Using the Pseudo-GLM in Warning and Impact-based Decision Support in Preparation for GOES-R

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Satellite Science Week

Short-term Prediction Research and Transition (SPoRT)

SPoRT transitions unique NASA and NOAA observations and research capabilities to the operational weather community to improve short-term weather forecasts.

- Close collaboration with numerous WFOs across the country
- Began in 2002, first products to AWIPS in February 2003 (Total lightning!)

SPoRT Paradigm

- Match observations to forecast challenges
- Develop and assess solution in "testbed" environment
- Transition solution to decision support system
- Develop/conduct training, product assessment and impact

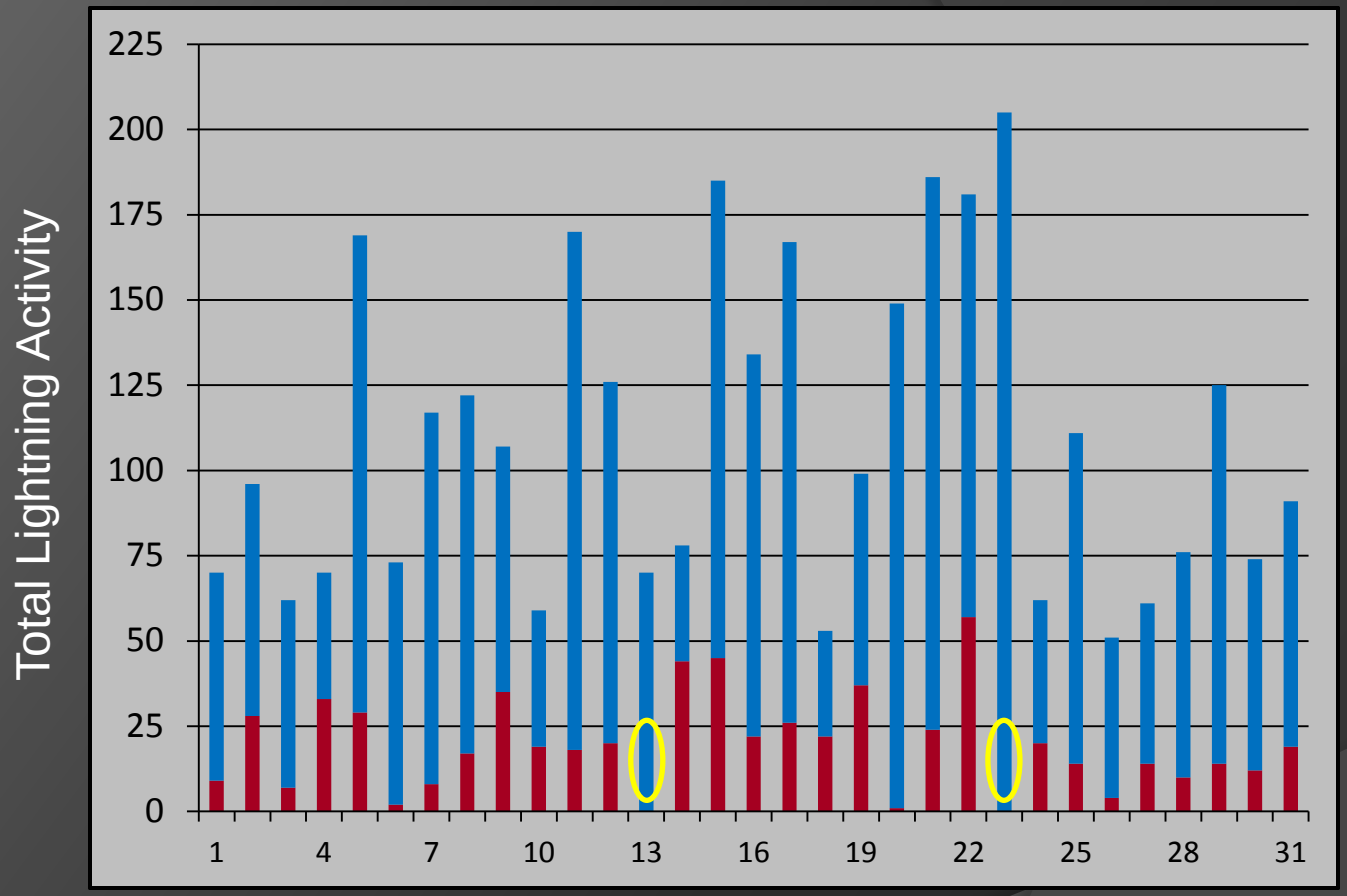
Benefit

- Demonstrate capability of NASA experimental products to weather applications and societal benefit
- Prepares forecasters for use of data from next generation of operational satellites (NPP/JPSS, GOES-R)

What is Total Lightning?

Total Lightning

Intra-cloud AND cloud-to-ground

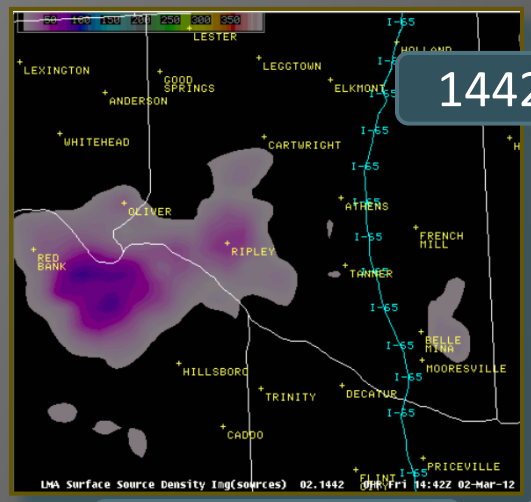


31 Individual Storms

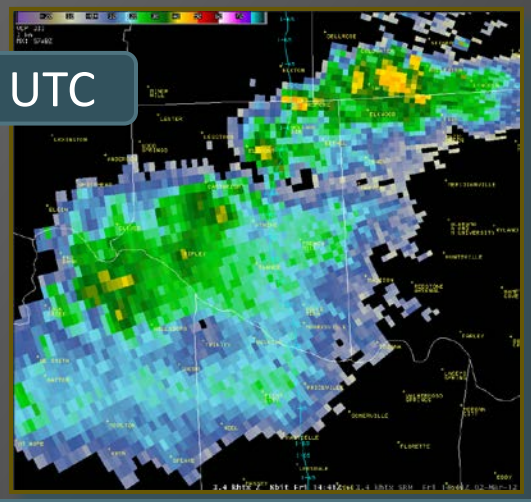
Cloud-to-Ground Strikes

Inter-Cloud Flashes

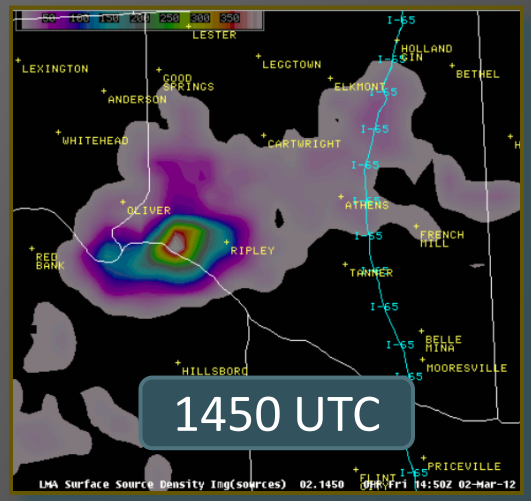
Total Lightning: Details

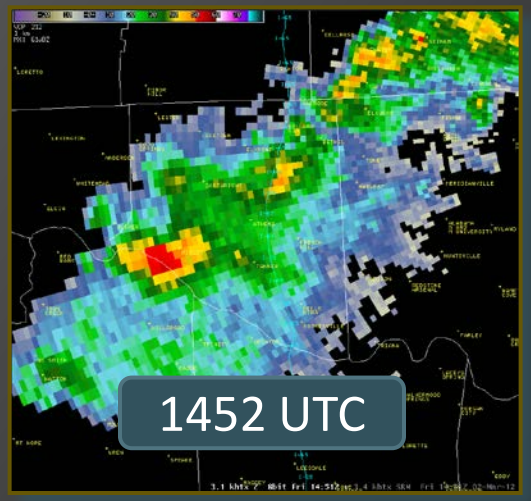


Total Lightning



3.4° Reflectivity, ~20 kft





Total Lightning

- Observes intra-cloud (IC) and cloud-to-ground (CG) lightning (1-2 min updates)

Physical Reasoning

- Driven by updraft in mixed phase region (above -10°C isotherm)
- Stronger, deeper updrafts
  - More lightning

Application

- Increase in total lightning signifies strengthening updraft
- Important for severe weather and lightning safety

The Pseudo-Geostationary Lightning Mapper

Prepare forecasters for GLM

Counts lightning flashes

Pseudo-GLM only uses ground-based VHF data

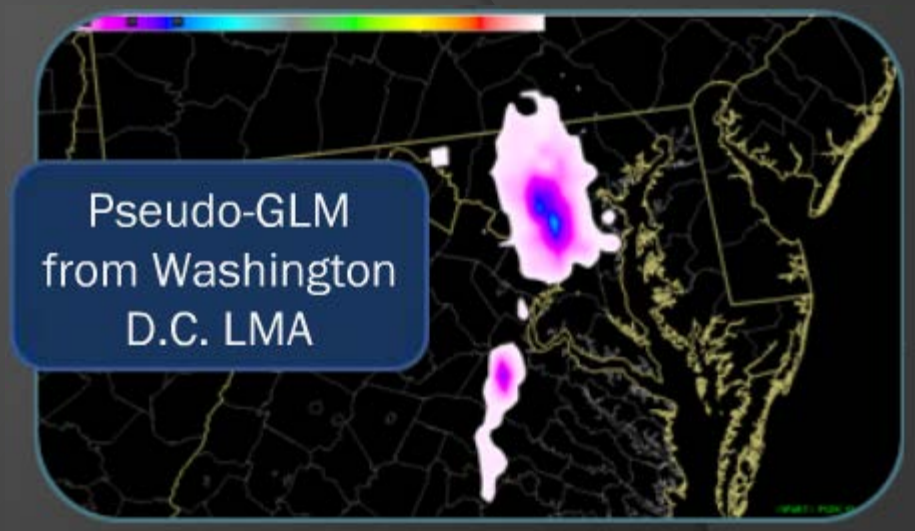
- GLM is optically based
- Different from PGLM proxy that uses TRMM LIS data

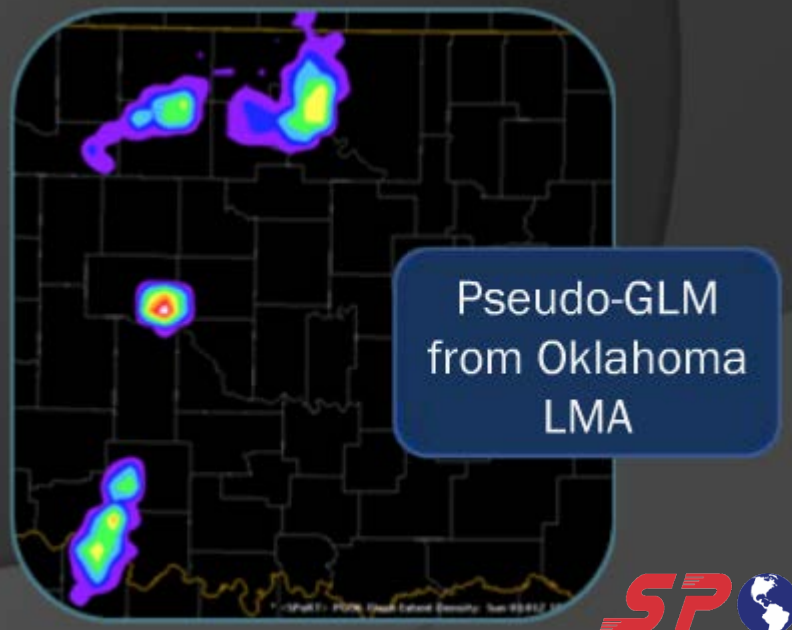
Pseudo GLM is for training

- Flash rate trends
- Cellular flash density patterns
- How to fuse with operations

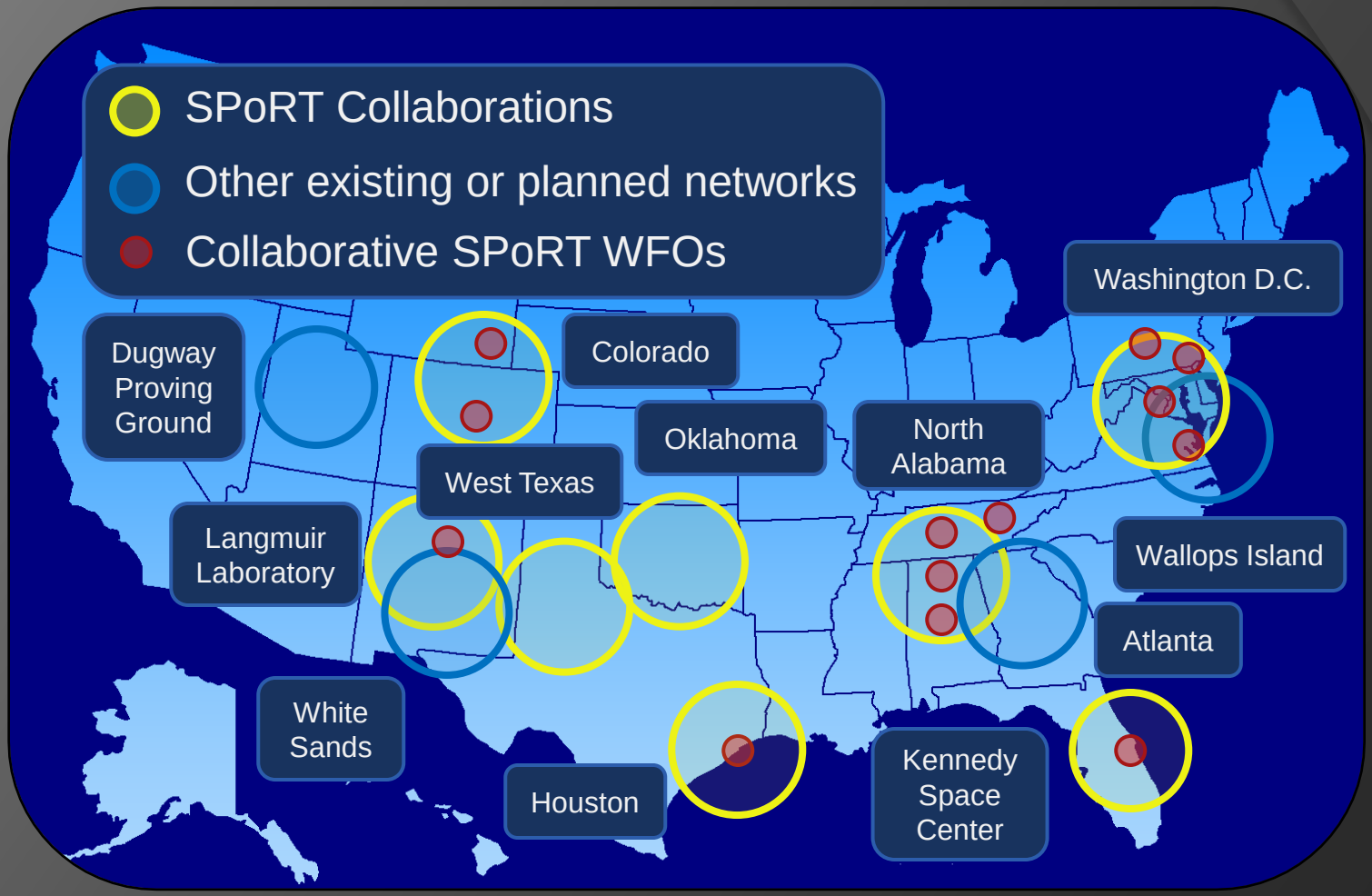
Advantage of PGLM

- Available in real-time
- Applicable to any LMA network





Total Lightning Collaborations



8 current partners

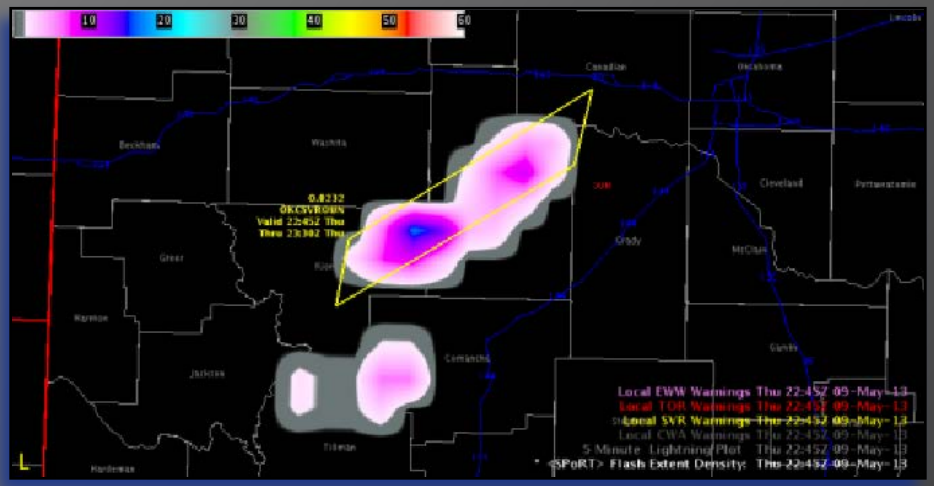
2 pending – Atlanta and Wallops Island

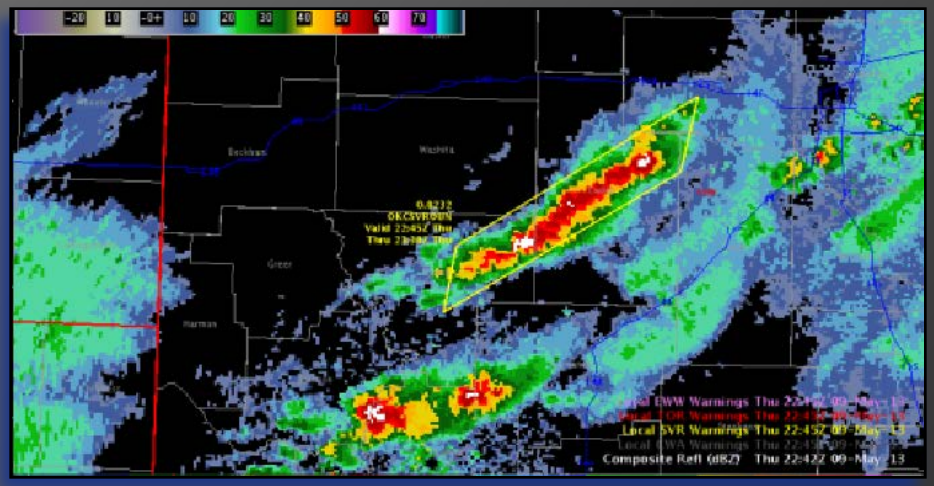
Diverse locations

GOES-R has supported efforts to expand collaborations

Collaborations also include: Denver, Albuquerque, Houston CWSUs and Aviation Weather Center and Storm Prediction Center

Importance of Collaborations



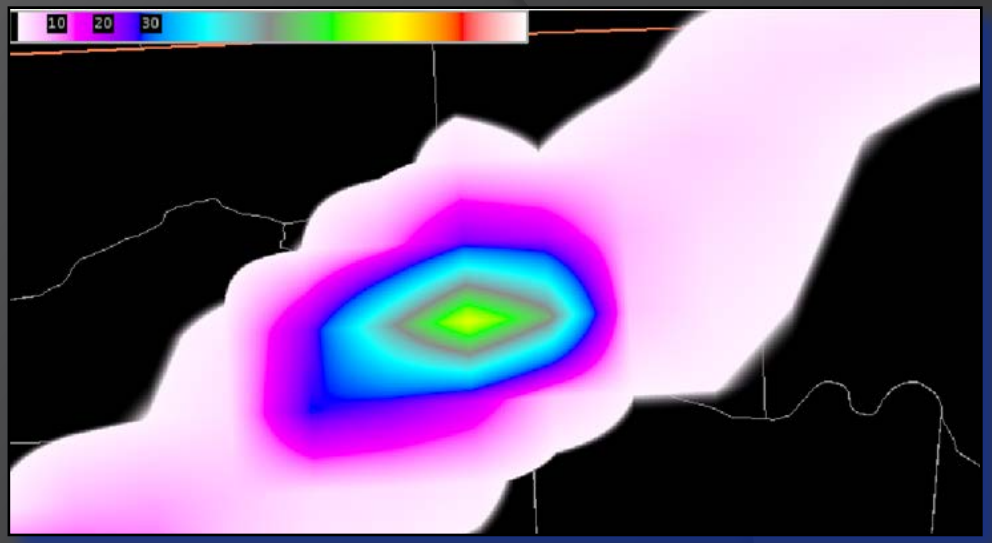


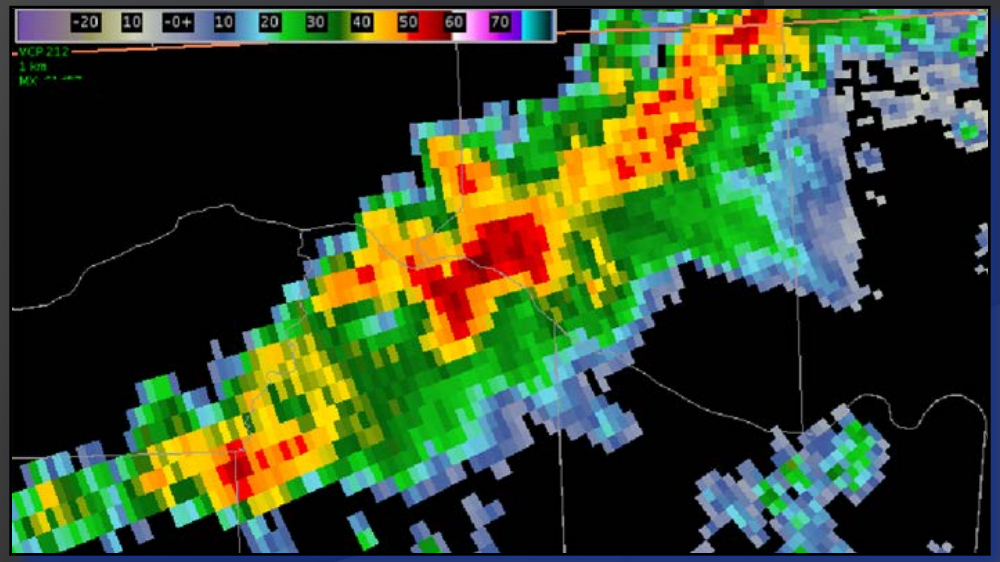
Not all partners use PGLM

- Benefits from diverse group
  - Severe weather support
    - Multiple regions
  - Impact-base decision support
  - Aviation interests
  - Situational awareness
  - Lightning safety
- Product recommendations
  - Visualizations
  - Data fusion
  - New product ideas

What Has PGLM Accomplished So Far?

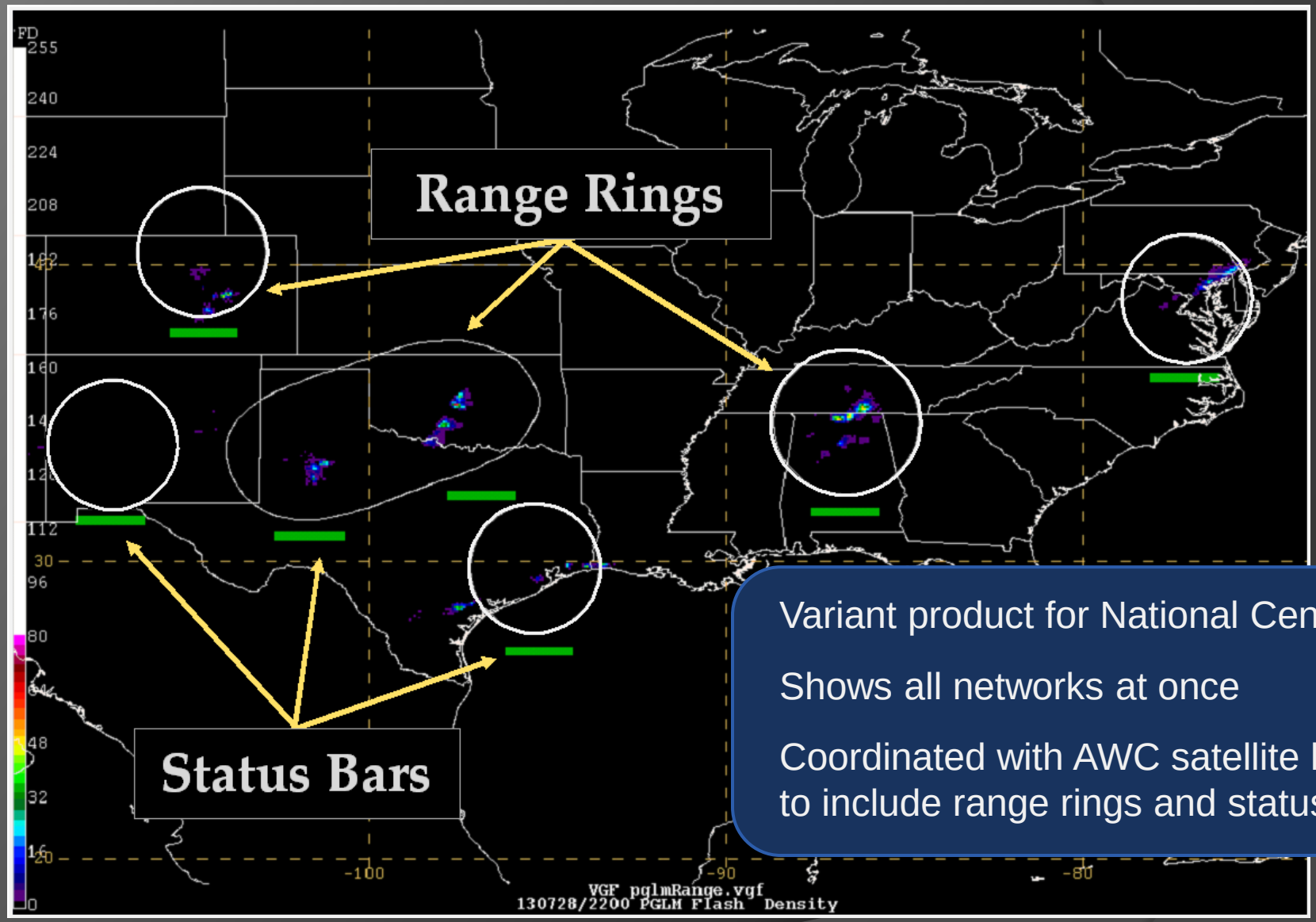
- Provide training on total lightning
- Provide “hands-on” ability to evaluate data in real-time
- Train on the future Geostationary Lightning Mapper
- Develop procedures to fuse total lightning with other data sets
- Demonstrate that GLM resolution can apply lessons learned from years of work with lightning mapping arrays





“Operational” Examples

The PGLM Mosaic Product

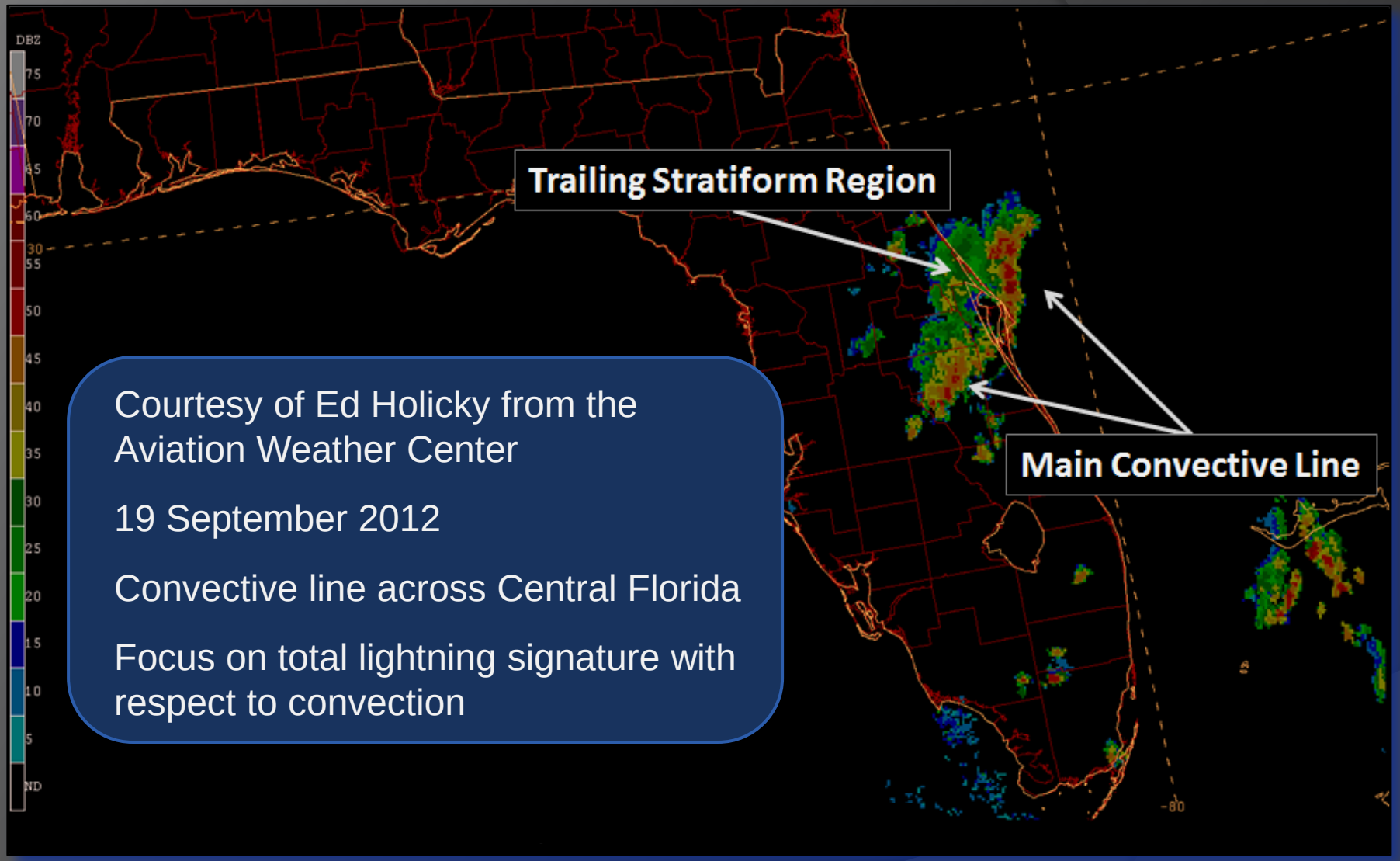


Variant product for National Centers

Shows all networks at once

Coordinated with AWC satellite liaison to include range rings and status bars

Aviation Example



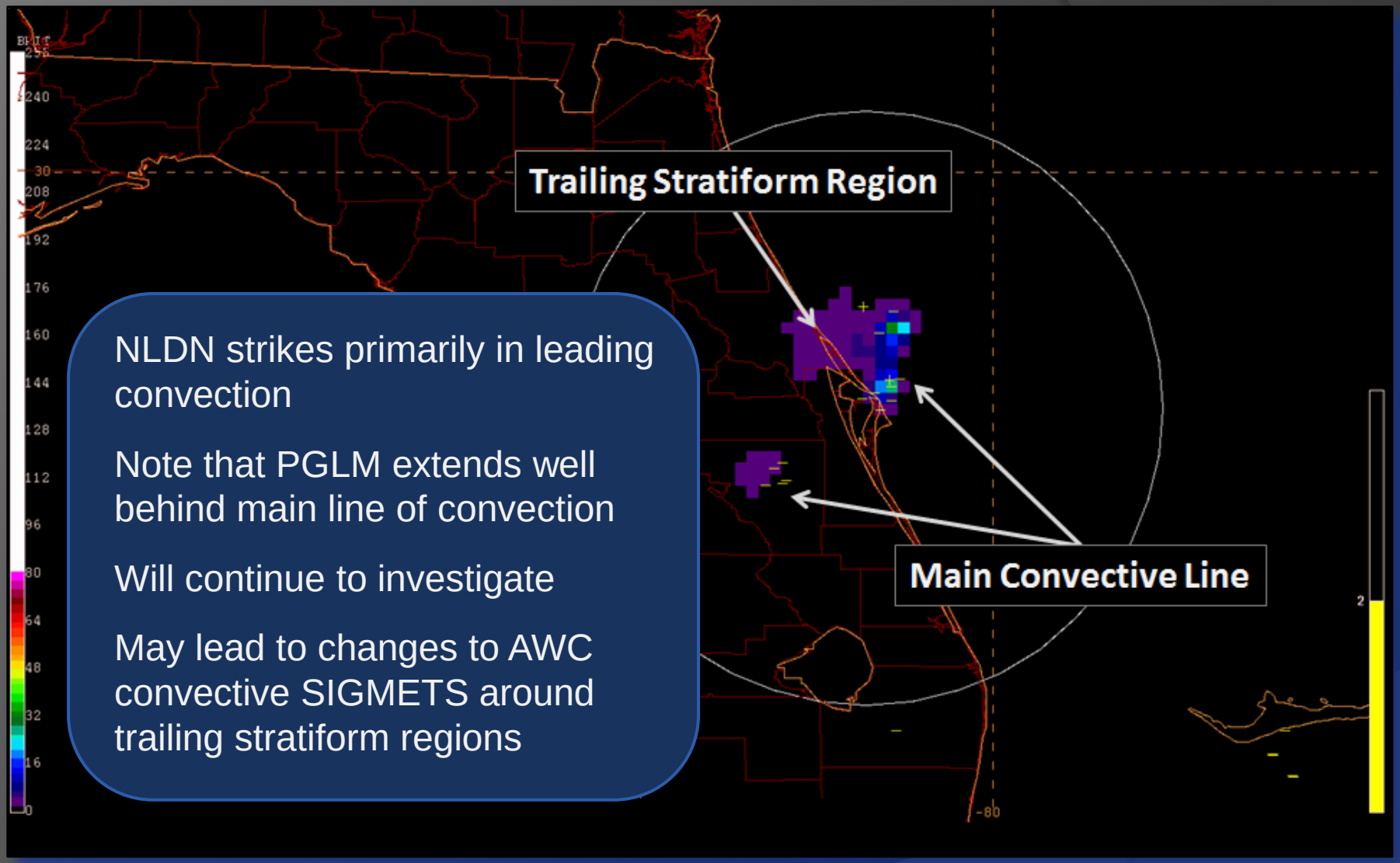
Courtesy of Ed Holicky from the Aviation Weather Center

19 September 2012

Convective line across Central Florida

Focus on total lightning signature with respect to convection

Aviation Example



NLDN strikes primarily in leading convection

Note that PGLM extends well behind main line of convection

Will continue to investigate

May lead to changes to AWC convective SIGMETS around trailing stratiform regions

Emergency Operations Example

WFO Morristown, TN

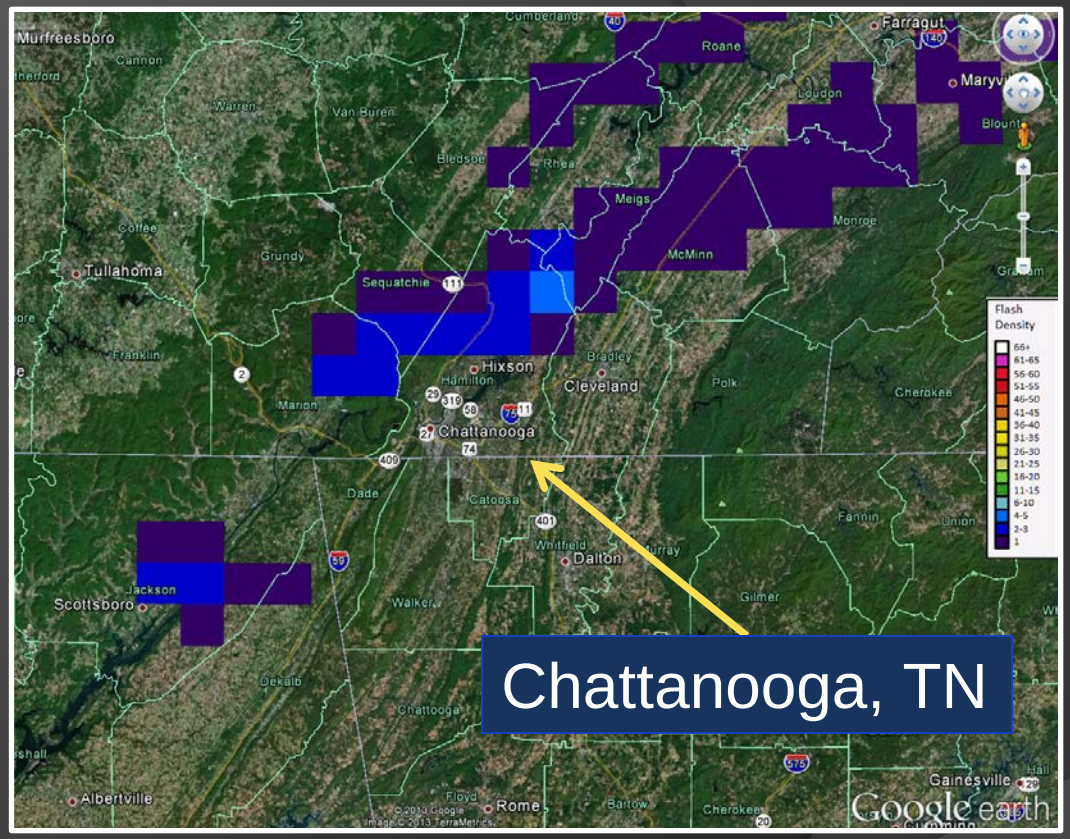
- Emergency Managers are WFO's end users
- Evaluate PGLM with Emergency Managers
- Understood this is experimental

Web Access

- 1 hour loop
- Pan and zoom ability
- Adjustable with feedback

Example Shown

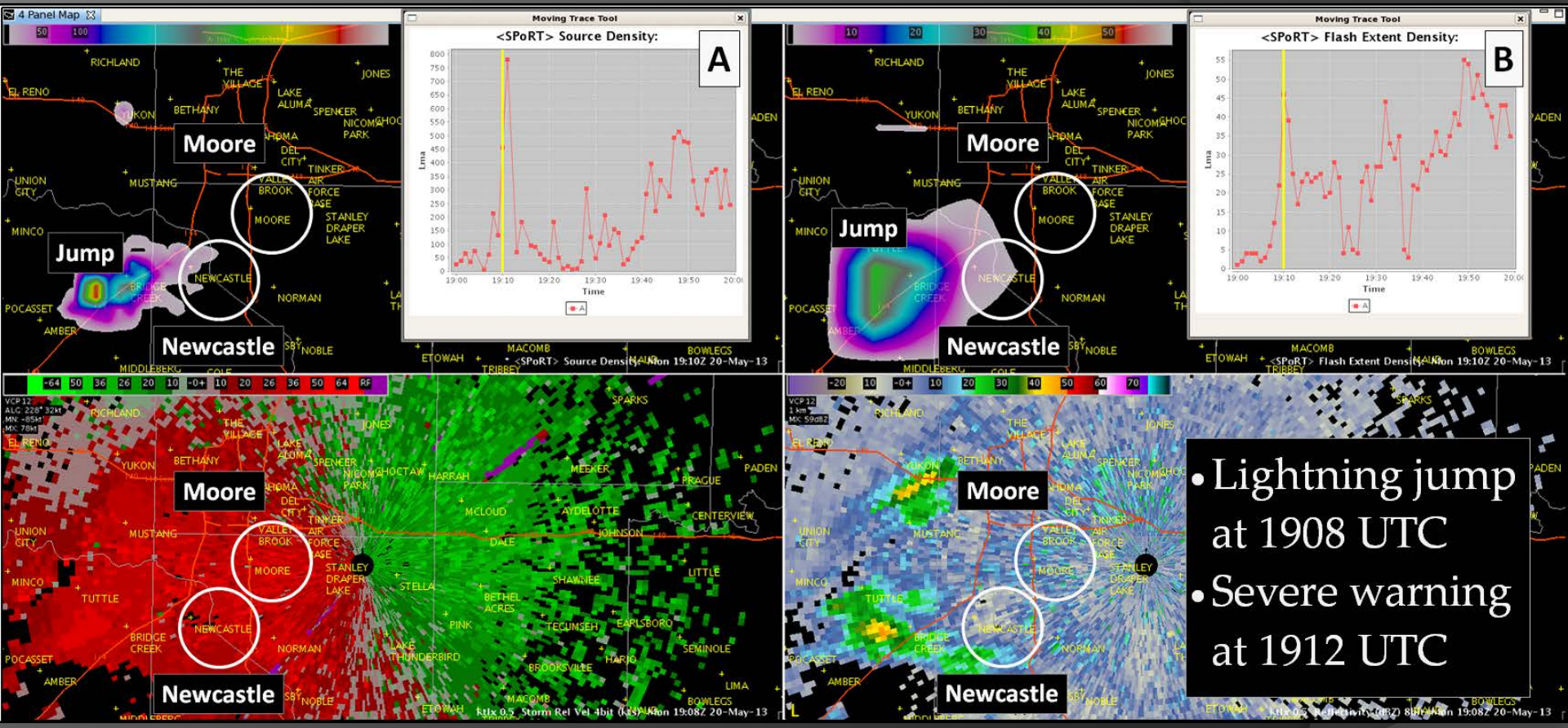
- Weak storms, but these potentially more dangerous for lightning safety



Chattanooga, TN

Animation: 29 May 2012, 20-21 UTC

Moore, Oklahoma Tornadic Supercell



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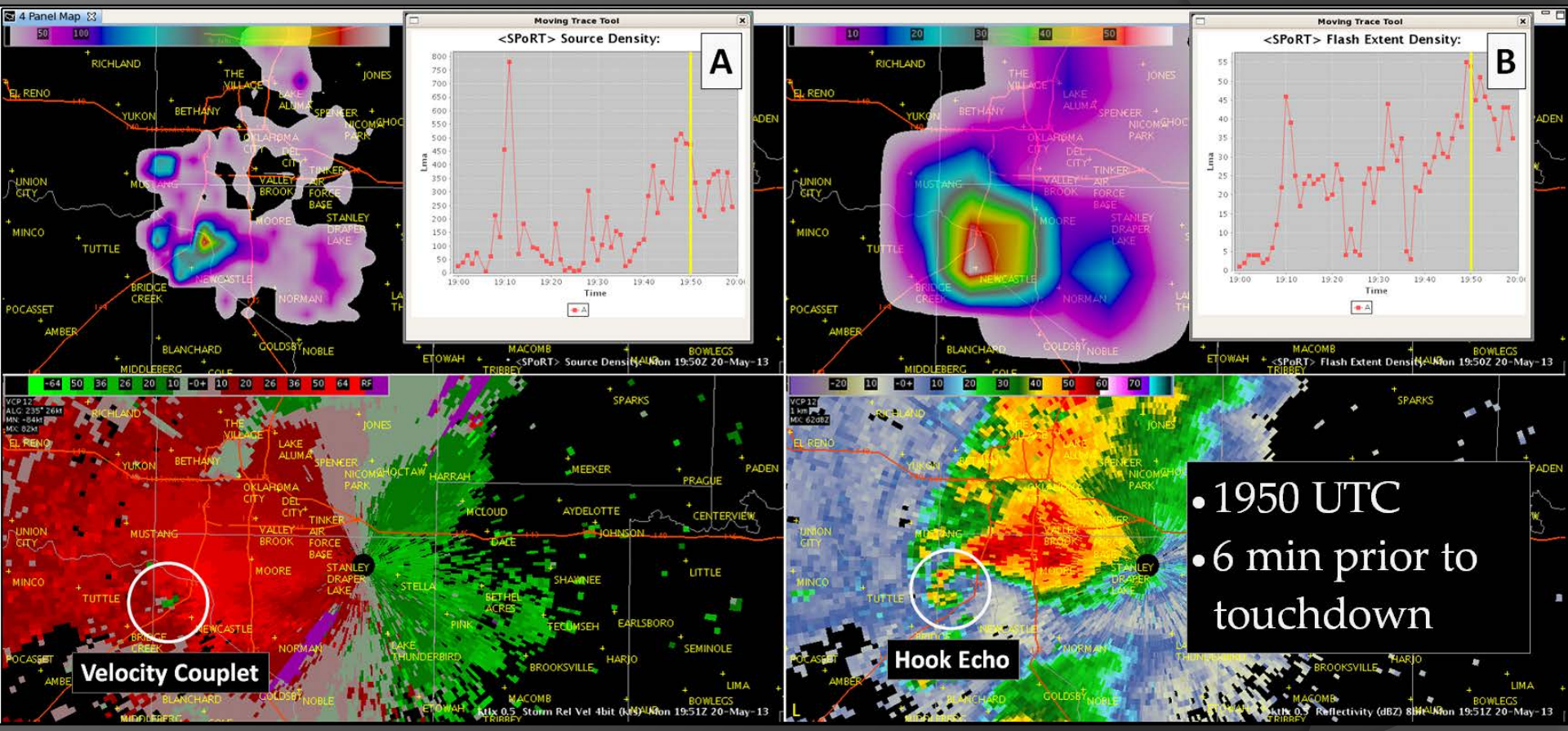

Transitioning unique NASA data and research technologies to operations

Upcoming Activities

Several GOES-R Visiting Scientist trips

- Expand collaborations with the Colorado, Houston, and Langmuir Labs (NMT) networks
- Supporting forecast offices and now Center Weather Service Units for aviation

Initiating new partnerships

- Central Florida LMA
- North Georgia LMA
- Wallops Island LMA

New round of evaluations

- Hazardous Weather Testbed (May 2014)
- Aviation Weather Center (August 2014)
- SPoRT-led evaluation with all total lightning partners (May-June 2014)

Questions?

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NASA SPoRT web page: http://weather.msfc.nasa.gov/sport/

Wide World of SPoRT blog: http://nasasport.wordpress.com/