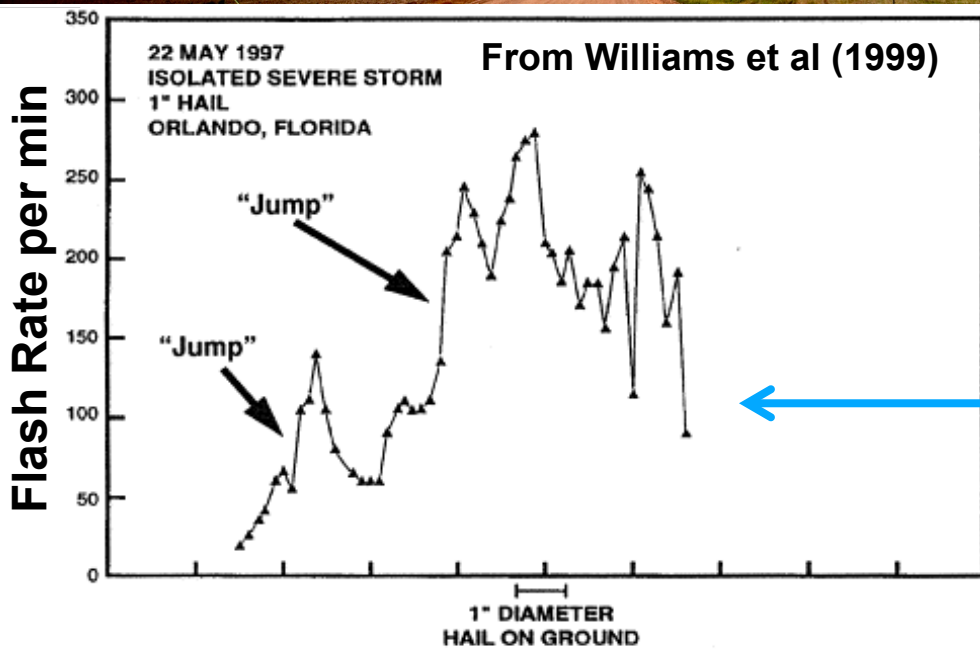




Reg. Vis. Sat Tue 20:32Z + ELASR/ATE\_001MNCOMPOSITE Surface ELASR/ATE\_001MNCOMPOSITE Img 24 2032 0HR Tue 20:32Z-24-May-11







## Lightning Jump Algorithm

A Lightning Jump = rapid increase total flash rate

This is a typical view of Lightning jump via Time Series.

These jumps have been shown to be precursors of severe weather in

thunderstorms

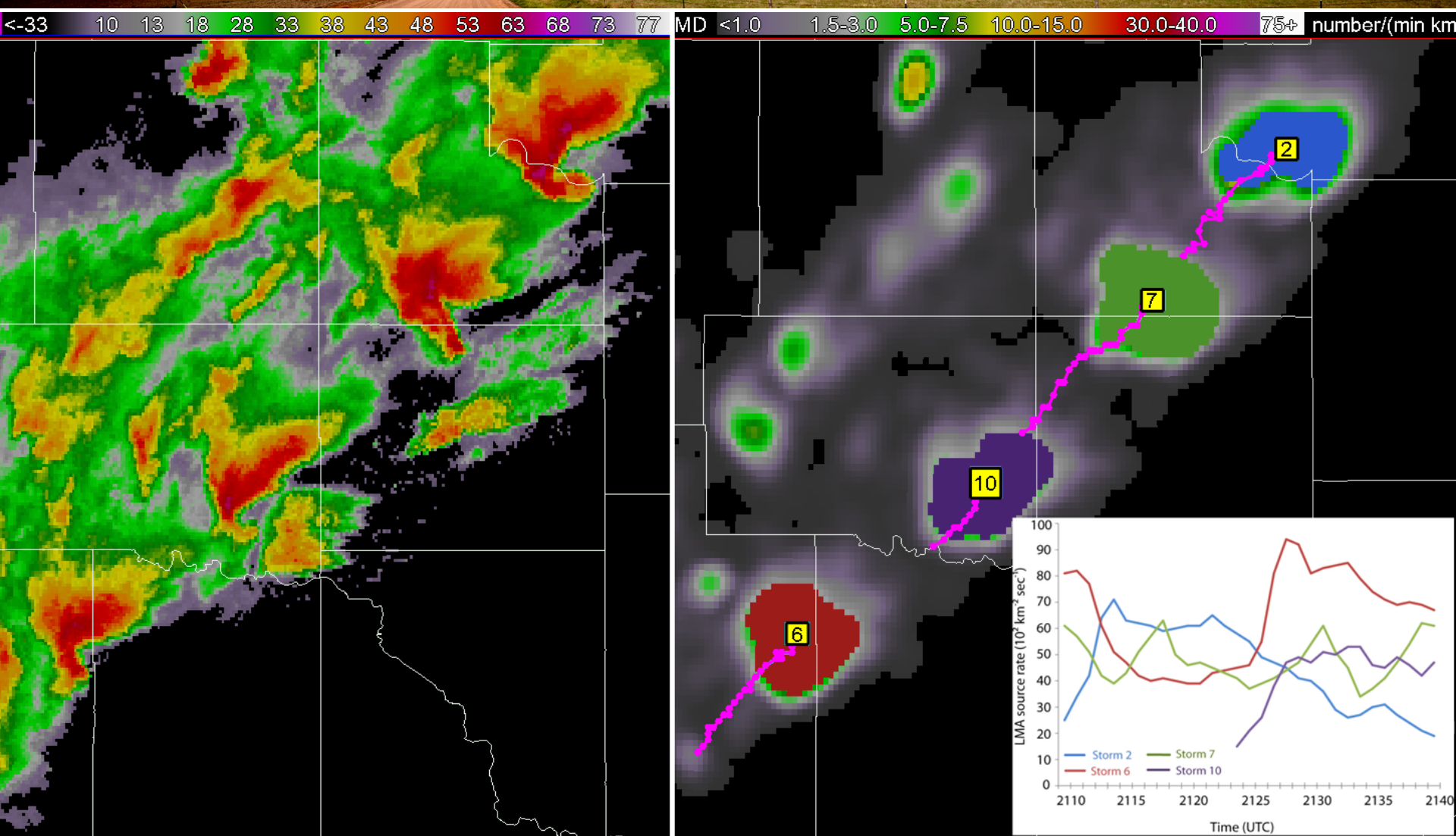
Should forecaster view this as time series too?

Get the forecaster get an alert?

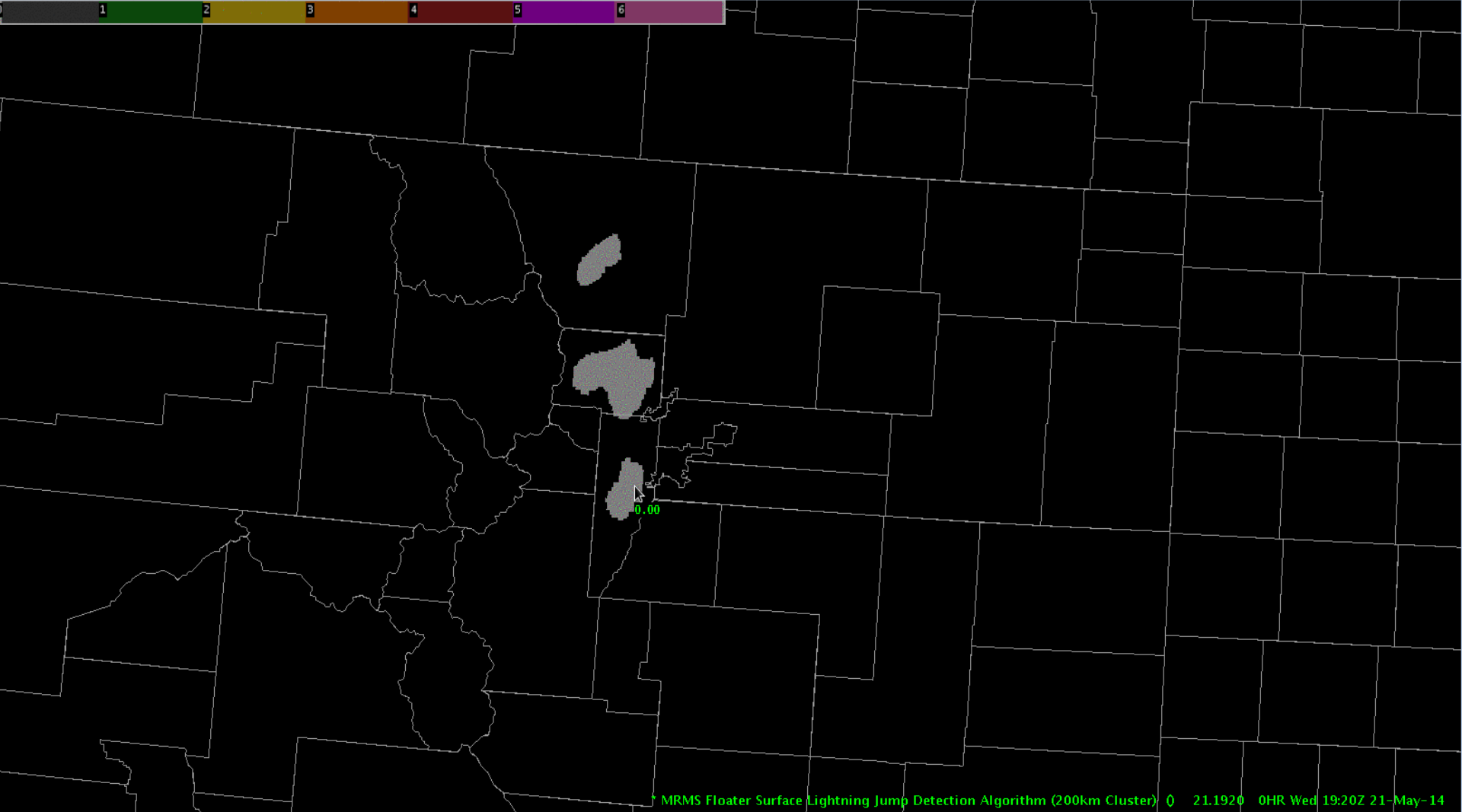
Goodman et al (1988), MacGorman et al (1989), Williams et al (1999)

Hear bells?  
See flashing lights?

More recently Schultz et al (2009, 2011)



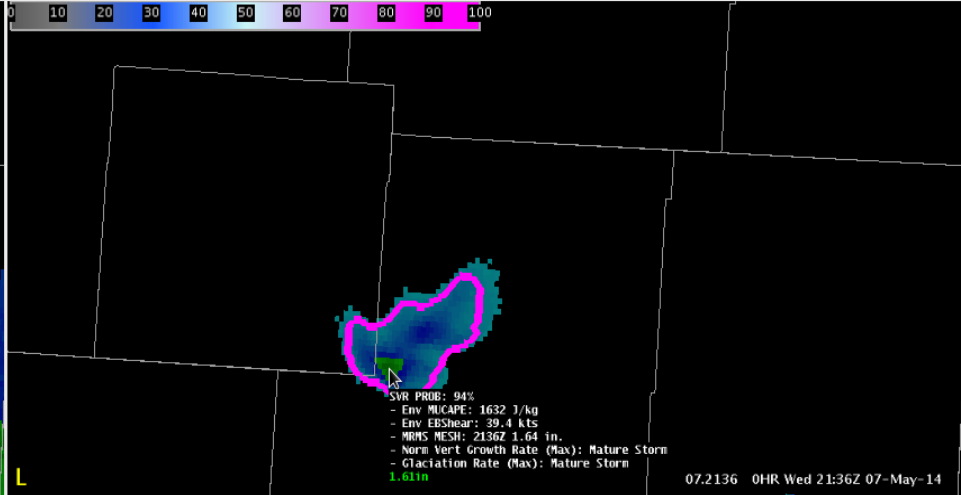
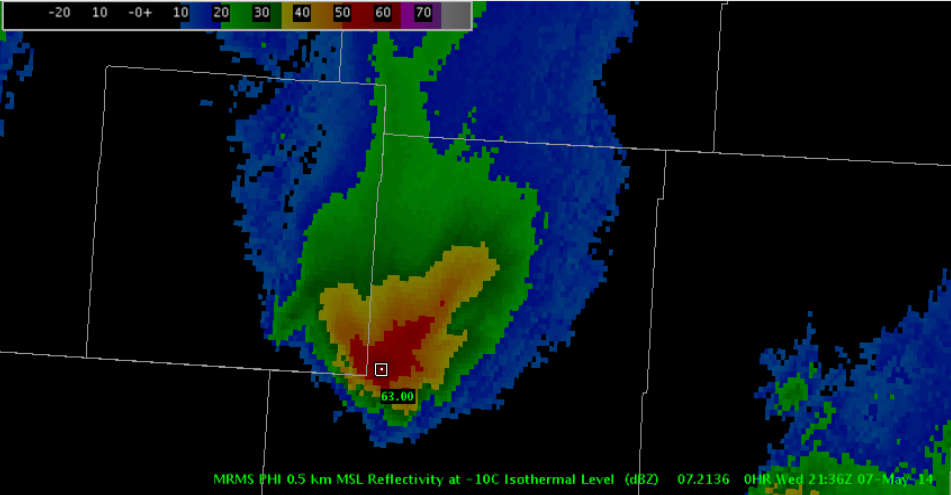
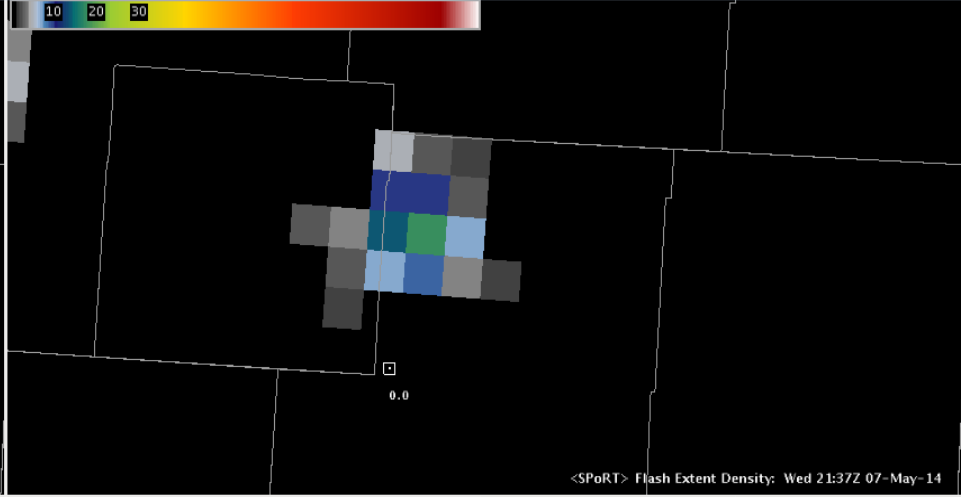
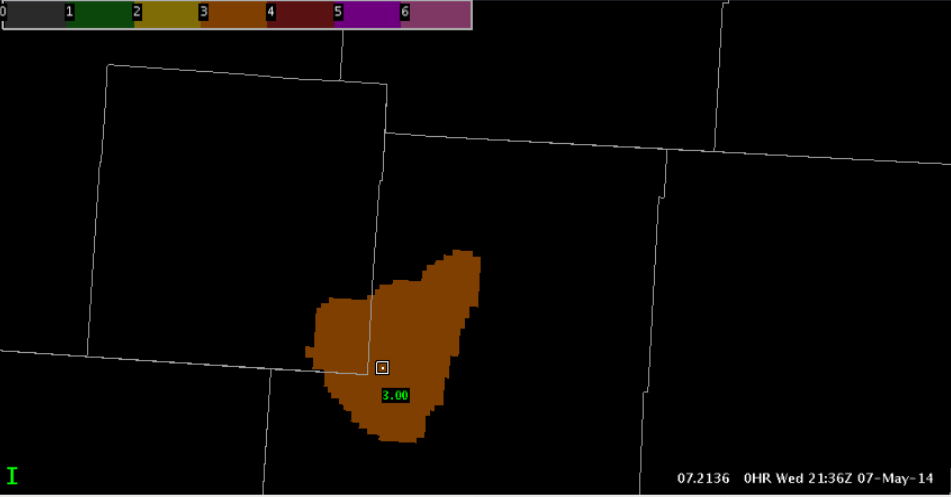




“I really think this could be one of the most valuable tools in WFO operations. Once a jump - or more precisely a series of jumps occurred - there seem to be excellent correlation to an increase in storm intensity.”

*-NWS Forecaster, Post Event Survey*



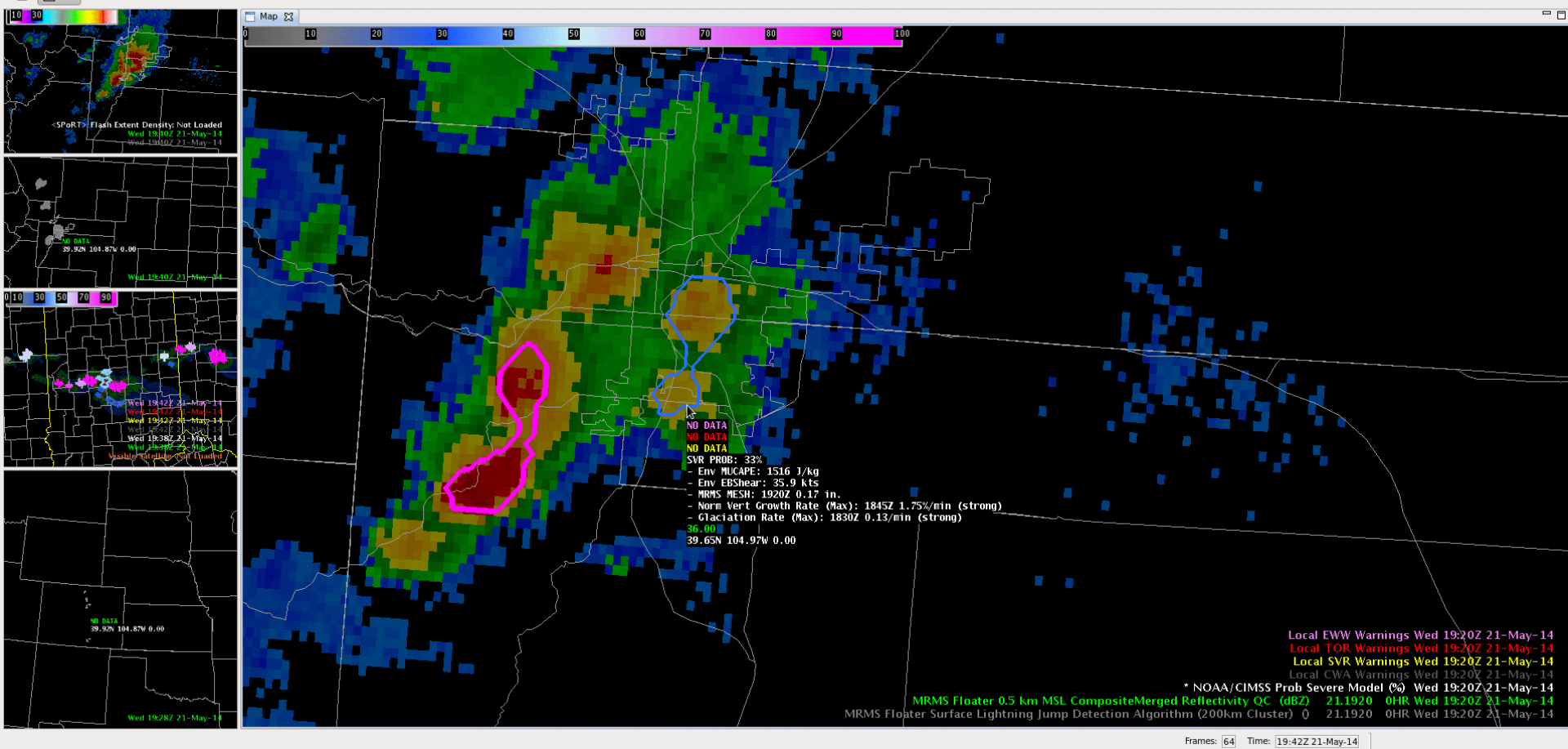


## Lightning Data was heavily used in warning operations:

- Rapid (1 min) update – filled gap in time (and distance) from radar
- Jump provided view of rapid intensification in multiple storm environments
- Provided extra confidence in warning decision







“In this case, ProbSevere and LJDA both displayed the rapid intensification of the updraft, and could be especially useful in identifying the first severe storm of the day, and the maintenance of the ProbSevere and additional lightning jumps continued to highlight the threat of severe weather as the storm continued eastward as the storm propagated eastward.

This information is a high temporal resolution (1-2 minutes) and provides additional data points that can fill gaps between radar volume times.”

-NWS Forecasters (HWT blog)



## Grand Scientific Challenge 4:

**Predict useful warnings of lightning activity  
one hour in advance (onset through demise)**

### GOES-R Collaborators:

NOAA Satellite and Information Service (NESDIS)

Univ. of Alabama – Huntsville

Univ. of Wisconsin – Coop. Inst. for Meteorological Satellite Studies (CIMSS)

NASA – Short-term Prediction Research and Transition Center (SPoRT)

NOAA/ Center for Satellite Applications and Research (STAR)

Colorado State Univ - Coop. Inst. for Research in the Atmosphere (CIRA)

Texas Tech Univ

Meteorological Development Laboratory

Storm Prediction Center

National Weather Service







# Summary

The HWT provides a vehicle for forecasters to evaluate GOES-R instruments and capabilities **PRIOR** to launch to ensure use of GOES-R system by the National Weather Service as soon as it is operational.

**Includes:** Iterative Product Development (e.g., Operations to Research feedback) as well as development of training / best practices.

HWT also fosters collaboration between organizations leading to new research applications and ideas.

