Progress on GOES-R Proving Ground Convective Decision Support Research

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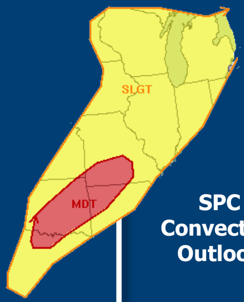
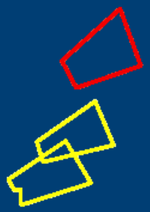
Multiple Other Contributions from GOES-R Funded Principal Investigators

European Convective Working Group 2016 – Florence, Italy

The -6-0 h Convective Forecasting Timeline

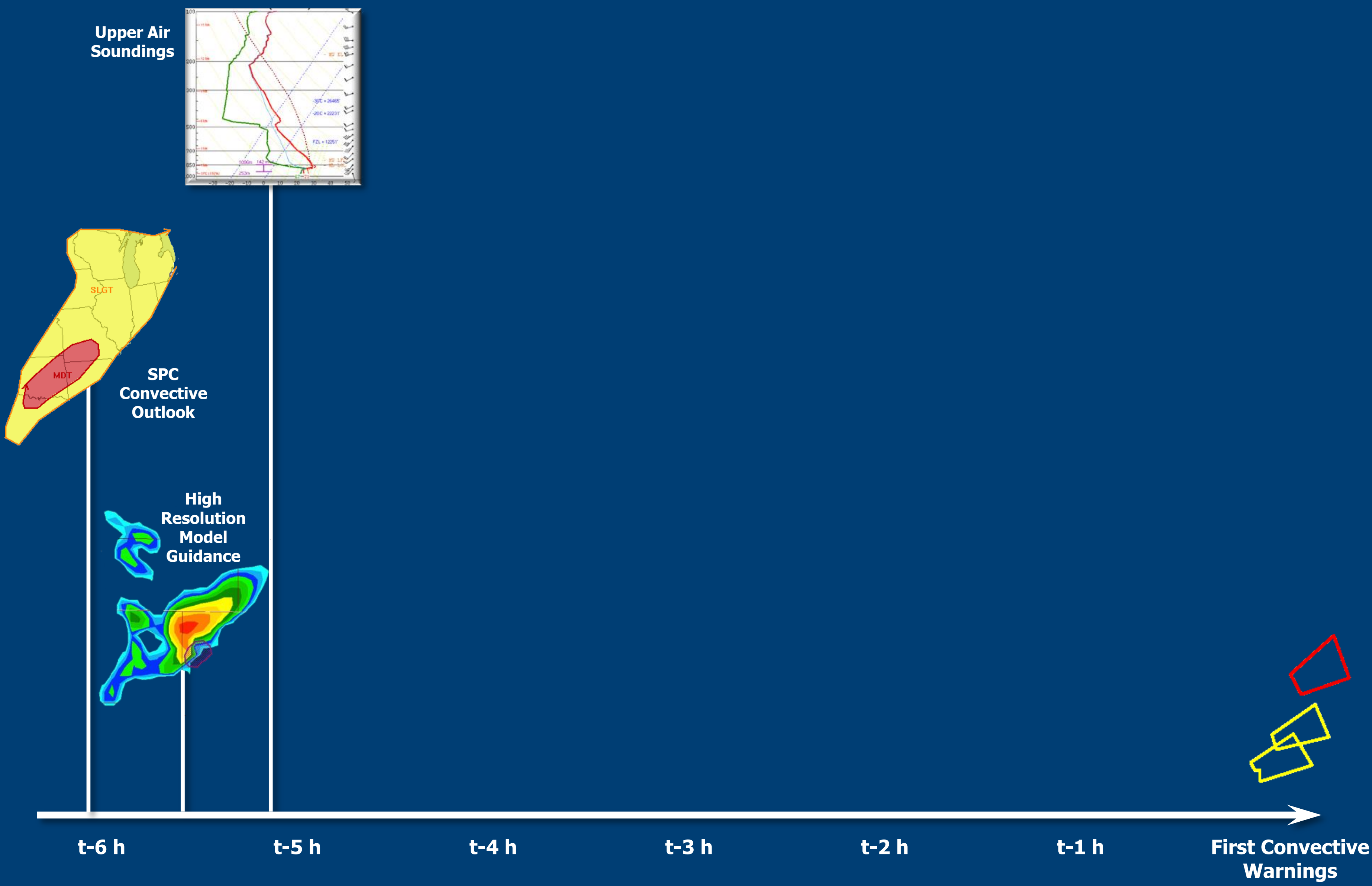


SPC
Convective
Outlook



t-6 h | t-5 h | t-4 h | t-3 h | t-2 h | t-1 h | First Convective Warnings

The -6-0 h Convective Forecasting Timeline



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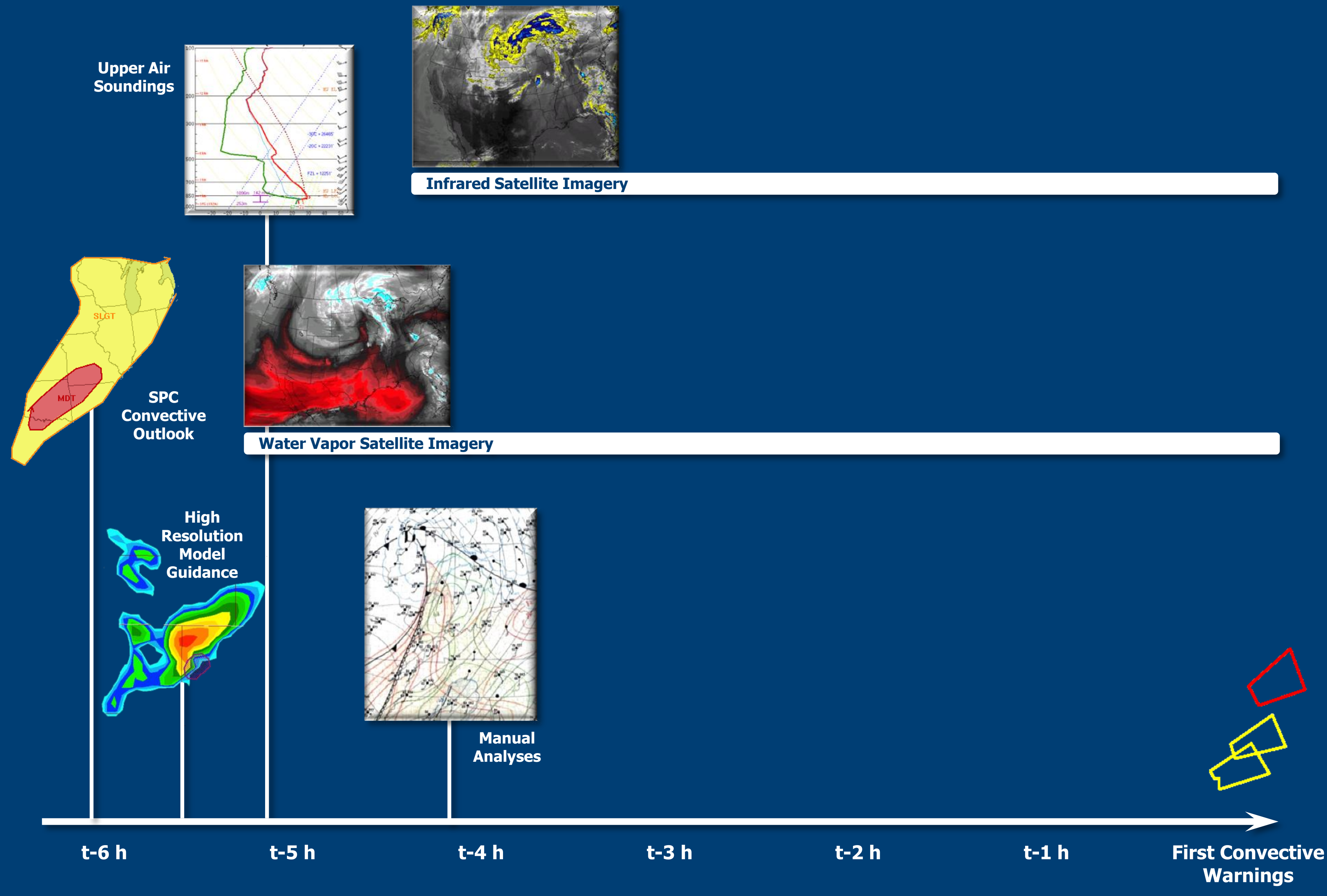

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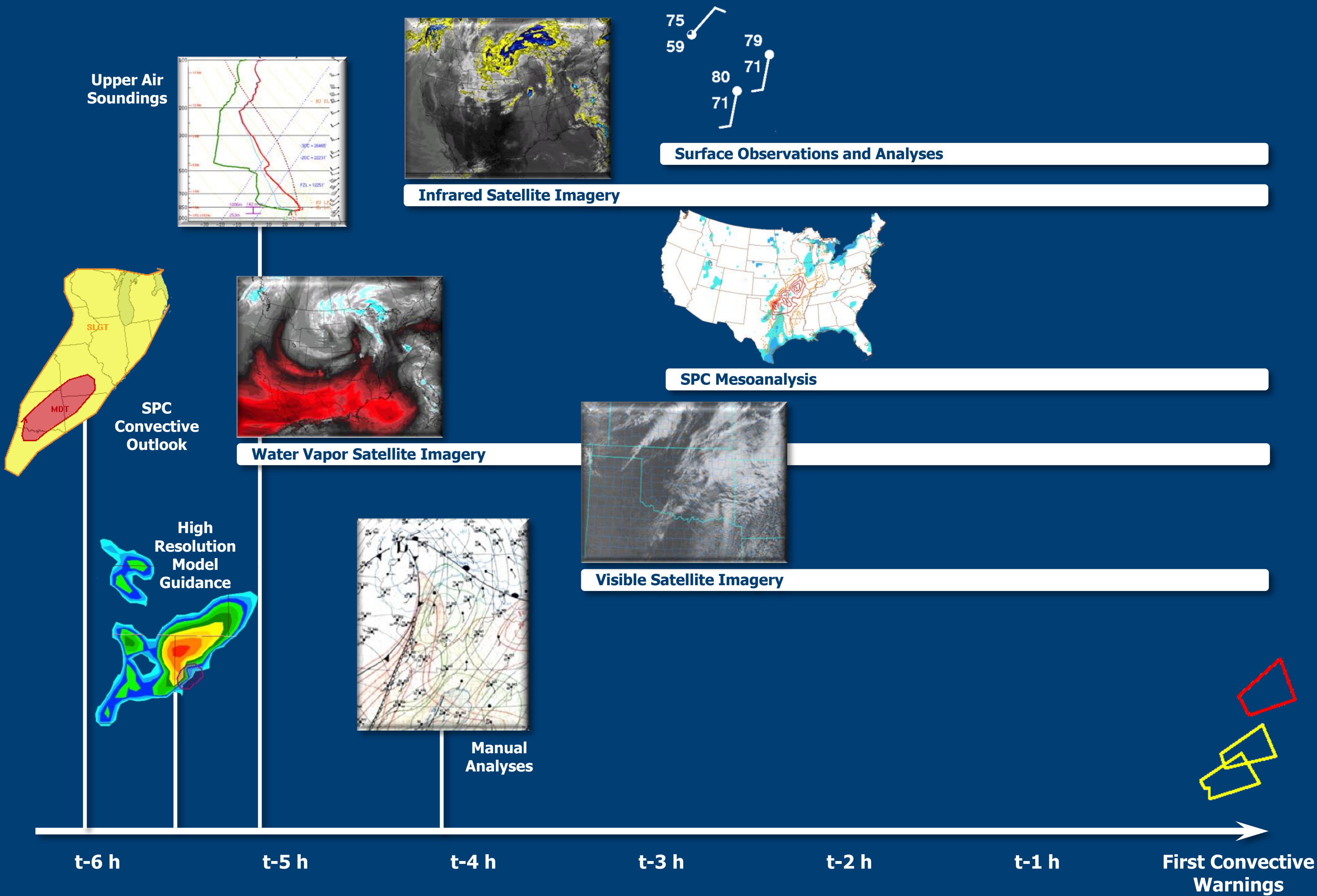

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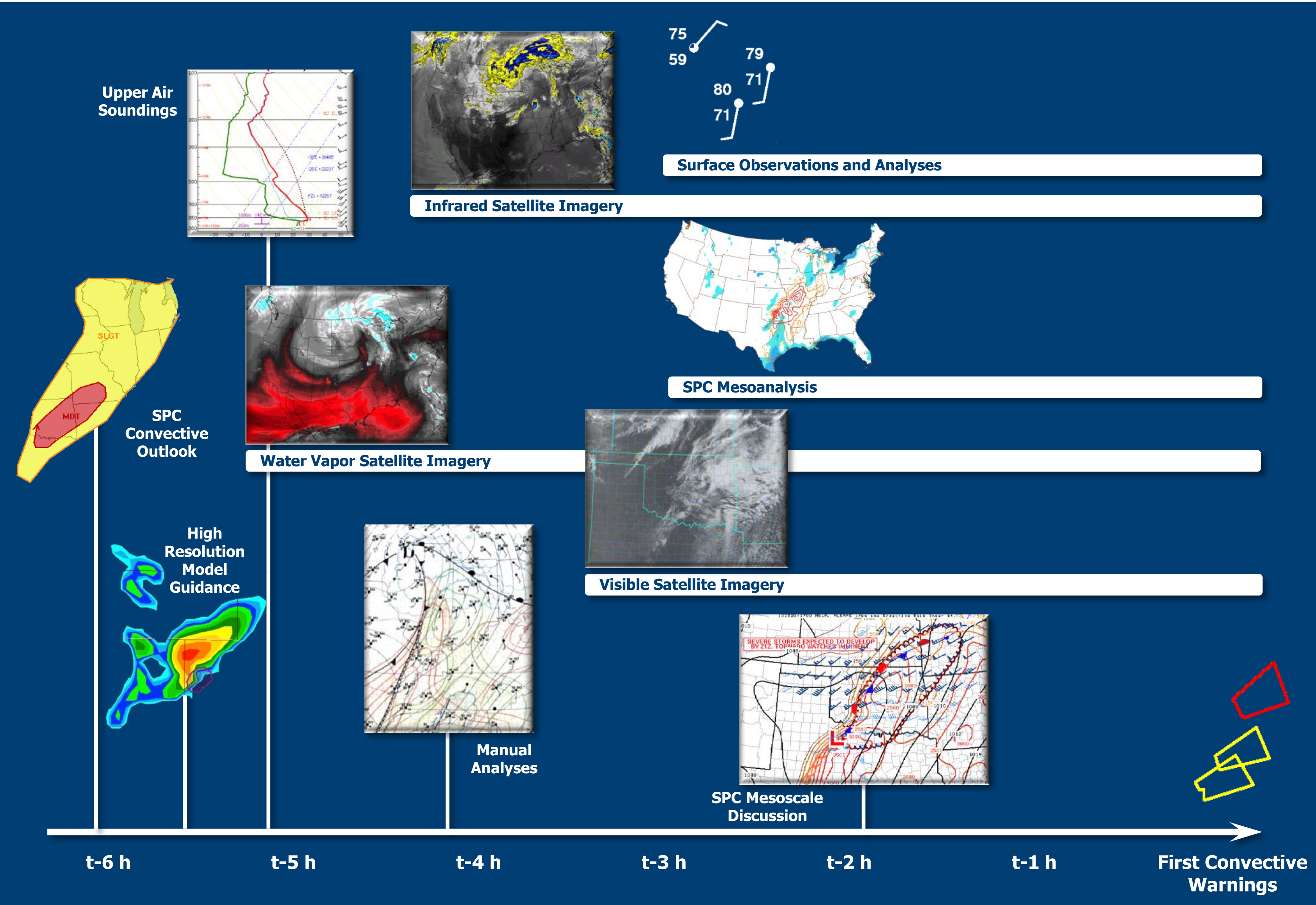

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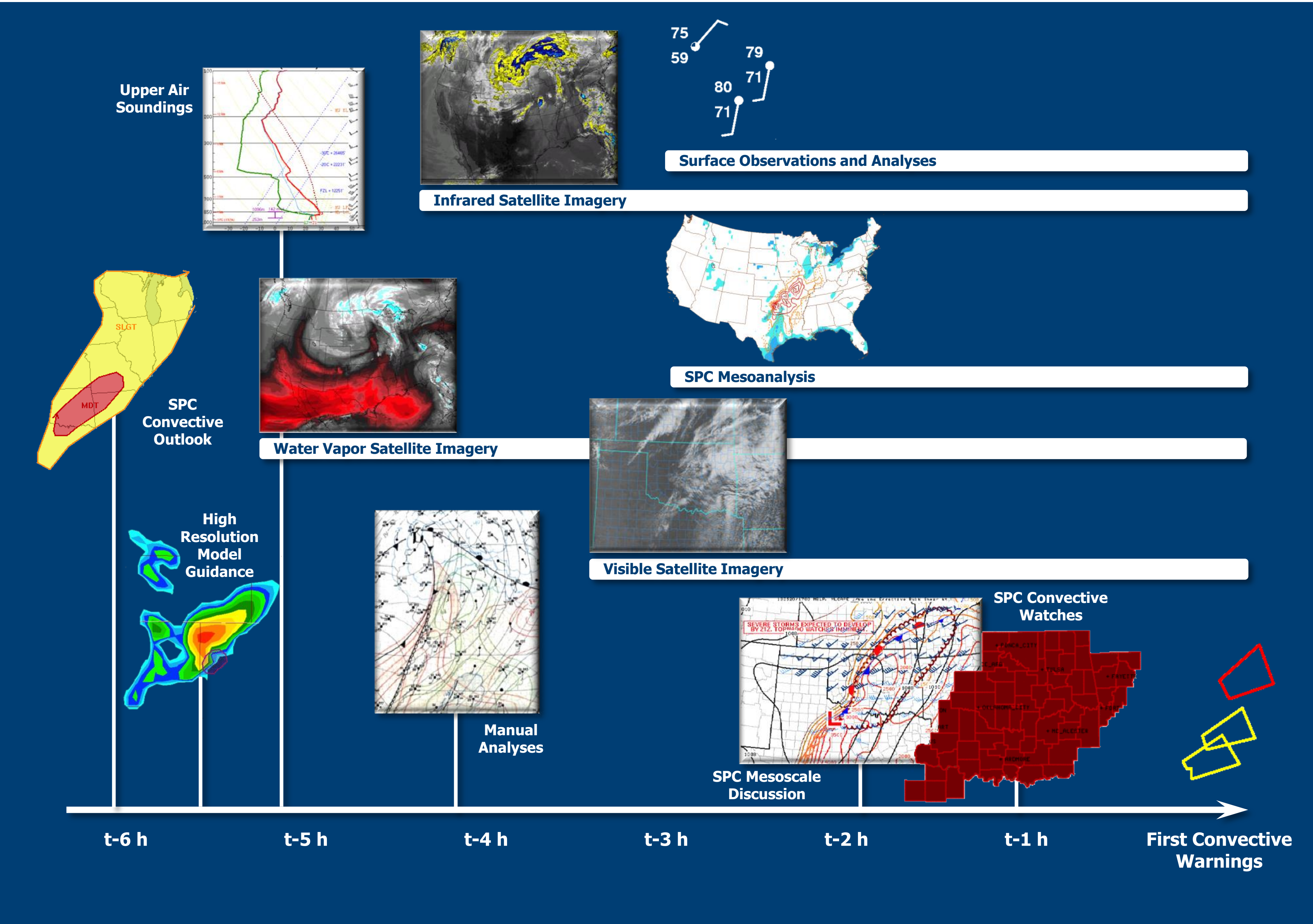

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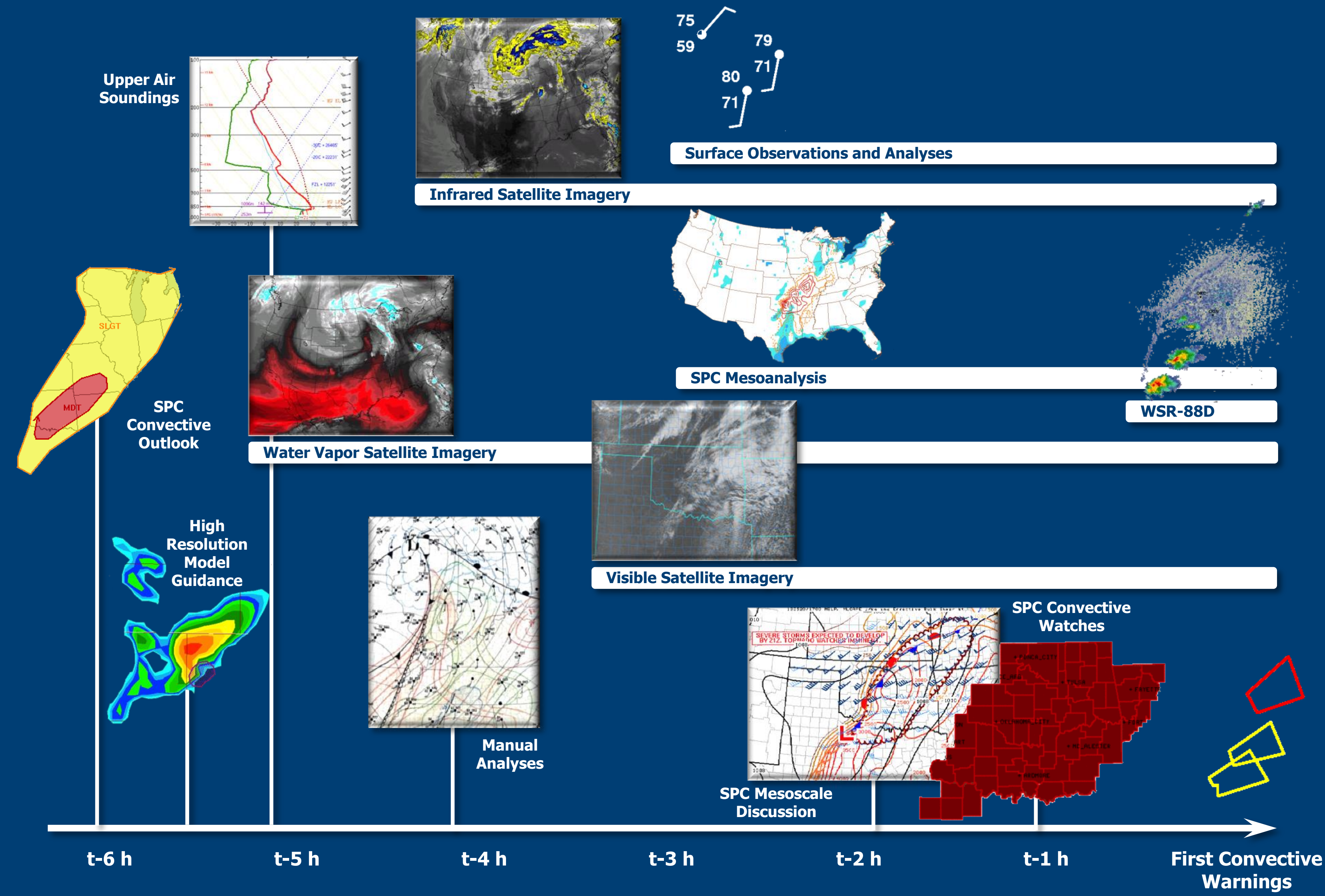

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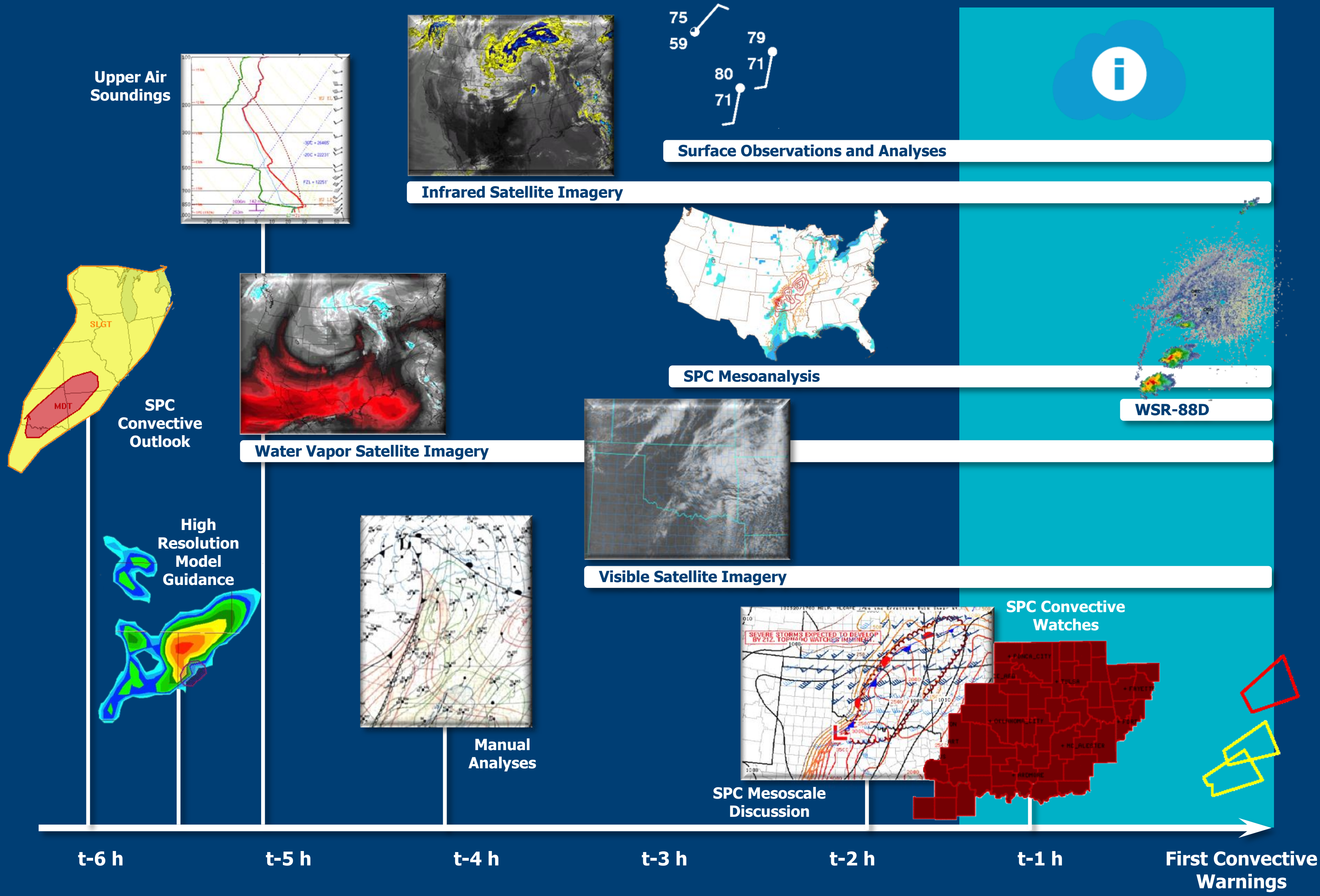
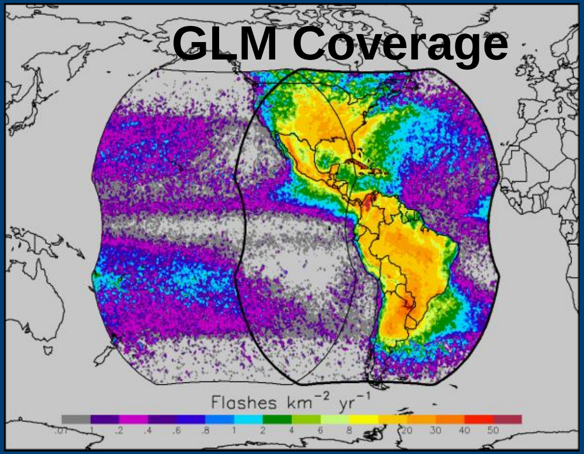


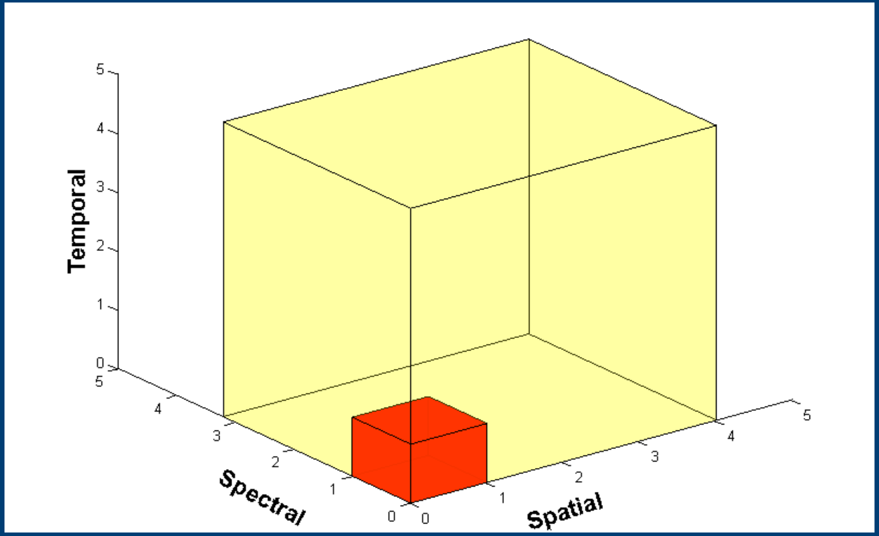
GOES-R

- Next generation of NOAA/NASA geo weather satellites
  - R-Series includes 4 satellites
  - First to launch in Oct 14, 2016

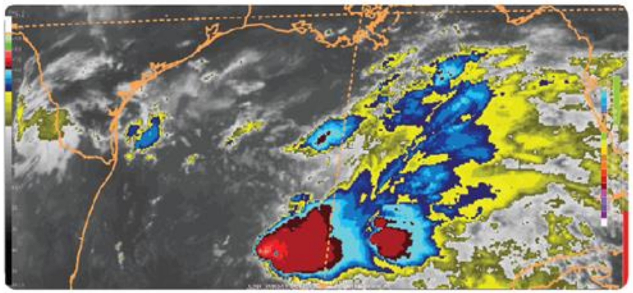


- Geostationary Lightning Mapper (GLM)

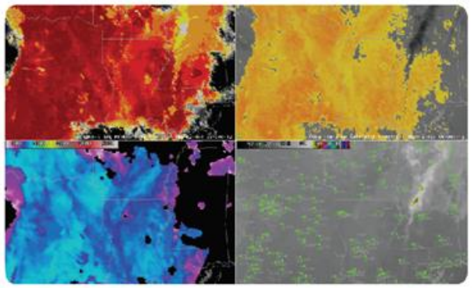
- Advanced Baseline Imager (ABI)
  - 3x more spectral bands
    - 16 on ABI vs. 5 today
  - 4x spatial resolution
    - IR: 2 km vs. 4 km
    - 0.64 um vis: 0.5 km vs. 1 km
  - 5x temporal coverage
    - 5-min vs. 25-min full disk



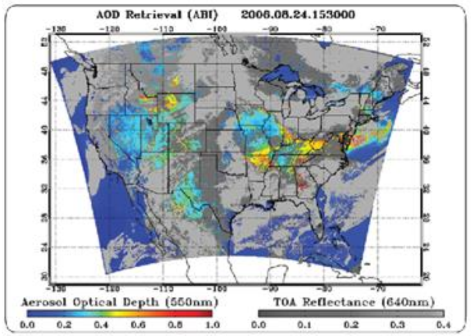
GOES-R Proving Ground Partners



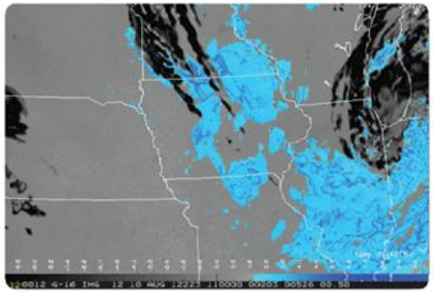
AWC – Kansas City, MO IR Imagery of Oceanic Storms



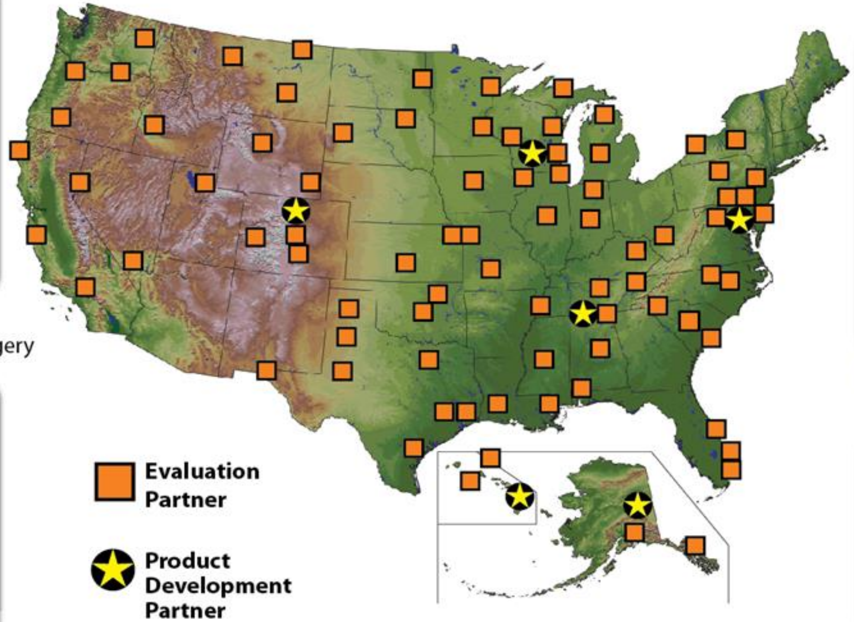
CIMSS/STAR – Madison, WI
Fog/Low Stratus Product

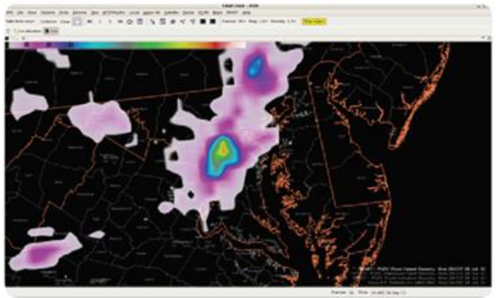


STAR/UMBC – College Park, MD
Aerosol Optical Depth

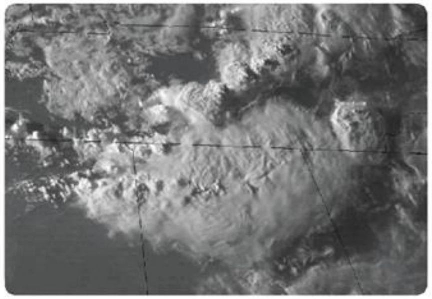


CIRA/STAR – Ft. Collins, CO
ABI Synthetic Low Cloud Enhancement Imagery

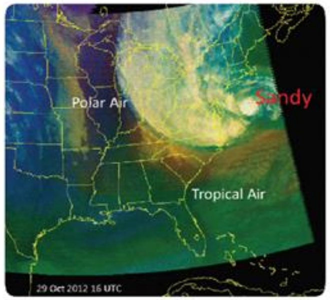




SPoRT/NASA – Huntsville, AL
GLM Lightning Density

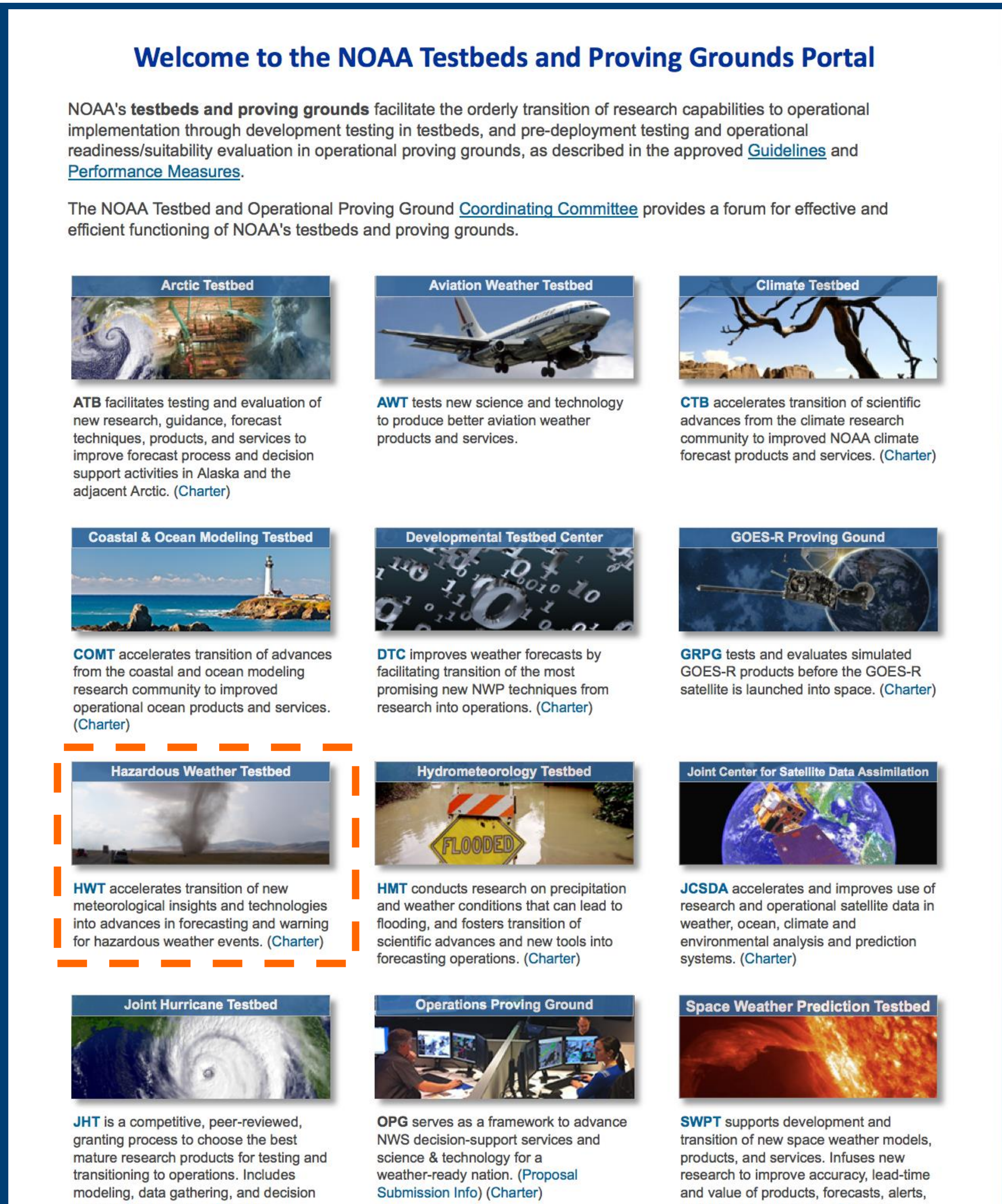


SPC – Norman, OK
Severe Storms 1-Min Visible Imagery of Overshooting Tops



NHC – Miami, FL
RGB Air Mass for Hurricane Sandy

NOAA Testbed Centers



Welcome to the NOAA Testbeds and Proving Grounds Portal

NOAA's **testbeds and proving grounds** facilitate the orderly transition of research capabilities to operational implementation through development testing in testbeds, and pre-deployment testing and operational readiness/suitability evaluation in operational proving grounds, as described in the approved Guidelines and Performance Measures.

The NOAA Testbed and Operational Proving Ground Coordinating Committee provides a forum for effective and efficient functioning of NOAA's testbeds and proving grounds.

Arctic Testbed

ATB facilitates testing and evaluation of new research, guidance, forecast techniques, products, and services to improve forecast process and decision support activities in Alaska and the adjacent Arctic. (Charter)

Aviation Weather Testbed

AWT tests new science and technology to produce better aviation weather products and services.

Climate Testbed

CTB accelerates transition of scientific advances from the climate research community to improved NOAA climate forecast products and services. (Charter)

Coastal & Ocean Modeling Testbed

COMT accelerates transition of advances from the coastal and ocean modeling research community to improved operational ocean products and services. (Charter)

Developmental Testbed Center

DTC improves weather forecasts by facilitating transition of the most promising new NWP techniques from research into operations. (Charter)

GOES-R Proving Gound

GRPG tests and evaluates simulated GOES-R products before the GOES-R satellite is launched into space. (Charter)

Hazardous Weather Testbed

HWT accelerates transition of new meteorological insights and technologies into advances in forecasting and warning for hazardous weather events. (Charter)

Hydrometeorology Testbed

HMT conducts research on precipitation and weather conditions that can lead to flooding, and fosters transition of scientific advances and new tools into forecasting operations. (Charter)

Joint Center for Satellite Data Assimilation

JCSDA accelerates and improves use of research and operational satellite data in weather, ocean, climate and environmental analysis and prediction systems. (Charter)

Joint Hurricane Testbed

JHT is a competitive, peer-reviewed, granting process to choose the best mature research products for testing and transitioning to operations. Includes modeling, data gathering, and decision support components. (Charter)

Operations Proving Ground

OPG serves as a framework to advance NWS decision-support services and science & technology for a weather-ready nation. (Proposal Submission Info) (Charter)

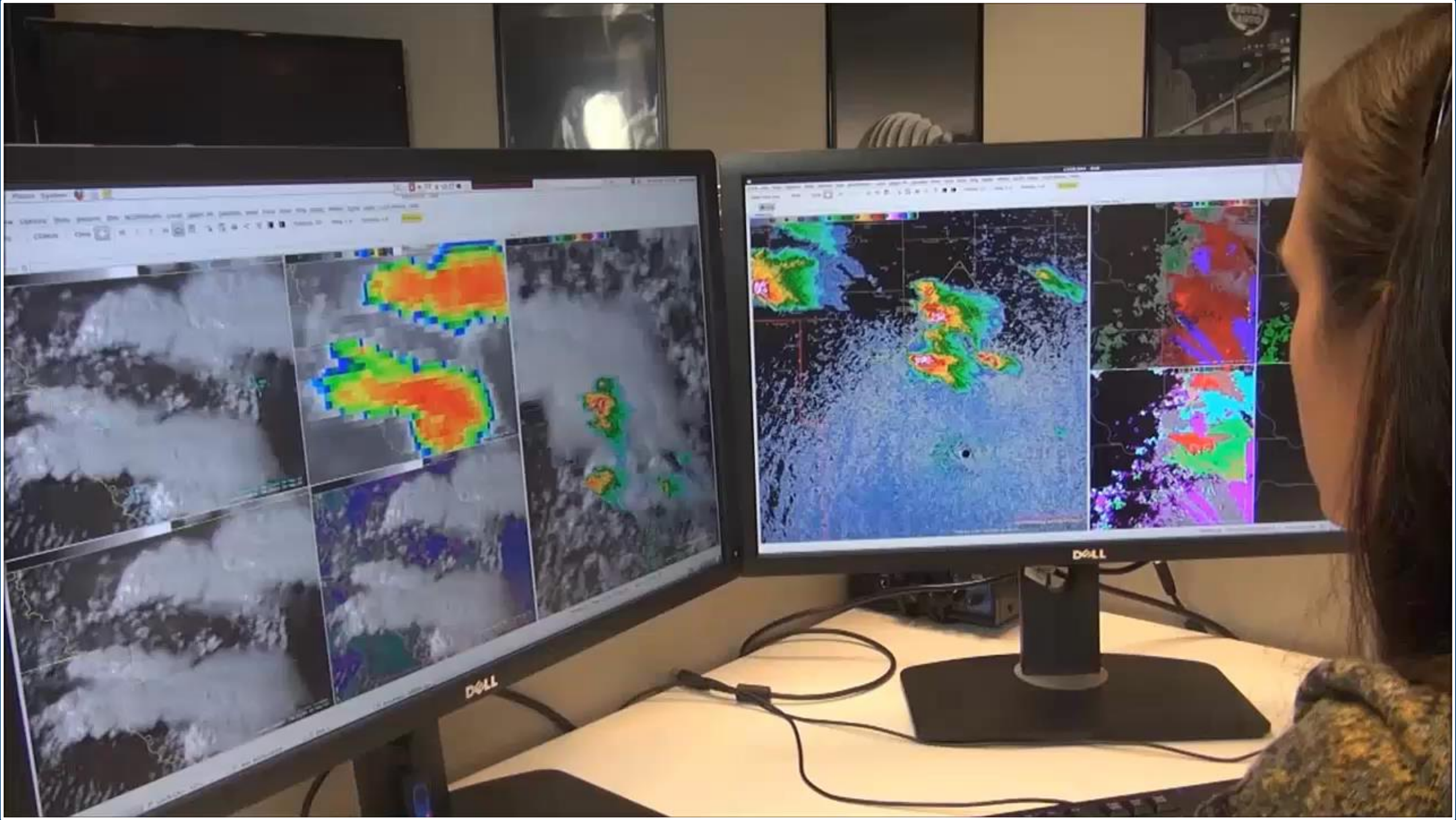
Space Weather Prediction Testbed

SWPT supports development and transition of new space weather models, products, and services. Infuses new research to improve accuracy, lead-time and value of products, forecasts, alerts, watches, and warnings. (Charter)

GOES-R Proving Ground Demonstrations

- *Hazardous Weather Testbed (Since 2009)*
  - Focus on Severe Storms
- NHC/Joint Hurricane Testbed (Since 2010)
  - Focus on tropical cyclones/hurricane intensity and track
- Aviation Weather Testbed (Since 2011)
  - Focus on High Impact Convective Weather
- OPC and SAB (Camp Springs MD) (Since 2011)
  - Focus on offshore thunderstorms
- High Latitude and Arctic Experiment (Alaska Region) (Since 2010)
  - Focus on precipitation/snow/cloud/ash/aviation
- WPC and SAB (Camp Springs MD) (Since 2011)
  - Focus on precipitation/QPF
- Air Quality (UMBC) (Since 2012)
  - Focus on aerosol detection
- Pacific Region (Hawaii) (Since 2010)
  - Focus on tropical cyclones/heavy rainfall/aviation
- Space Weather (NWS SWPC: Boulder CO) (Since 2012)
  - Focus on GOES-R like level 2 products

NWS Forecaster Becca Mazur
Using 1-min Satellite Imagery as the Warning Forecaster



GOES-R Convective Monitoring Demonstration Products

- Day-1 readiness of NOAA funded GOES-R products is accomplished by providing pre-operational products that use the current GOES and/or model data.

- **All Sky Total Precipitable Water**
  - Jun Li (UW-CIMSS)
  - Current state of thermodynamic profiles, TPW, 3 Layer PW, Stability Indices
  - Availability: Hourly
  - Latency: ~ 2-3 min
- **NearCast**
  - Ralph Petersen (UW-CIMSS) Bill Line (OU-CIMMS/SPC)
  - Short-term predictions of convective instability
  - Availability: Hourly
  - Latency: ~ 2-3 min
- **Convective Initiation**
  - John Mecikalski (UAH-ATS)
  - Nowcast (0 to 2 hour) probability of convective initiation
  - Availability: Every GOES Scan
  - Latency: ~ 13-15 min
- **Probability of Severe (ProbSevere)**
  - Michael Pavolonis (NOAA NESDIS ASPB- Madison, WI)
  - John Cintineo (UW-CIMSS)
  - Assessment of satellite IR, radar, and NWP parameter tendencies
  - Availability: Every Radar/Satellite Scan
  - Latency: ~ 1-2 min
- **Overshooting Top Detection**
  - Kris Bedka (SSAI – NASA Langley)
  - Detection and magnitude of overshooting tops
  - Availability: Every GOES Scan
  - Latency: ~ 1-2 min
- **Pseudo Geostationary Lightning Mapper**
  - Geoffrey Stano (NASA SPoRT)
  - Total Lighting Flash Extent Density
  - Availability: Every 2 min
  - Latency: ~ 3-4 min

How can these products be used in a data-fusion process prior to convective initiation and during convective warning operations?

What is Data Fusion?

1. Multiple data sources are integrated to generate more meaningful convective decision support information that can be of greater value than single source data.
   - All Sky Total Precipitable Water
   - Convective Initiation
   - ProbSevere

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2. Multiple products are integrated in a visualization framework to provide situational awareness for weather hazards.
   - Cohesive group is more than the sum of its parts
   - Product Centric NWS Decision Support Services
   - Fusion Process or Synergistic Approach

GOES-R HWT Convective Monitoring Demonstration Products

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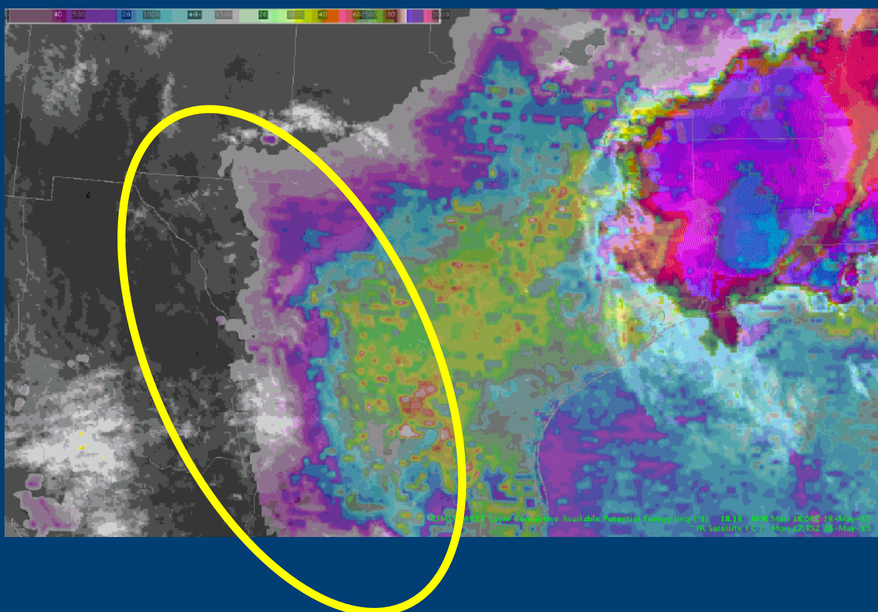
    - Current state of thermodynamic profiles, TPW, 3 Layer PW, Stability Indices
    - Availability: Hourly
    - Latency: ~ 2-3 min

How can these products be used in a data-fusion process prior to convective initiation and during convective warning operations?

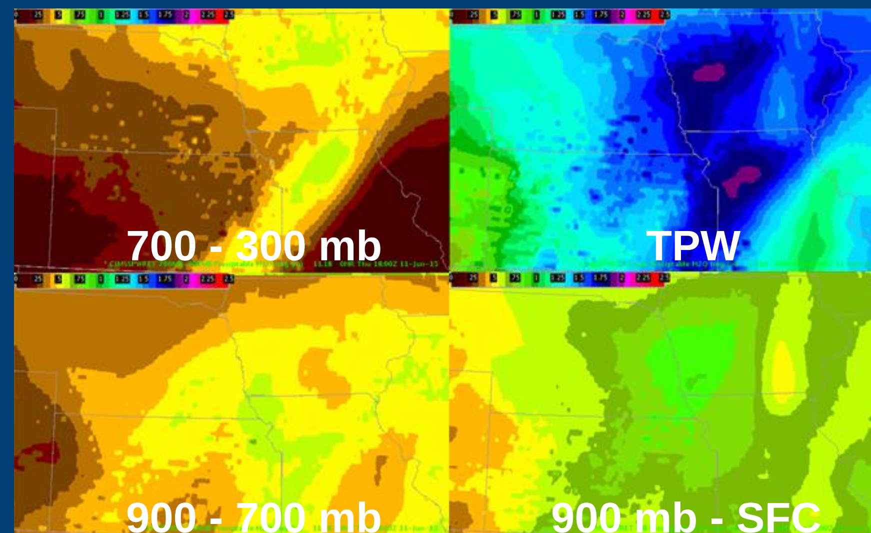
GOES-R ABI Thermodynamic Profiling Products

- CAPE, LI, SI, KI, TT, TPW, LPW in the SFC-900 mb, 900-700 mb, and 700-300mb atm. layers.
- GOES-R algorithm fuses clear-sky ABI Legacy Atmospheric Profiling algorithm, cloudy-sky algorithm, and numerical weather prediction model.

LAP CAPE and GOES IRW 18 May 2015



LAP TPW and Layer PW 11 Jun 2015



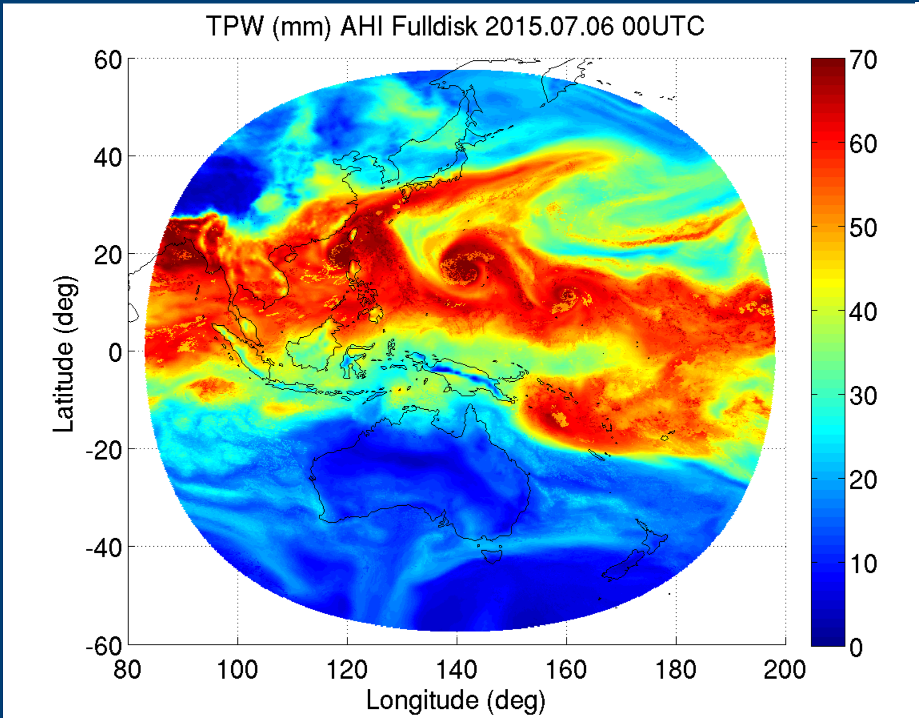
- *"… mesoscale analysis … at the beginning of the radar shift."*
- *"It was most useful to pay attention to the gradients and trends in the fields."*

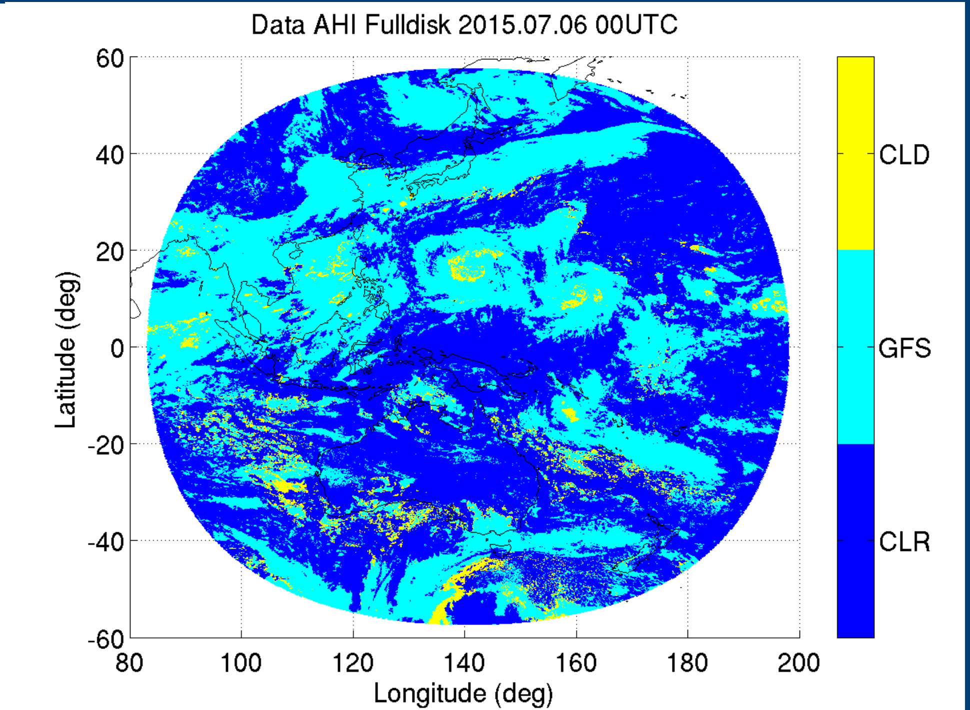
❖ Suggestions: fix sometimes unrealistic spatial variations in fields and inaccurate CAPE absolute values. implement a way of knowing which of the three algorithms the data are from at any given point, improved training on layer PW.

GOES-R All-Sky Total Precipitable Water (TPW)

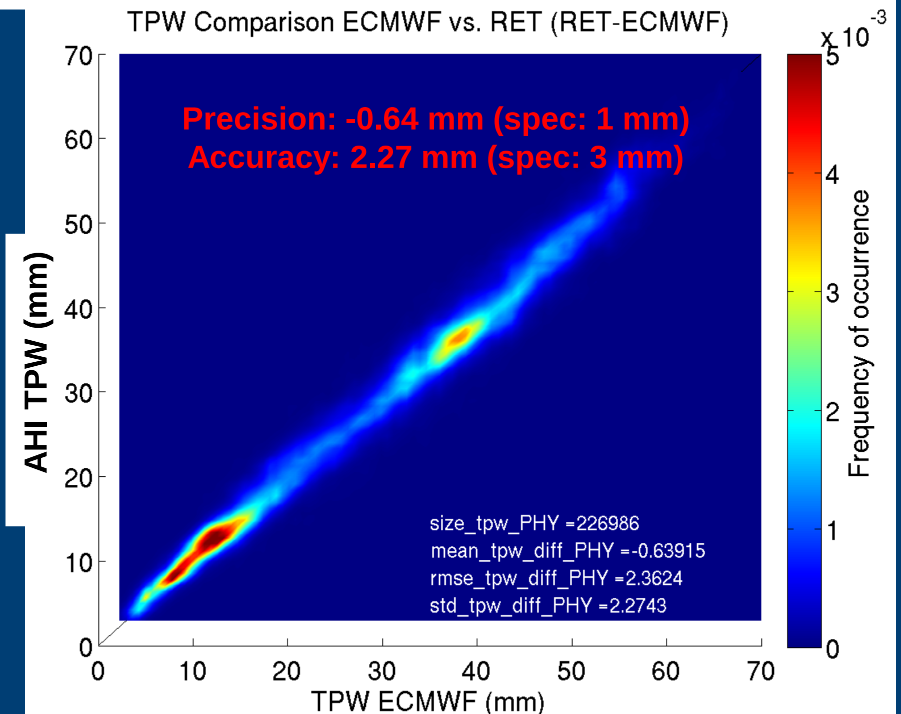
Input to all GOE-R all-sky Total Precipitable Water Algorithm:

- **GOES-R Clear/cloudy identification: AWG cloud mask product;**
- **Clear skies retrieval: GOES-R AWG LAP algorithm (see GOES-R LAP ATBD at: http://www.goes-r.gov);**
- **GOES-R Cloudy skies retrieval: Li et al. (2008);**
- **GOES-R Radiative transfer model – CRTM;**
- **Input: IR band brightness temperatures; GFS forecasts (could be another model forecasts);**
- **Output: Temperature and moisture profiles; TPW and 3 layered PW (LPW); Atmospheric instability indices; Quality flags.**

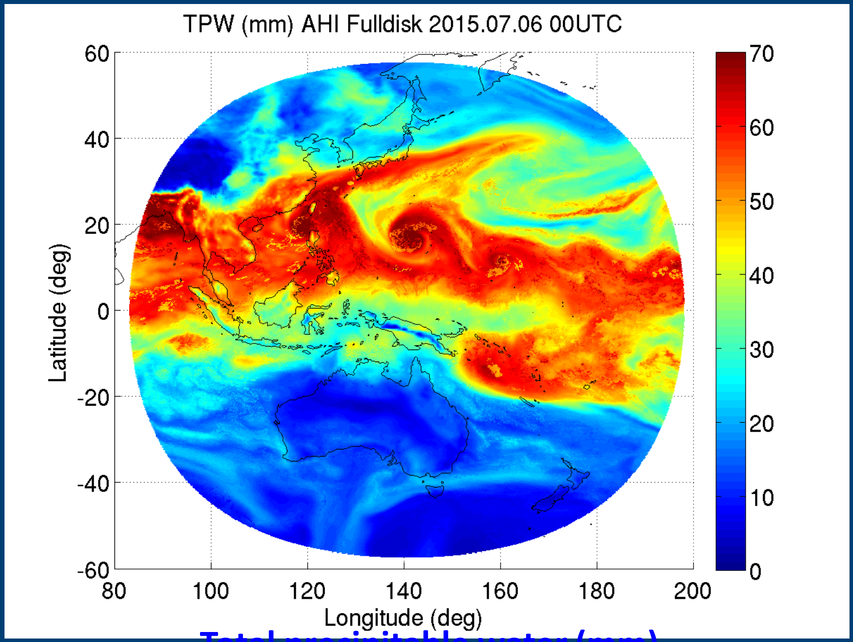




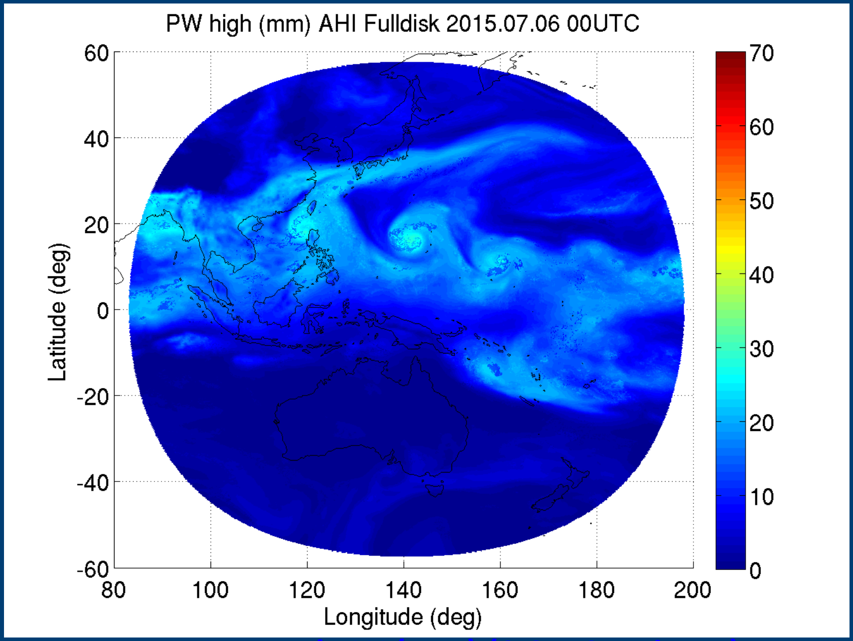
Validation of all-sky TPW with Advanced Himawari Imager (AHI) with GOES-R all-sky retrieval algorithms.



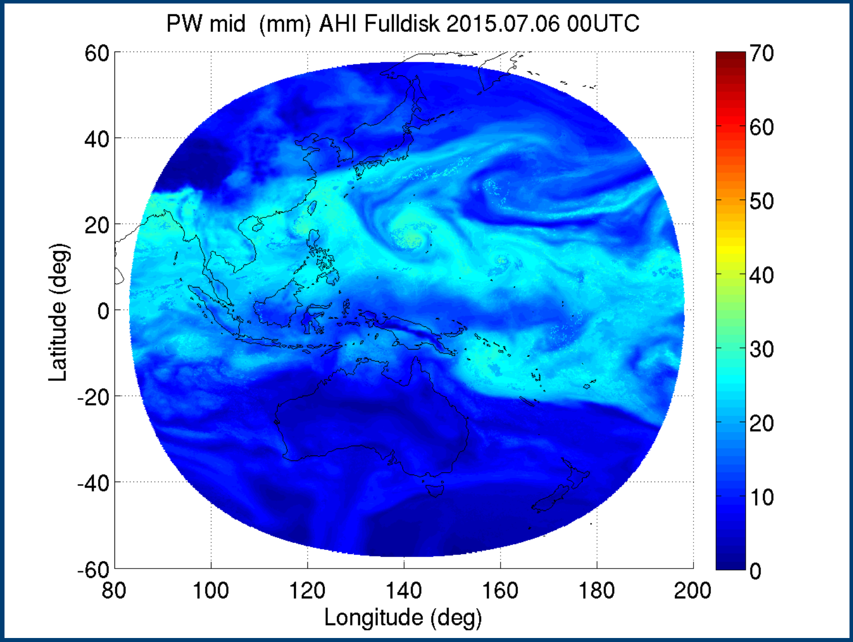
All-sky TPW and layered PW (LPW) from HIMAWARI-8 AHI with GOES-R algorithm



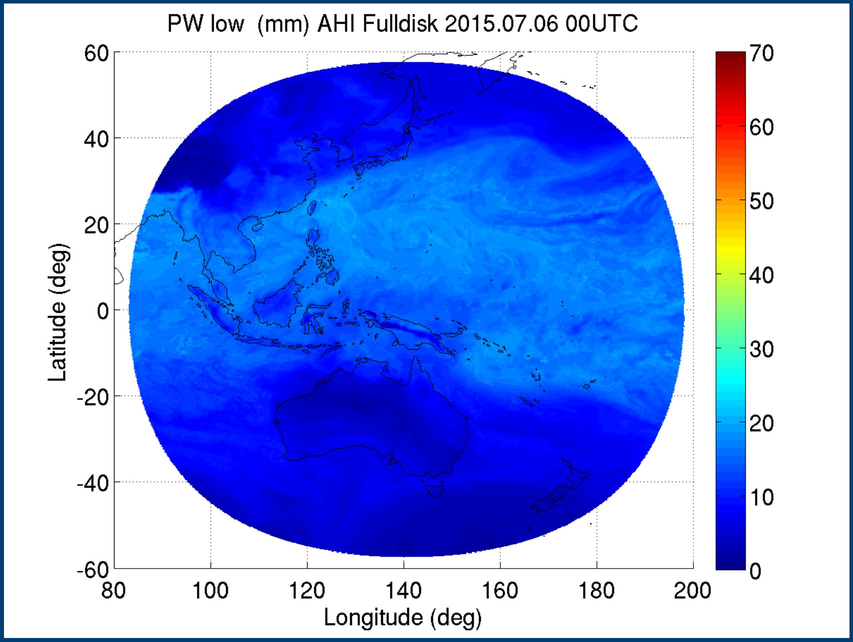
Total precipitable water (mm)



Layered PW (mm) (0.3 – 0.7 sigma)



Layered PW (mm) (0.7 – 0.9 sigma)



Layered PW (mm) (0.9 – SFC sigma)

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    - Ralph Petersen (UW-CIMSS) Bill Line (OU-CIMMS/SPC)
    - Short-term predictions of convective instability
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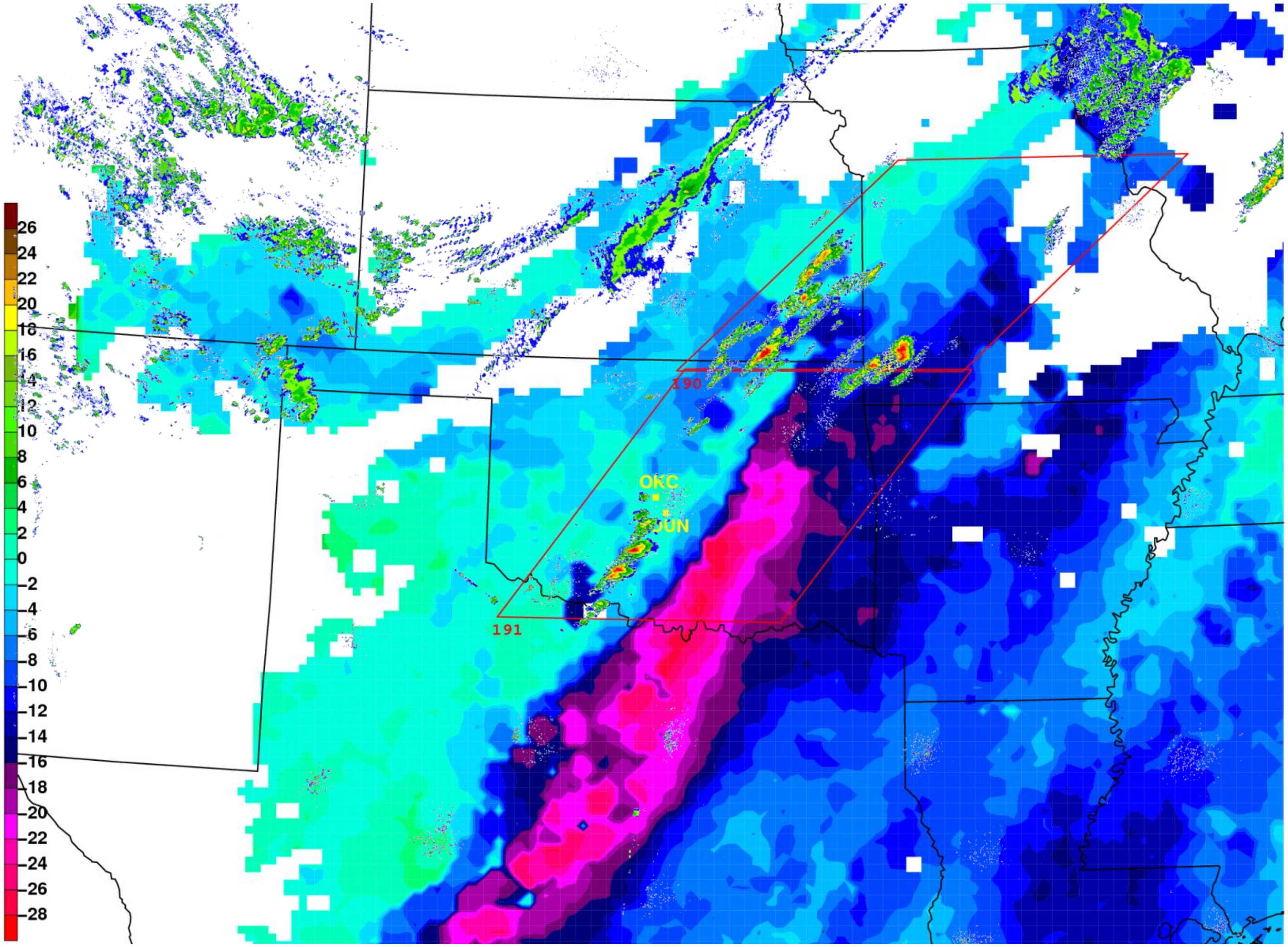
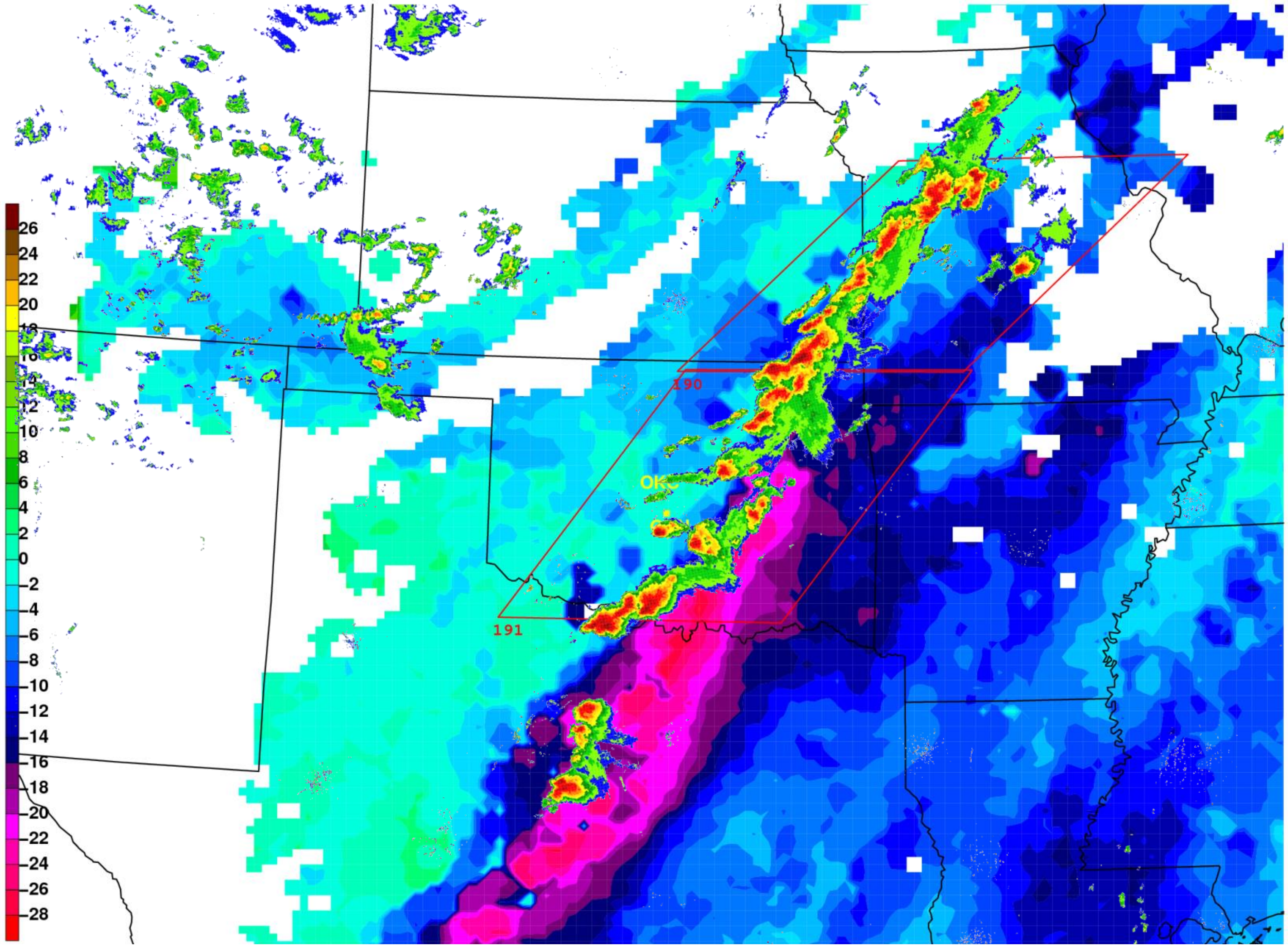
How can these products be used in a data-fusion process prior to convective initiation and during convective warning operations?

GOES-R NearCast (Petersen) – Mid-Low Level Theta-E Difference (K)



NearCast Mid-Low Theta-E Difference 03-h FCST valid 20 May 2013 at 2200 UTC
WSR-88D 1-h Accumulated Composite Reflectivity valid 20 May 2013 at 1900 UTC

GOES-R NearCast – Mid-Low Level Theta-E Difference (K)



NearCast Mid-Low Theta-E Difference 03-h FCST valid 20 May 2013 at 2200 UTC
WSR-88D Composite Reflectivity valid 20 May 2013 at 2202 UTC

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    - Availability: Every GOES Scan
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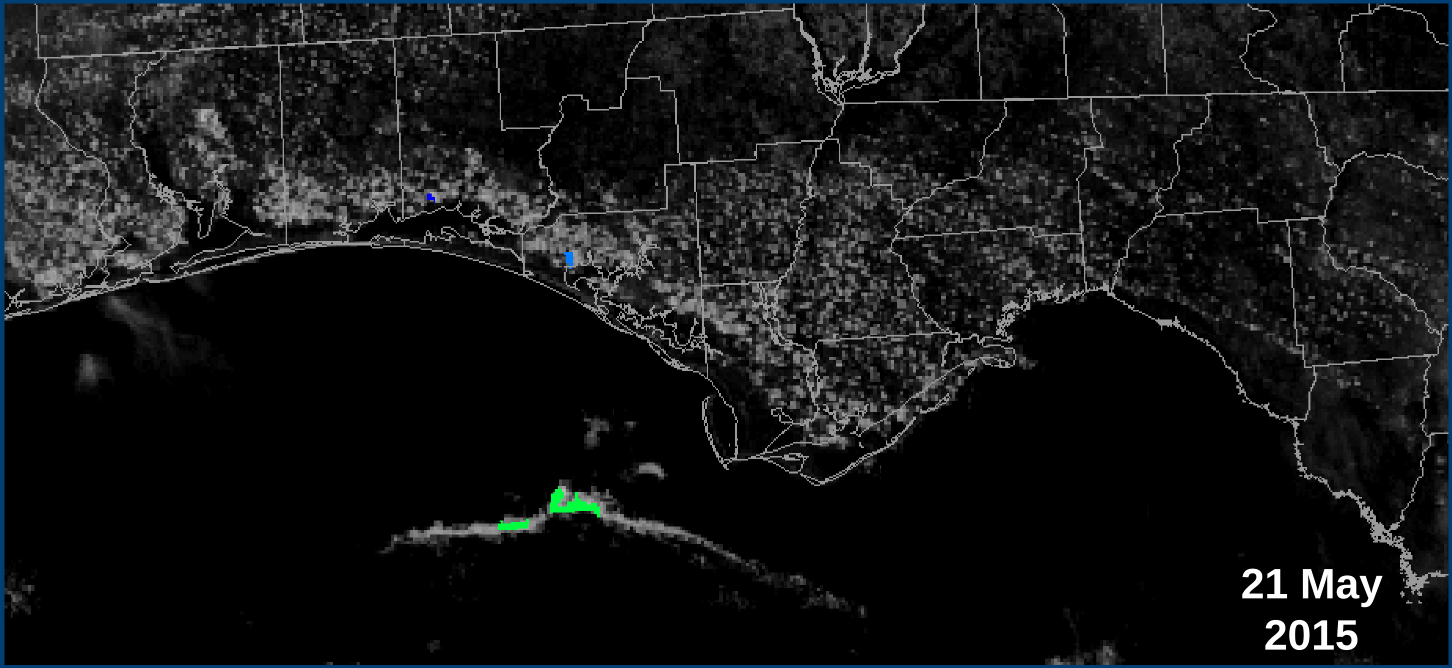
GOES-R Convective Initiation Algorithm (Mecikalski)

- **Fuses GOES cloud products and RAP-derived environmental fields and uses a logistic regression framework to produce probability of future CI**

GOES VIS, CI probabilities



- ***"It provides great situational awareness about initial convective development and helps focus in on which areas to watch."***
- ***"higher probabilities draw my attention to the areas where convection would eventually go."***
- ***Suggestions: improved performance under cirrus clouds and in areas of congested cu, would like an algorithm that provides CI probabilities to severe convection.***

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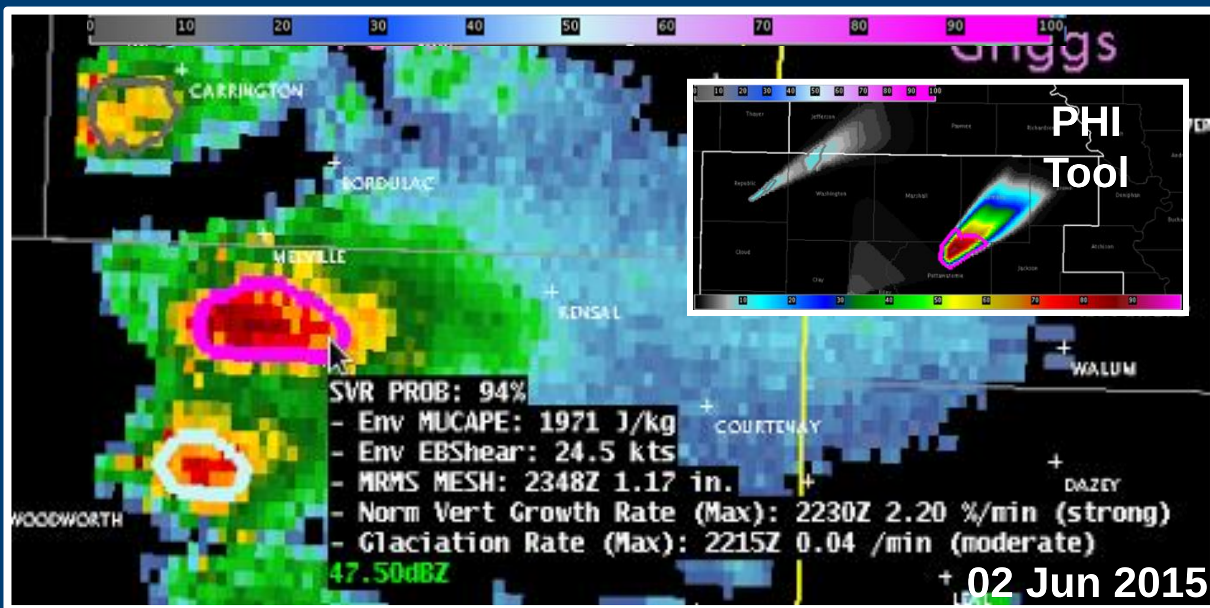
    - Latency: ~ 1-2 min

How can these products be used in a data-fusion process prior to convective initiation and during convective warning operations?

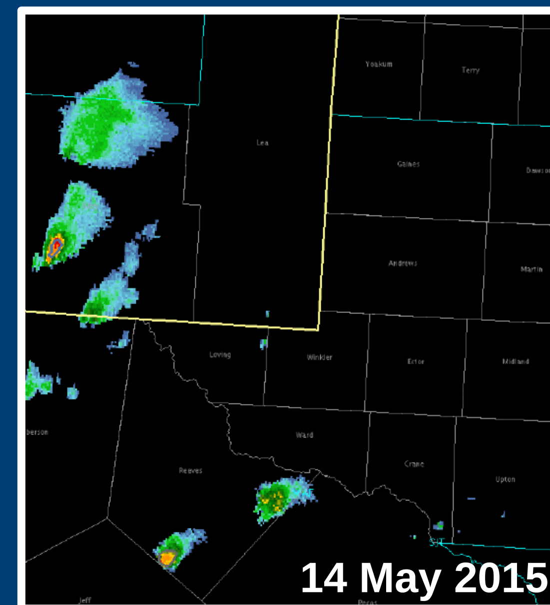
GOES-R Probability of Severe (ProbSevere – Pavolonis)

- **Fuses GOES cloud products, radar information, and RAP-derived environmental fields and uses object-based tracking in both GOES and radar imagery and a statistical model to produce probability of future severe weather.**

Radar reflectivity, ProbSevere contours, ProbSevere readout

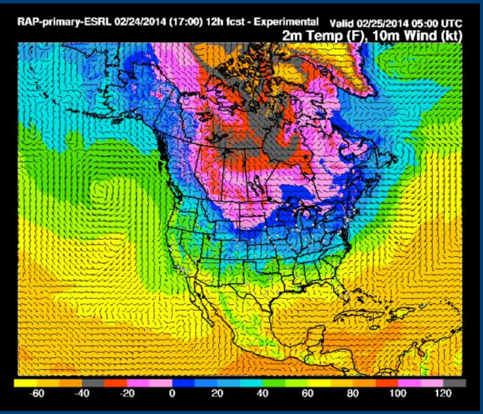


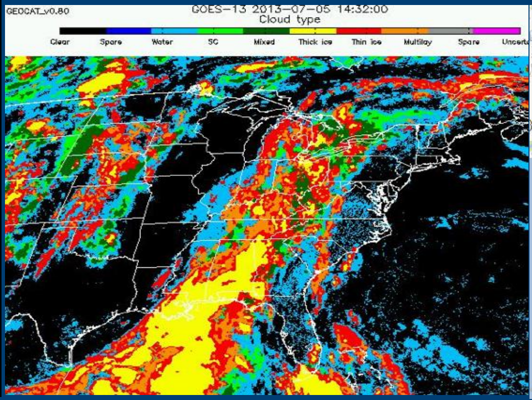
Radar reflectivity, ProbSevere contours, HWT Warnings

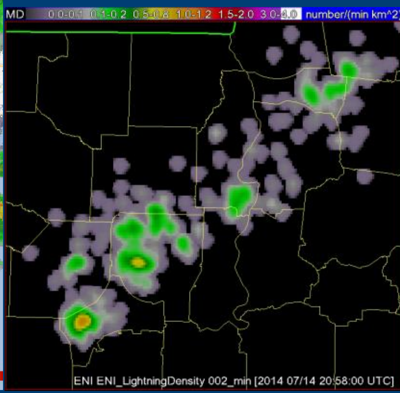


- ***"It did provide an opportunity to assess the situation quickly and figure out which of the ongoing storms need our attention first." … "Great situational awareness tool"***
- ***"Gave me confidence to load up Warngen and issue after a cursory look at the radar data"***
- **Suggestions: probabilities by specific threat, time series of recent probabilities, use of lightning data as a predictor, improved performance when severe wind was the main threat.**

Data to Environmental Intelligence (Pavolonis/Cintineo)







High-resolution NWP Data → **Storm Environment**

Satellite Imagery and Derived Products → **Evolution of Cumulus to Cumulonimbus**

Radar Imagery and Derived Products → **Storm Tracking and Hydrometeor Properties**

Total Lightning → **Storm Electrification**

Probability a thunderstorm will produce severe weather in the future (up to 60 minutes)

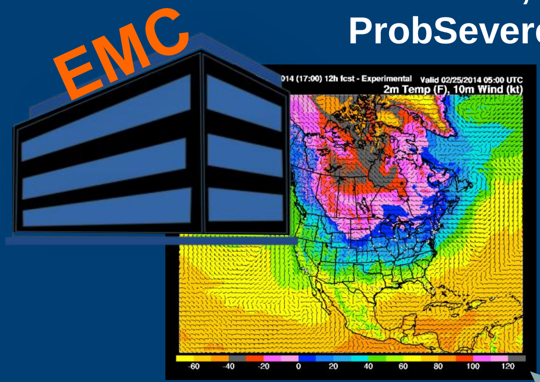
Wind gusts of 58 mph or greater or structural wind damage

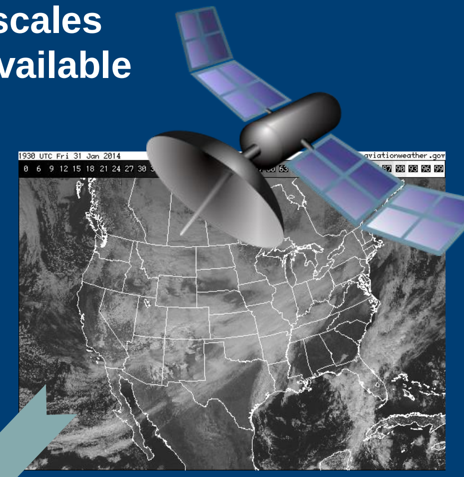
Tornado

Hail 1 inch in diameter or greater

ProbSevere Model Real-Time Operations

Satellite, radar, lightning, and model data have different timescales
ProbSevere probabilities can change each time new data are available

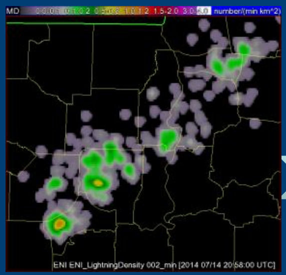




In one hour…

1 set of RAP grids

8 CONUS satellite scans (in rapid scan)



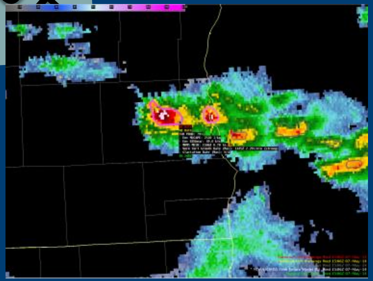
30 lightning files

ProbSevere

OUTPUT

Input: 1300 MB

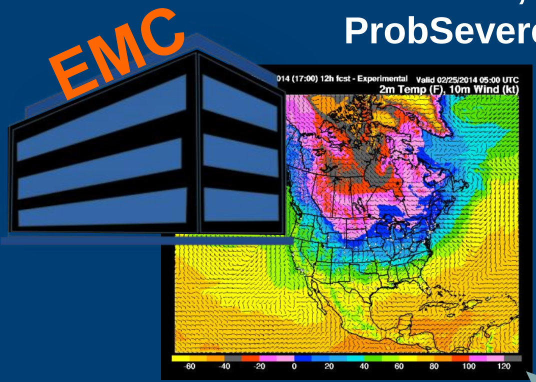
30 CONUS radar scans



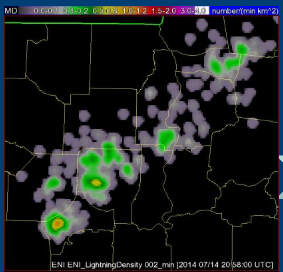
File size: 0.2 MB
30 output files

ProbSevere Model Real-Time Operations

Satellite, radar, lightning, and model data have different timescales
ProbSevere probabilities can change each time new data are available



1 set of RAP grids



30 lightning files

30 CONUS radar scans

In one hour…

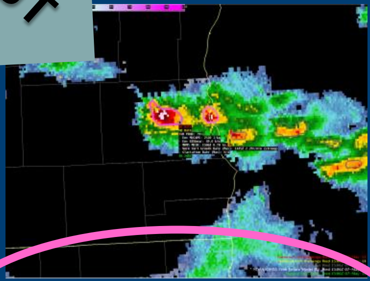
With 1 GOES-R ABI

ProbSevere

Input: 9000 MB

8 CONUS satellite scans (in rapid scan)

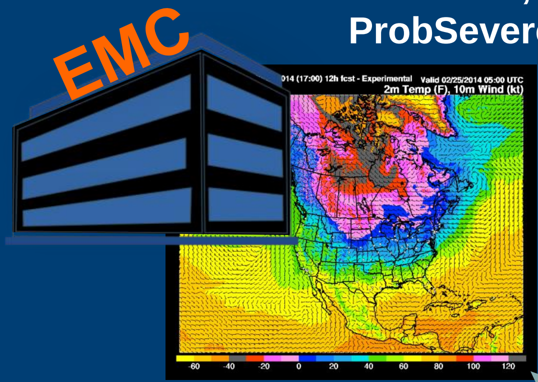
OUTPUT



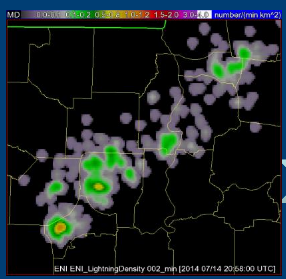
File size: 0.2 MB
30 output files

ProbSevere Model Real-Time Operations

Satellite, radar, lightning, and model data have different timescales
ProbSevere probabilities can change each time new data are available



1 set of RAP grids



30 lightning files

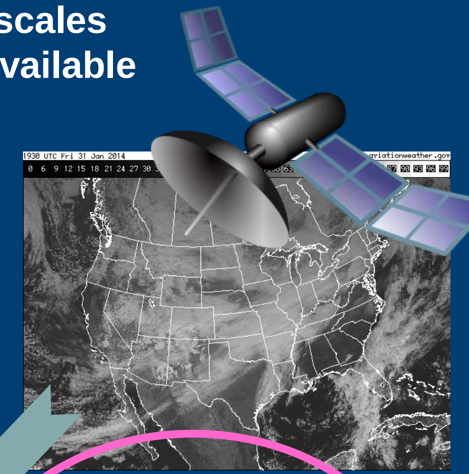
30 CONUS radar scans

In one hour…

With 1 GOES-R ABI + HRRR

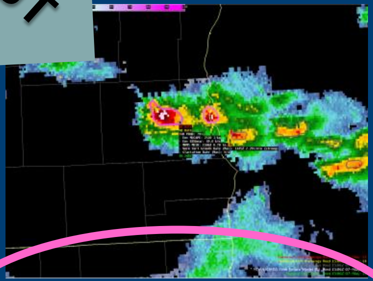
ProbSevere

Input: 12,500 MB



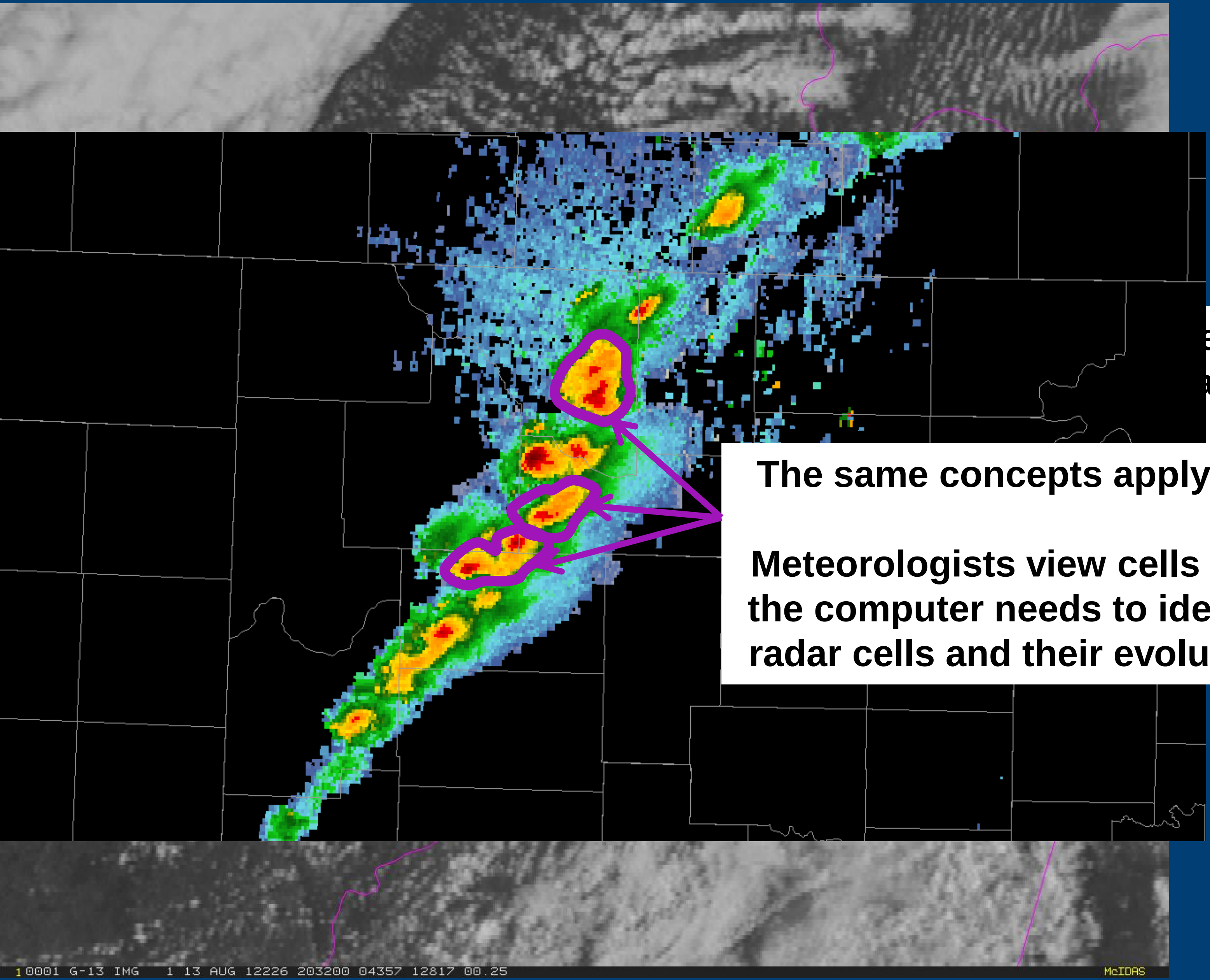
12 CONUS satellite scans (in rapid scan or greater**) and higher Spatial resolution**

OUTPUT



File size: 0.2 MB
30 output files

Automated integration of information



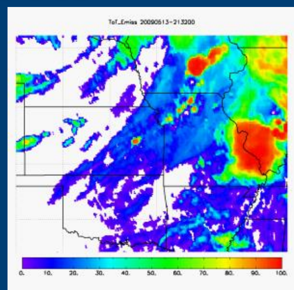
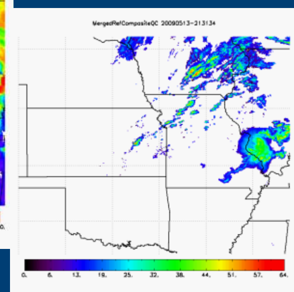
eloping storms
atellite pixels or

The same concepts apply to radar data.

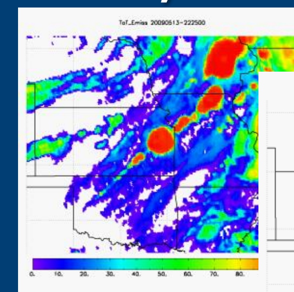
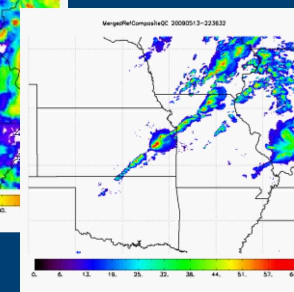
Meteorologists view cells or storms—so the computer needs to identify and track radar cells and their evolution over time.

Observation-driven – Object-centric

1. Identify and track storm-objects in satellite *and* radar imagery
2. Extract data from spatial grids (satellite, radar, NWP) from within objects

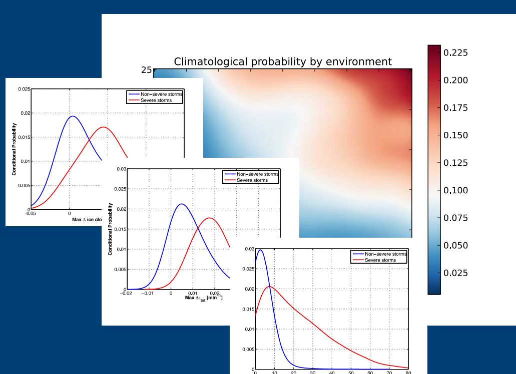



$t = t_0$

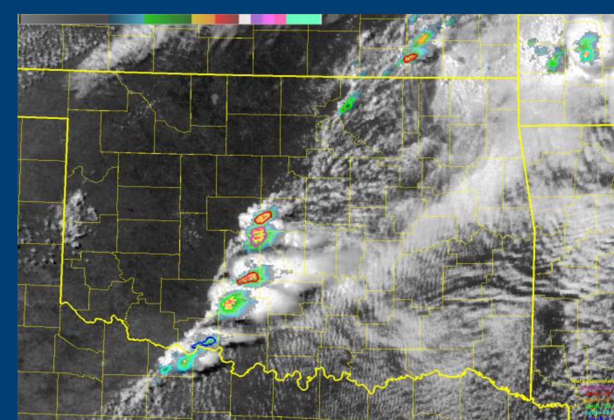
$t = t_0 + \Delta t$

3. Share information from satellite object within overlapping radar object(s)
4. Use trained statistical model to compute probability of severe



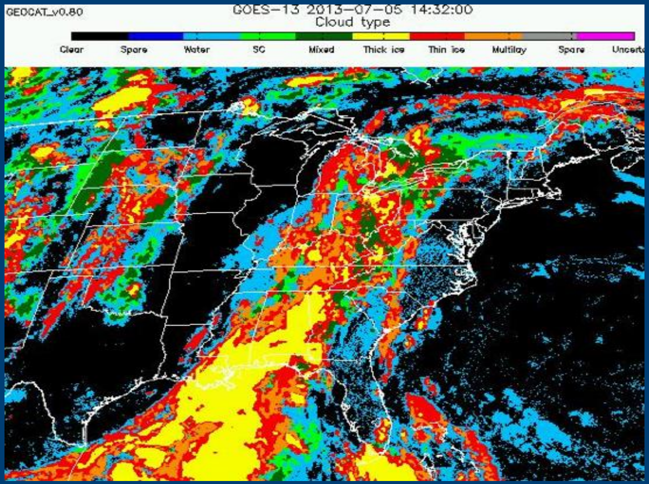
Probability of severe

$$P(C_{severe}|\mathbf{F}) = \frac{P(C_{severe})\prod_{i=1}^{N} P(F_i|C_{severe})}{P(\mathbf{F})}$$

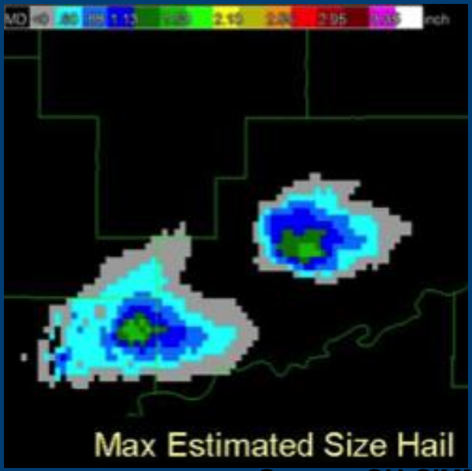


Leverages past and recent severe weather research

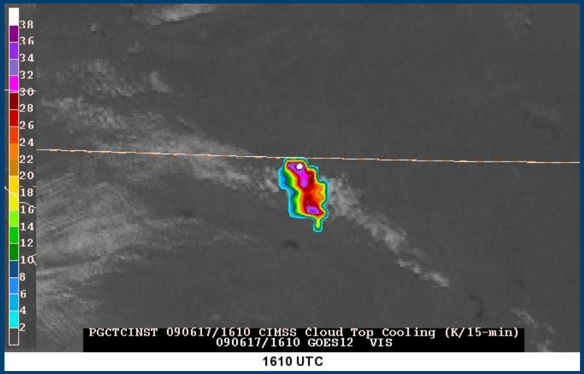
- Satellite and radar object identification and tracking
- RAP-derived fields
- UW-Cloud-top Cooling concept
- GOES-derived cloud-top properties
- NSSL Multi-Radar Multi-Sensor (MRMS) products



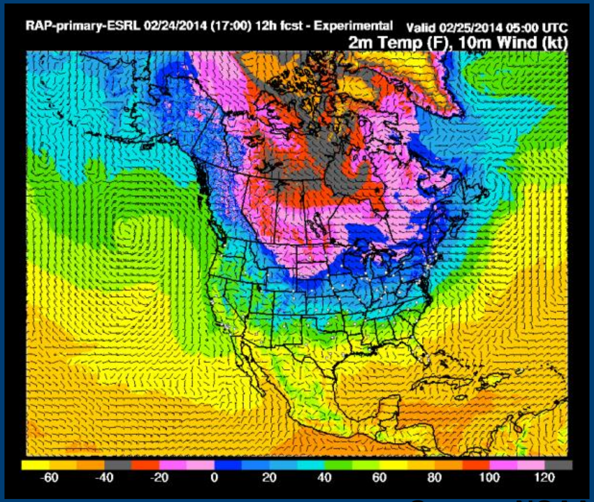
Source: NOAA



Source: OU-CIMMS



Source: UW-CIMSS



Source: NOAA

Naïve Bayesian Classifier

RAP NWP Predictors

- **- MUCAPE**
- **- Effective bulk shear**

Two satellite predictors (GOES-derived cloud product growth rates):

- **- max. lifetime rate of change in top-of-troposphere emissivity (analogous to BT cooling)**
- **- max. lifetime rate of change in ice cloud fraction (glaciation rate, at cloud-top)**

One radar predictor:

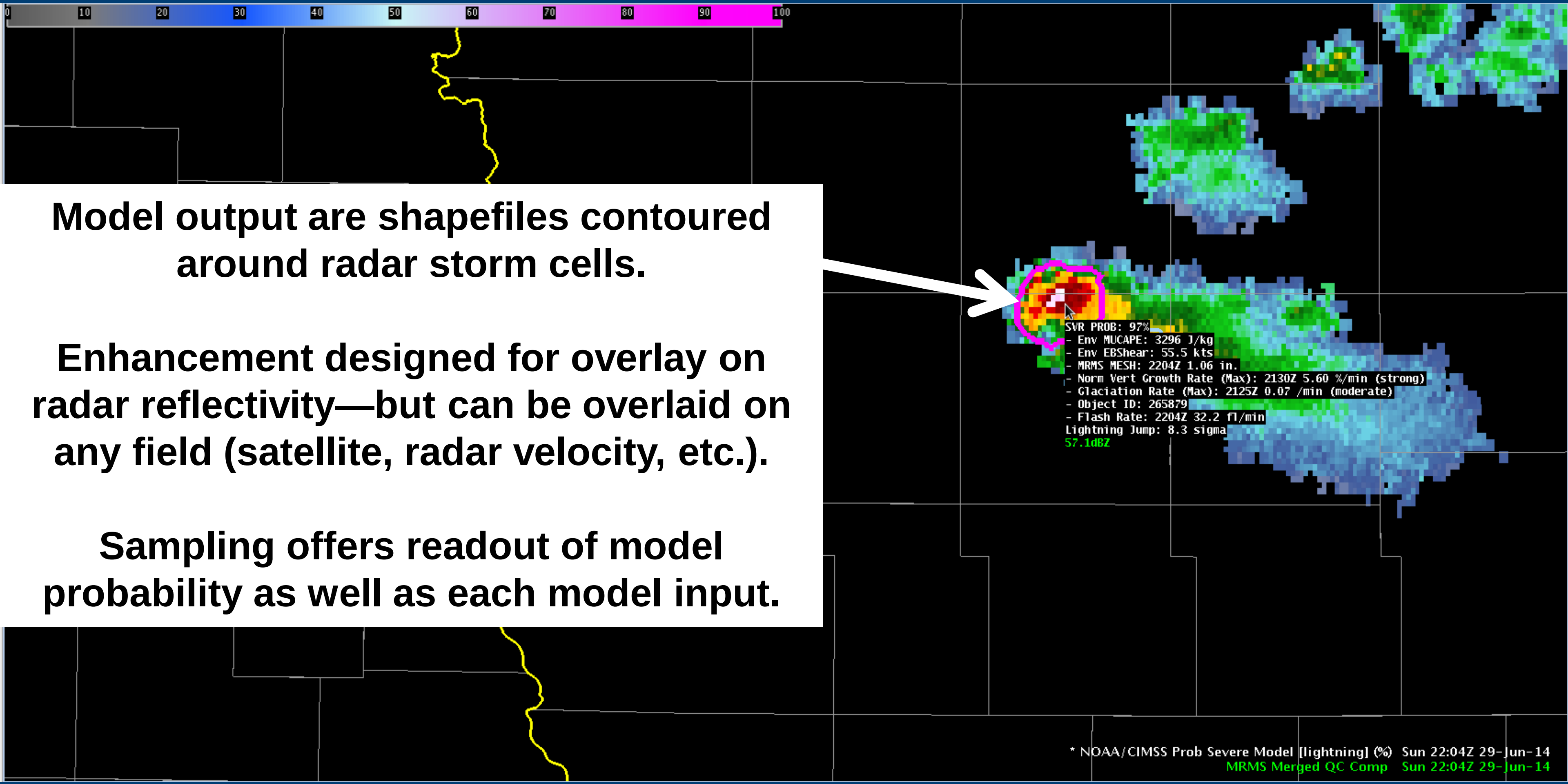
- **- instantaneous maximum MRMS MESH**

NEW: One lightning predictor predictor:

- **- Instantaneous flash rate**

Trained with Severe (NOAA SPC report indicated) vs Non-severe storm database

ProbSevere Model AWIPS-II Display



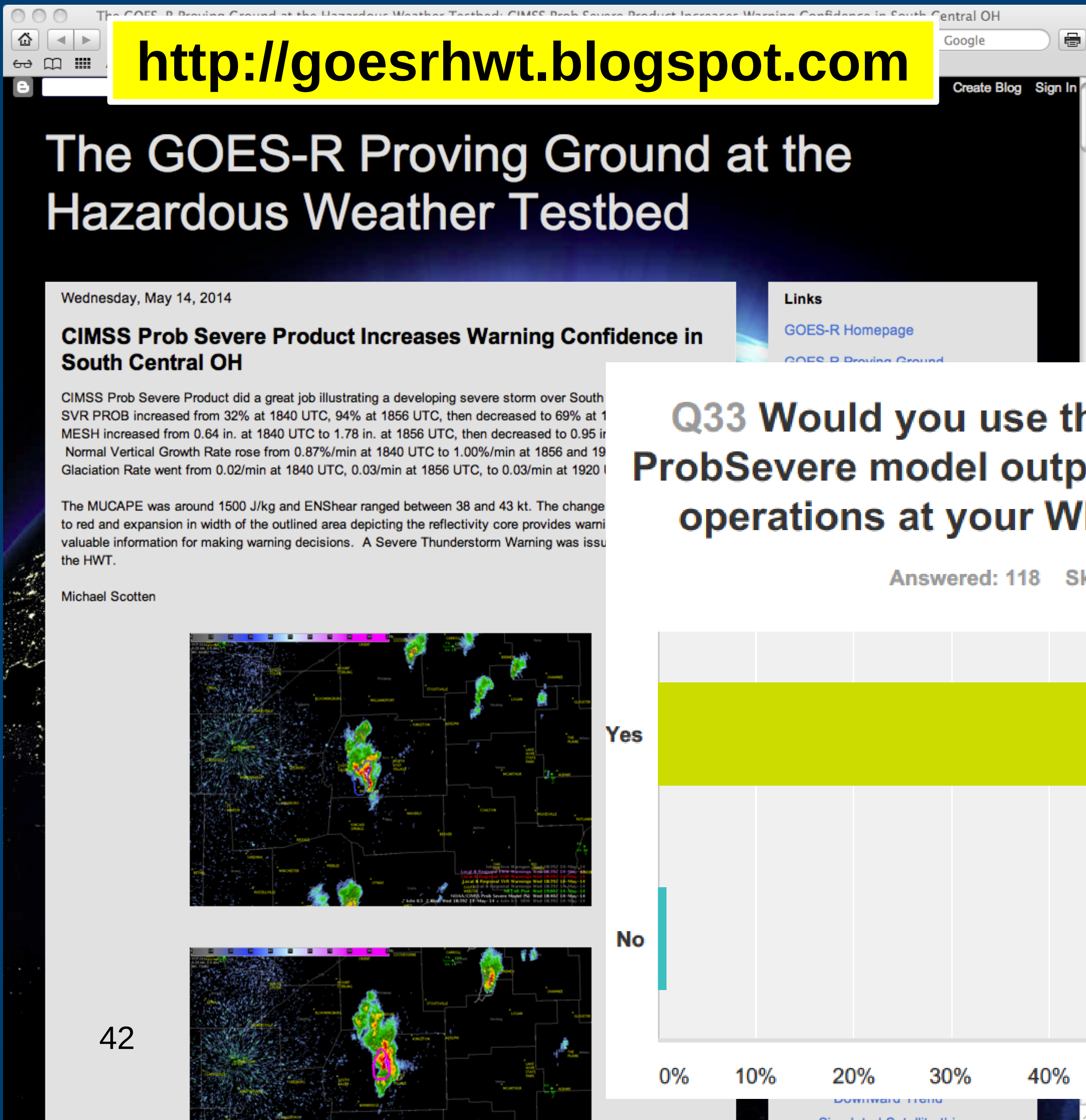
Model output are shapefiles contoured around radar storm cells.

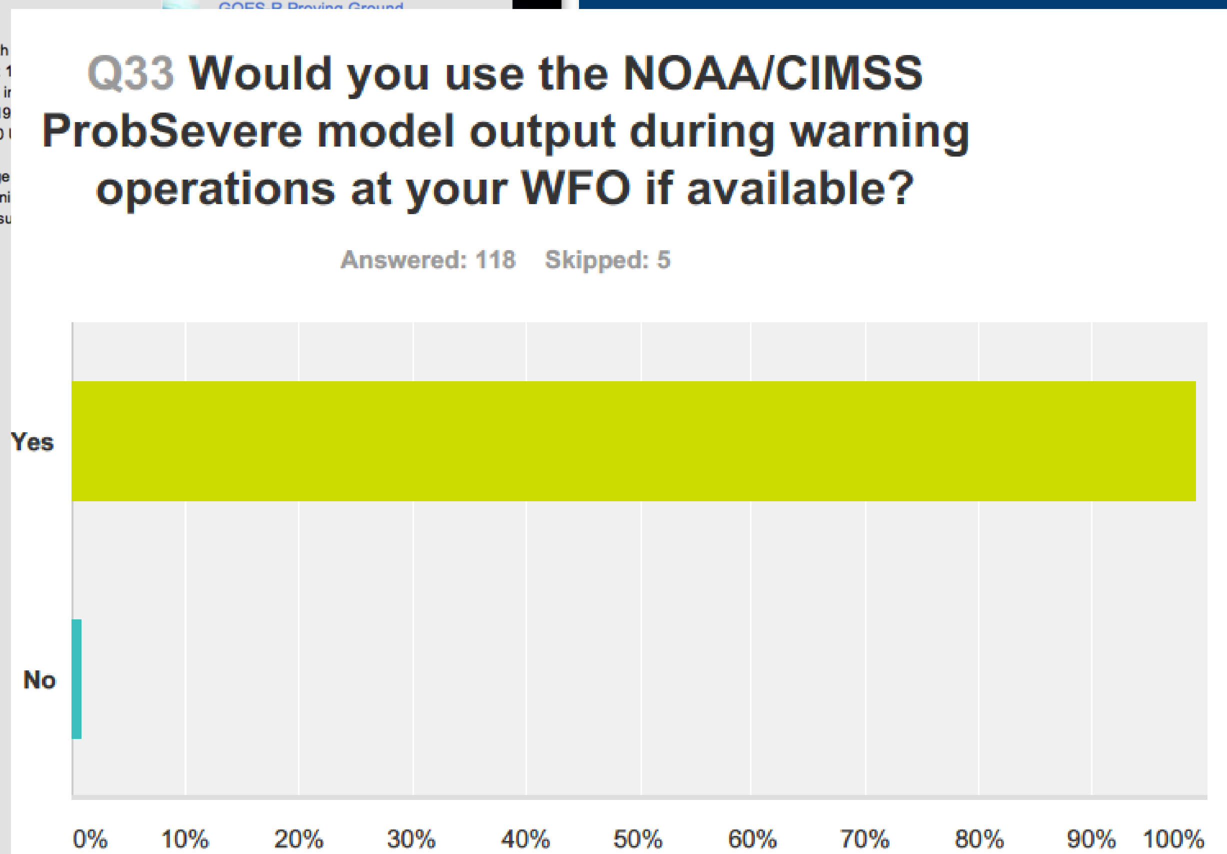
Enhancement designed for overlay on radar reflectivity—but can be overlaid on any field (satellite, radar velocity, etc.).

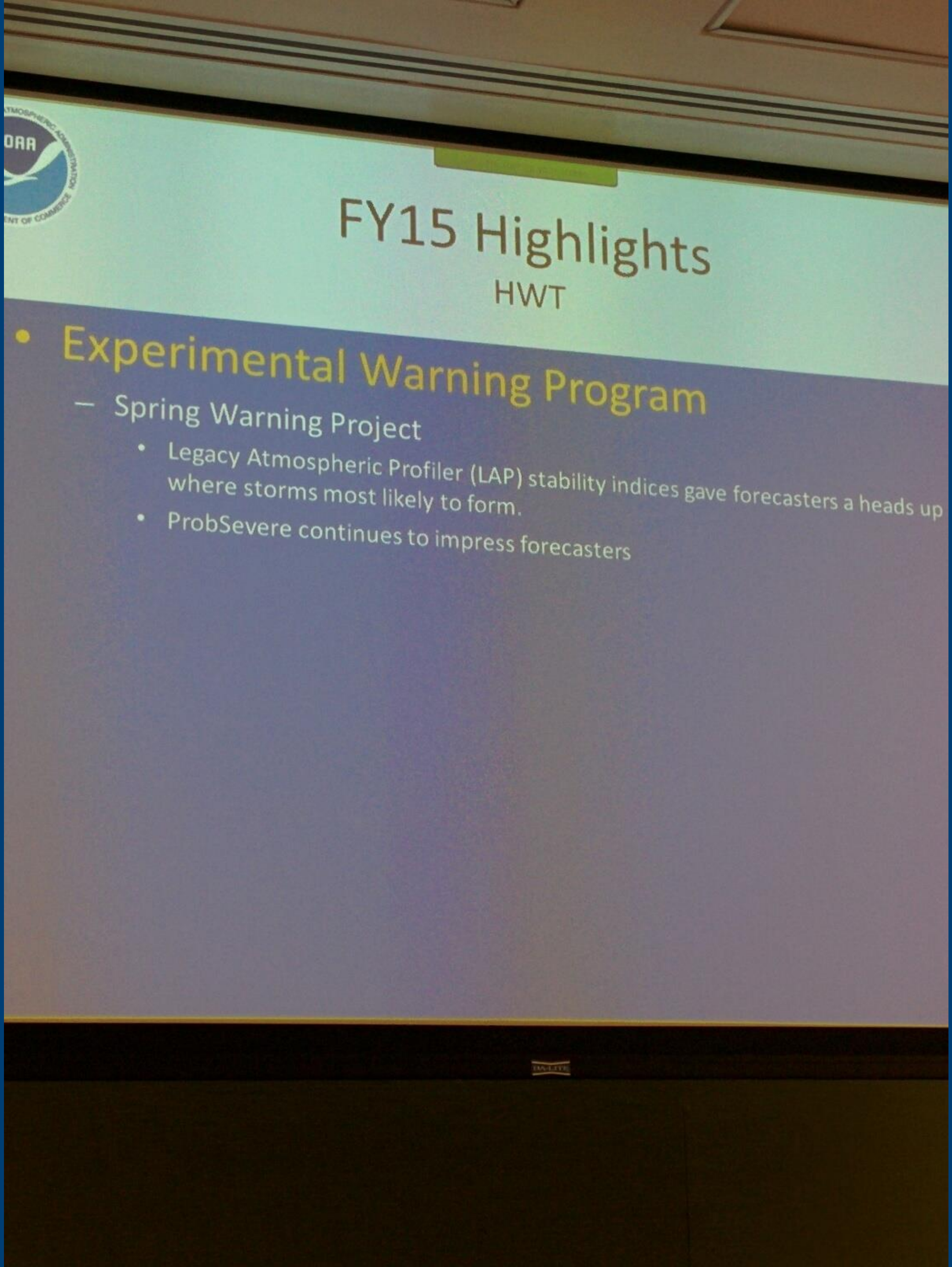
Sampling offers readout of model probability as well as each model input.

Hazardous Weather Testbed (HWT)

http://goesrhwt.blogspot.com



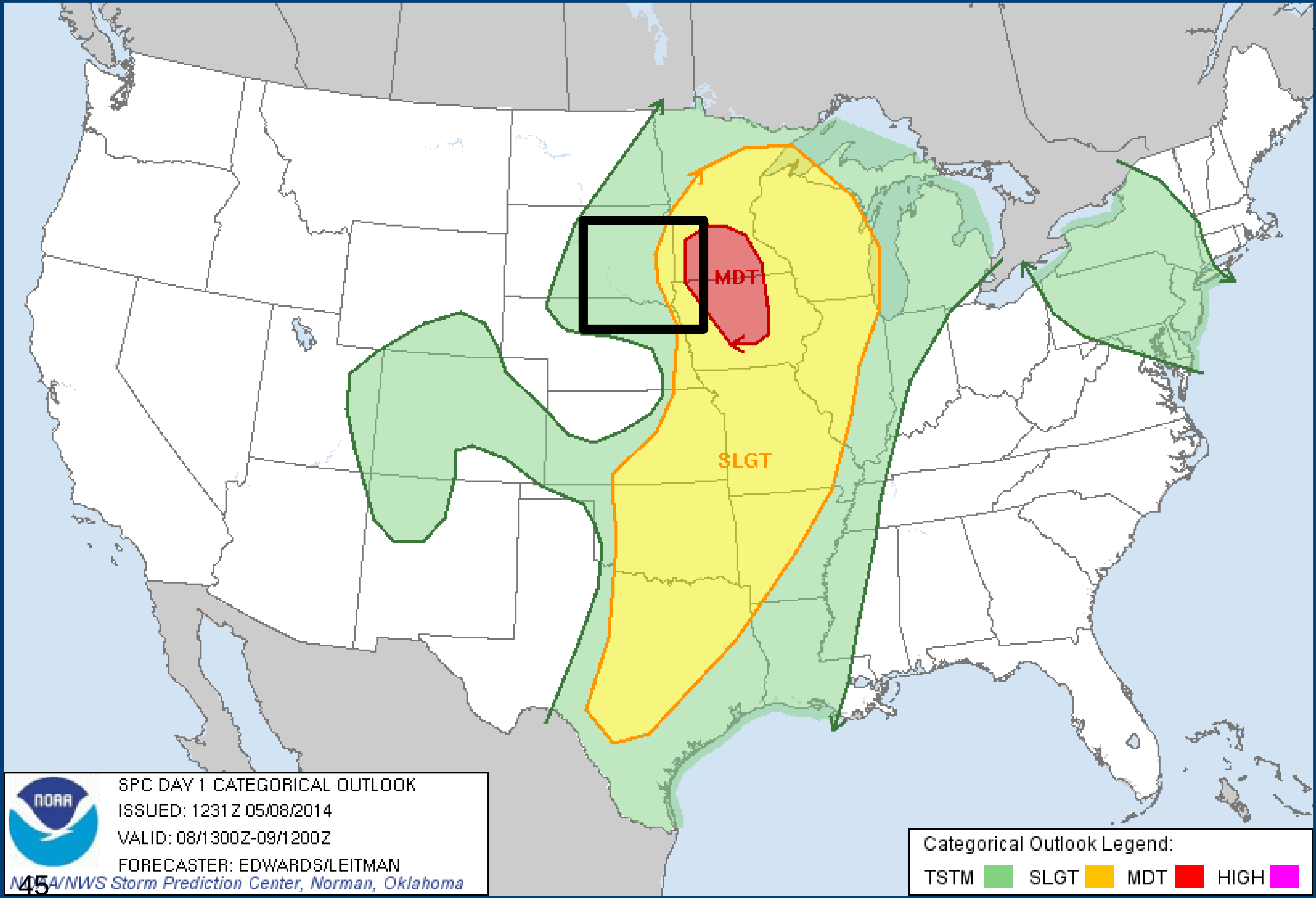




GOES-R Chief Scientist Steve Goodman Presentation Yesterday in Washington DC

Even The Weather Channel Describing

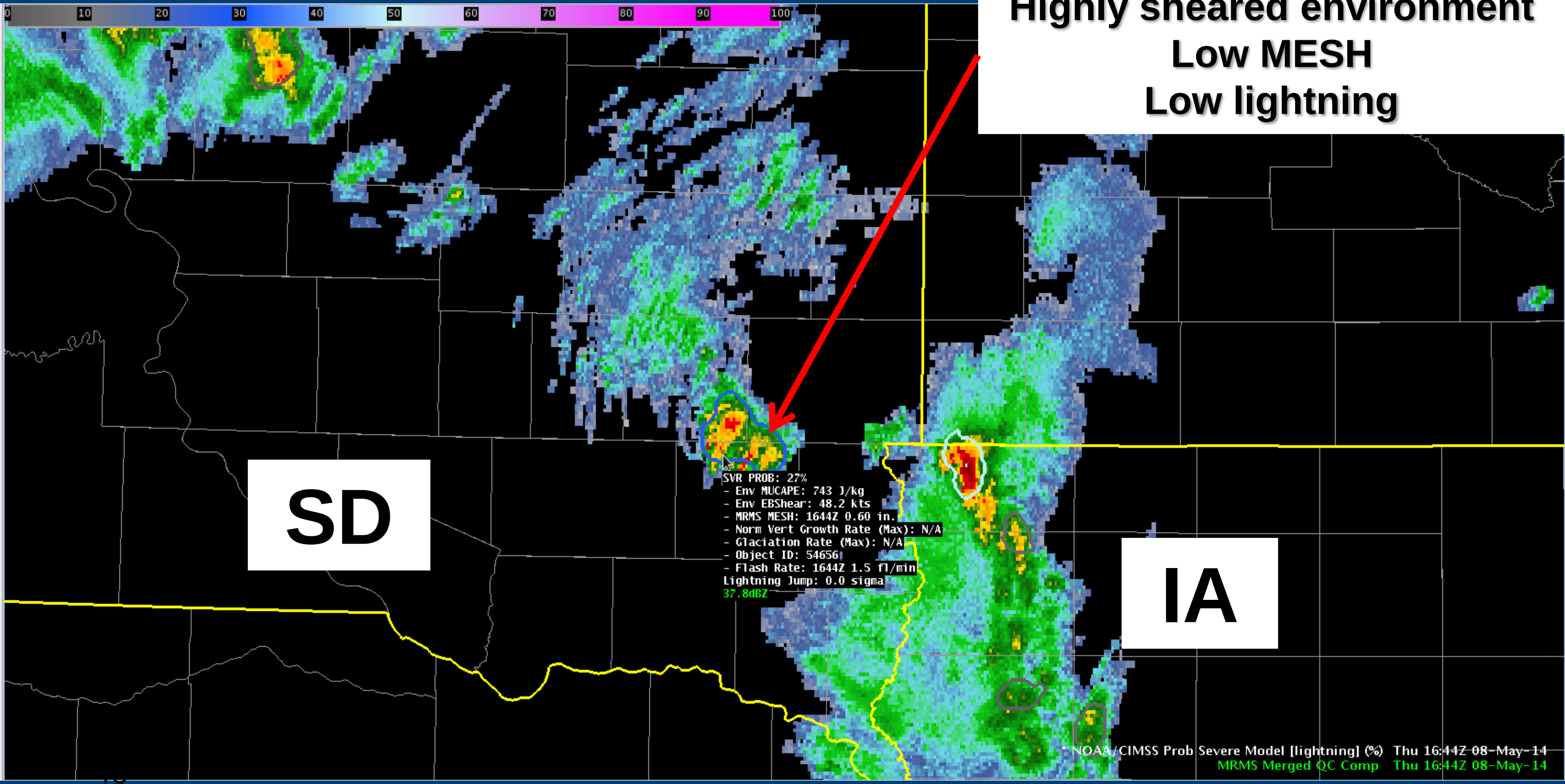
08 May 2014


MDT
SLGT
SPC DAY 1 CATEGORICAL OUTLOOK
ISSUED: 1231 Z 05/08/2014
VALID: 08/1300Z-09/1200Z
FORECASTER: EDWARDS/LEITMAN
NOAA/NWS Storm Prediction Center, Norman, Oklahoma
Categorical Outlook Legend:
TSTM SLGT MDT HIGH

1644 UTC May-08-2014

MUCAPE ~ 750 J kg^{-1}
Eff. shear ~ 48 kts

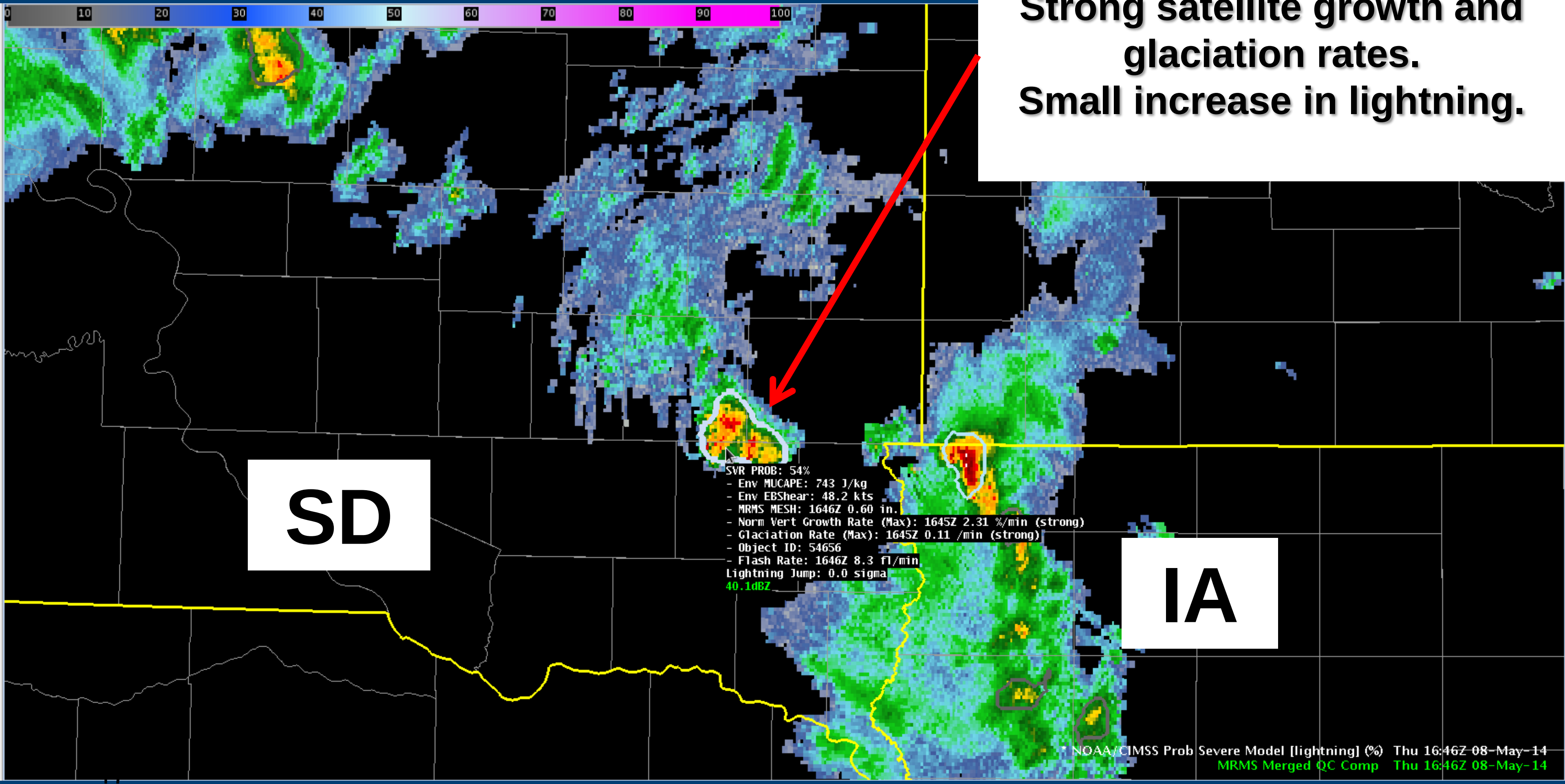
Prob = 27%
Highly sheared environment
Low MESH
Low lightning



1646 UTC May-08-2014

MUCAPE ~ 750 J kg^{-1}
Eff. shear ~ 48 kts

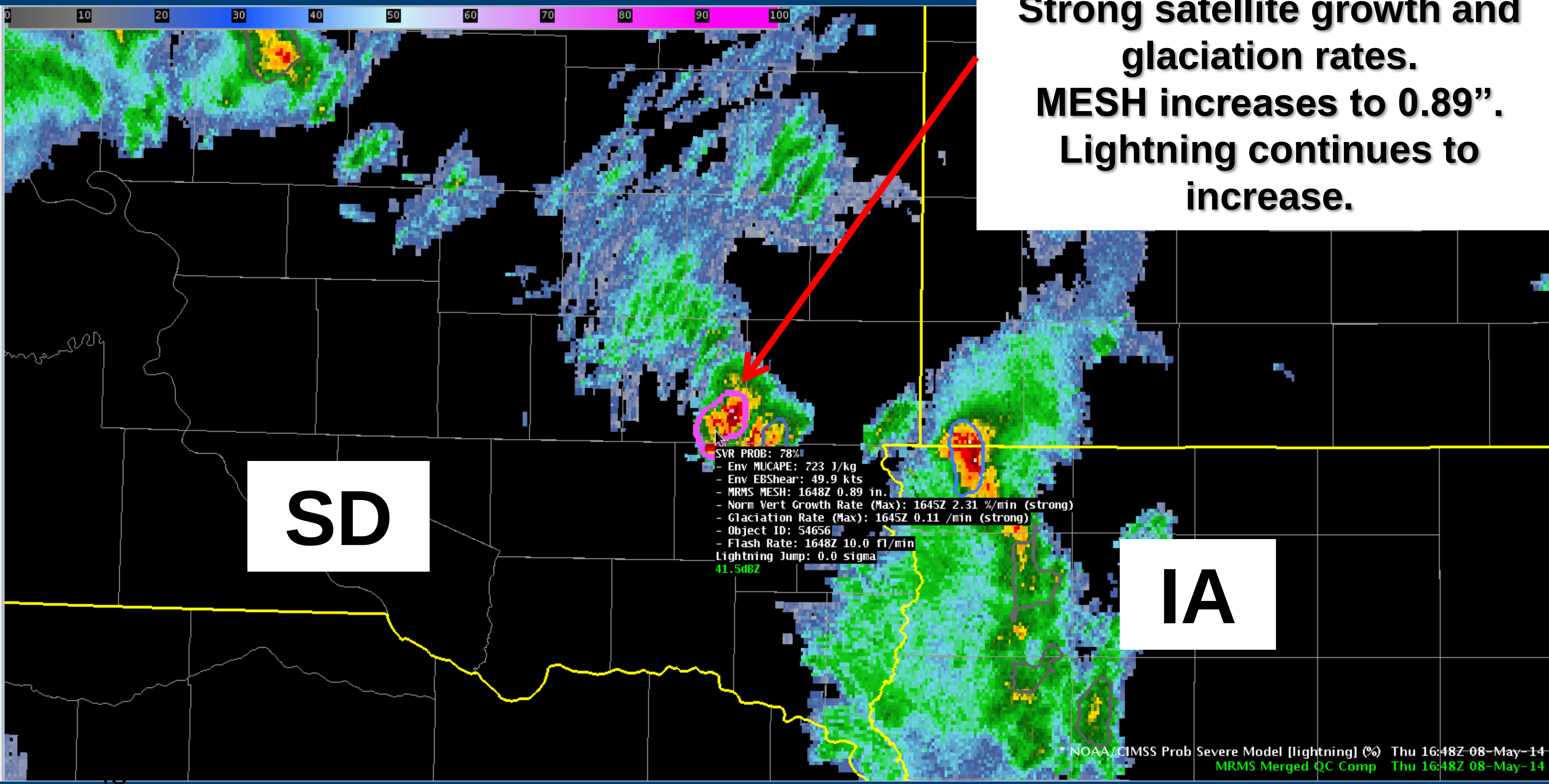
Prob = 54%
Strong satellite growth and glaciation rates.
Small increase in lightning.



1648 UTC May-08-2014

MUCAPE ~ 750 J kg^{-1}
Eff. shear ~ 48 kts

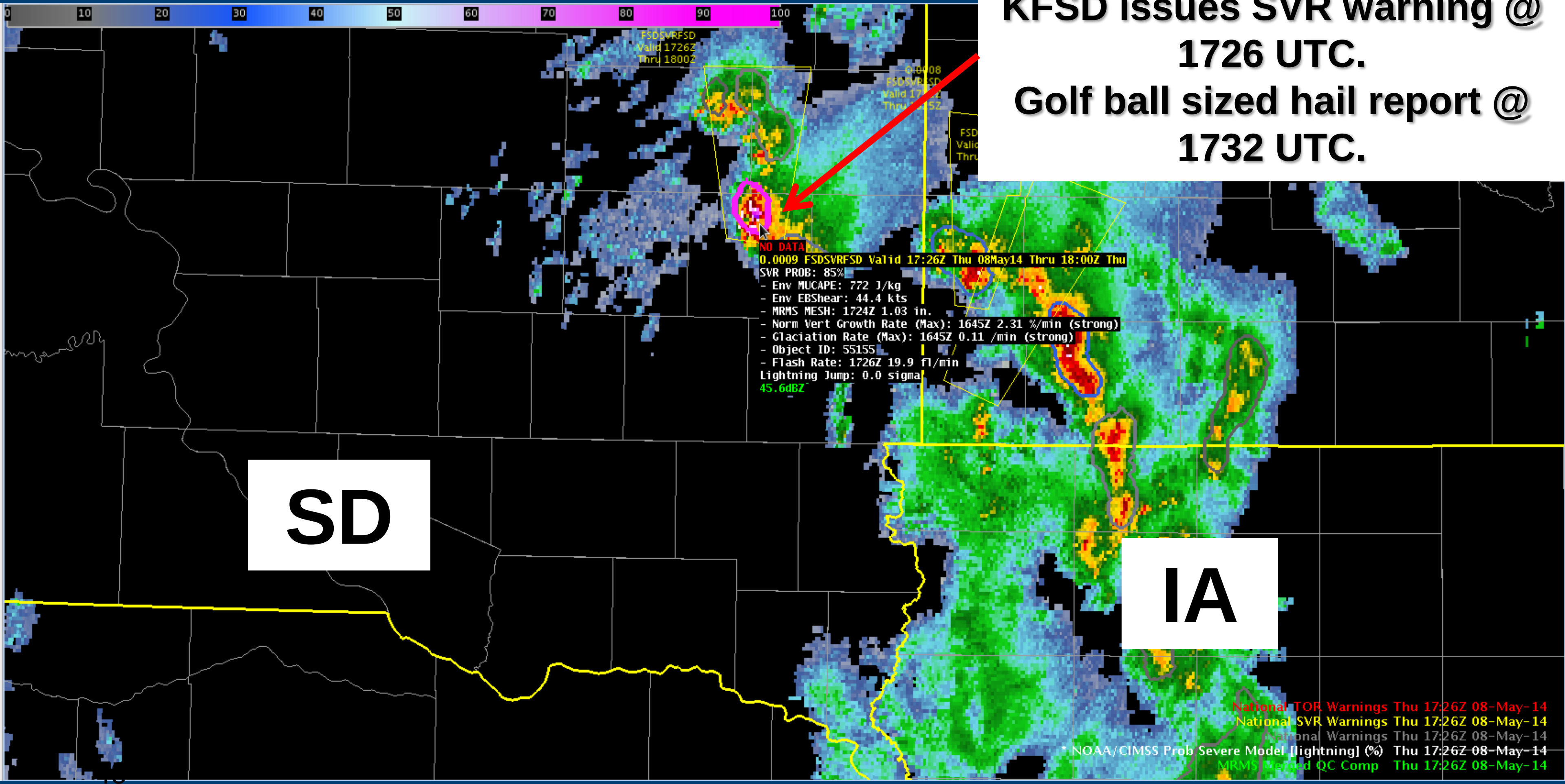
Prob = 78%
Strong satellite growth and glaciation rates.
MESH increases to 0.89”.
Lightning continues to increase.



1726 UTC May-08-2014

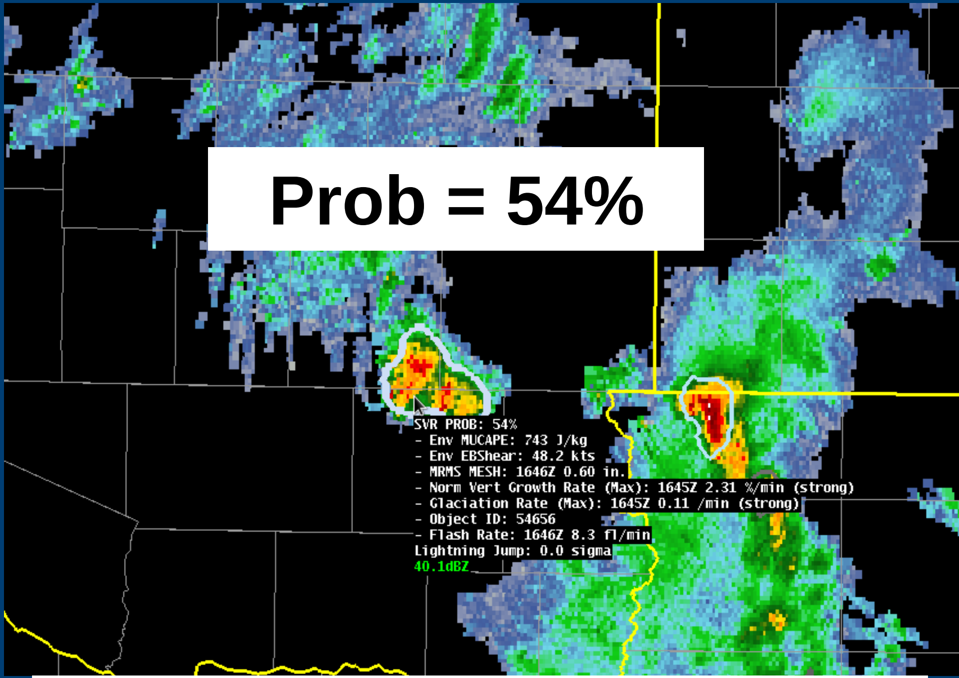
MUCAPE ~ 750 J kg^{-1}
Eff. shear ~ 48 kts

Prob = 85%
KFSD issues SVR warning @ 1726 UTC.
Golf ball sized hail report @ 1732 UTC.

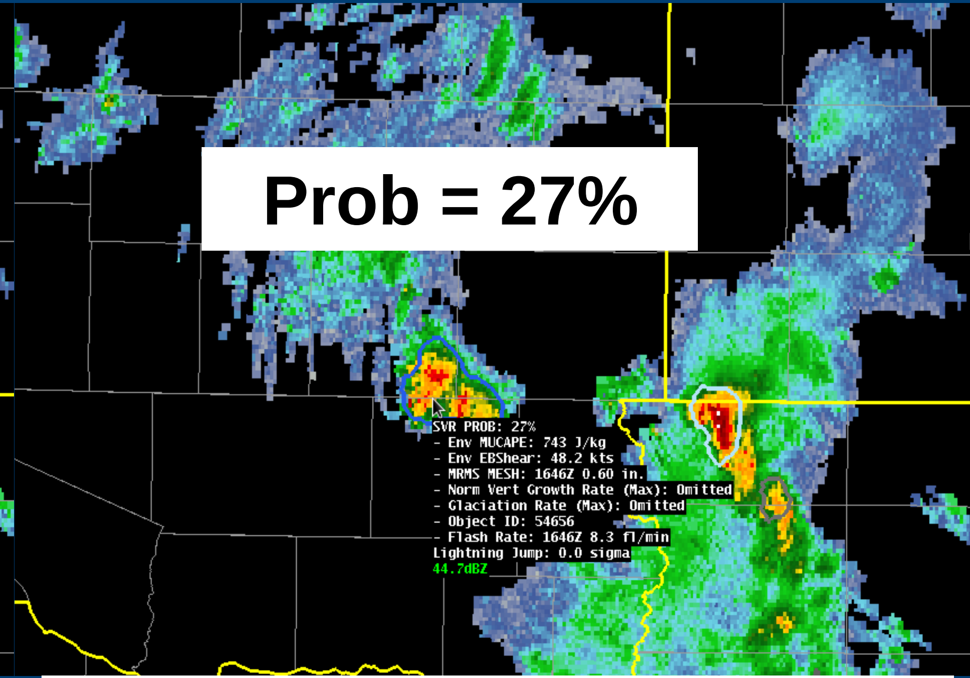


Impact of GOES Data

1646 UTC May-08-2014



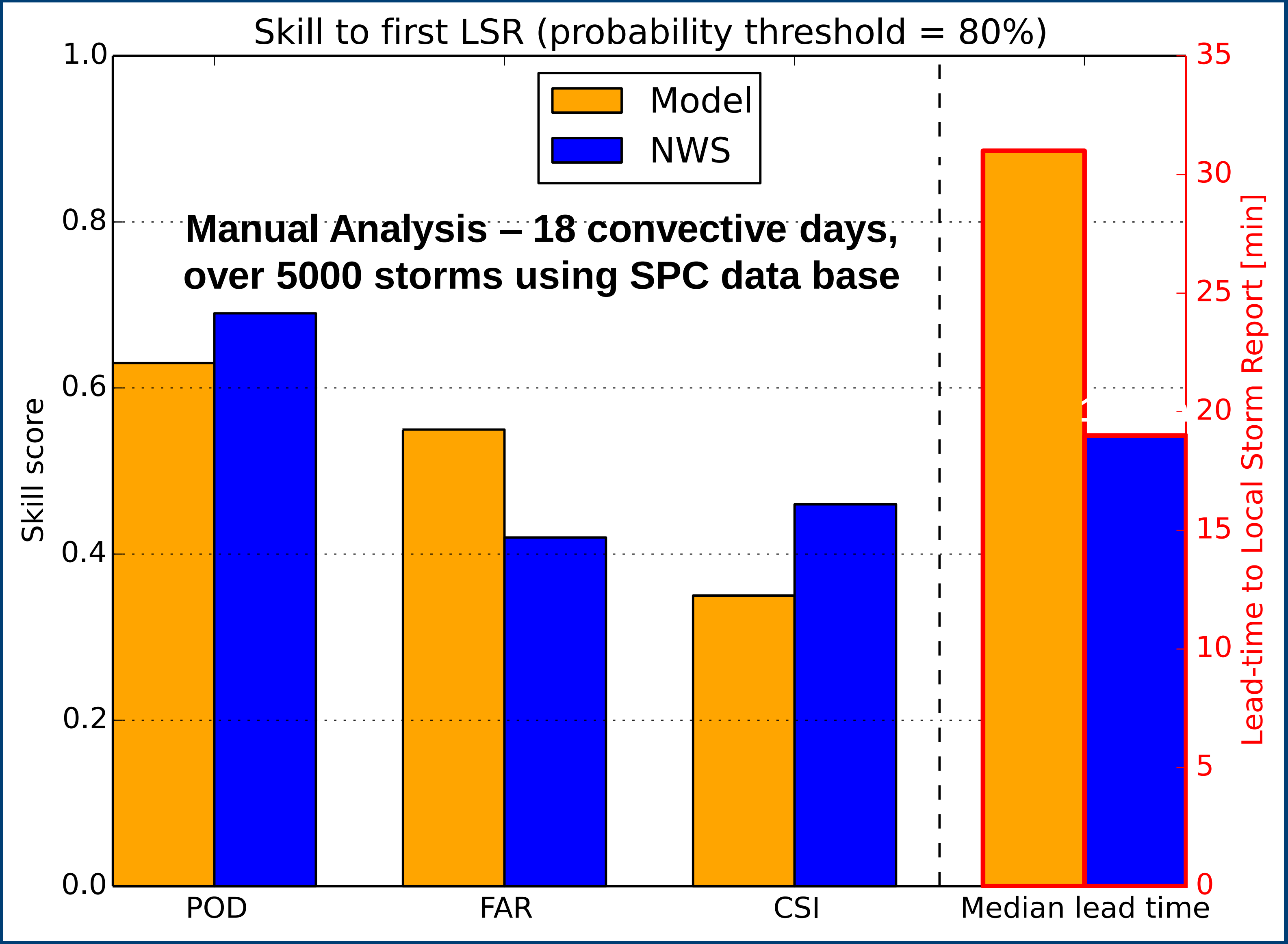
NWP + Satellite + Radar + Lightning



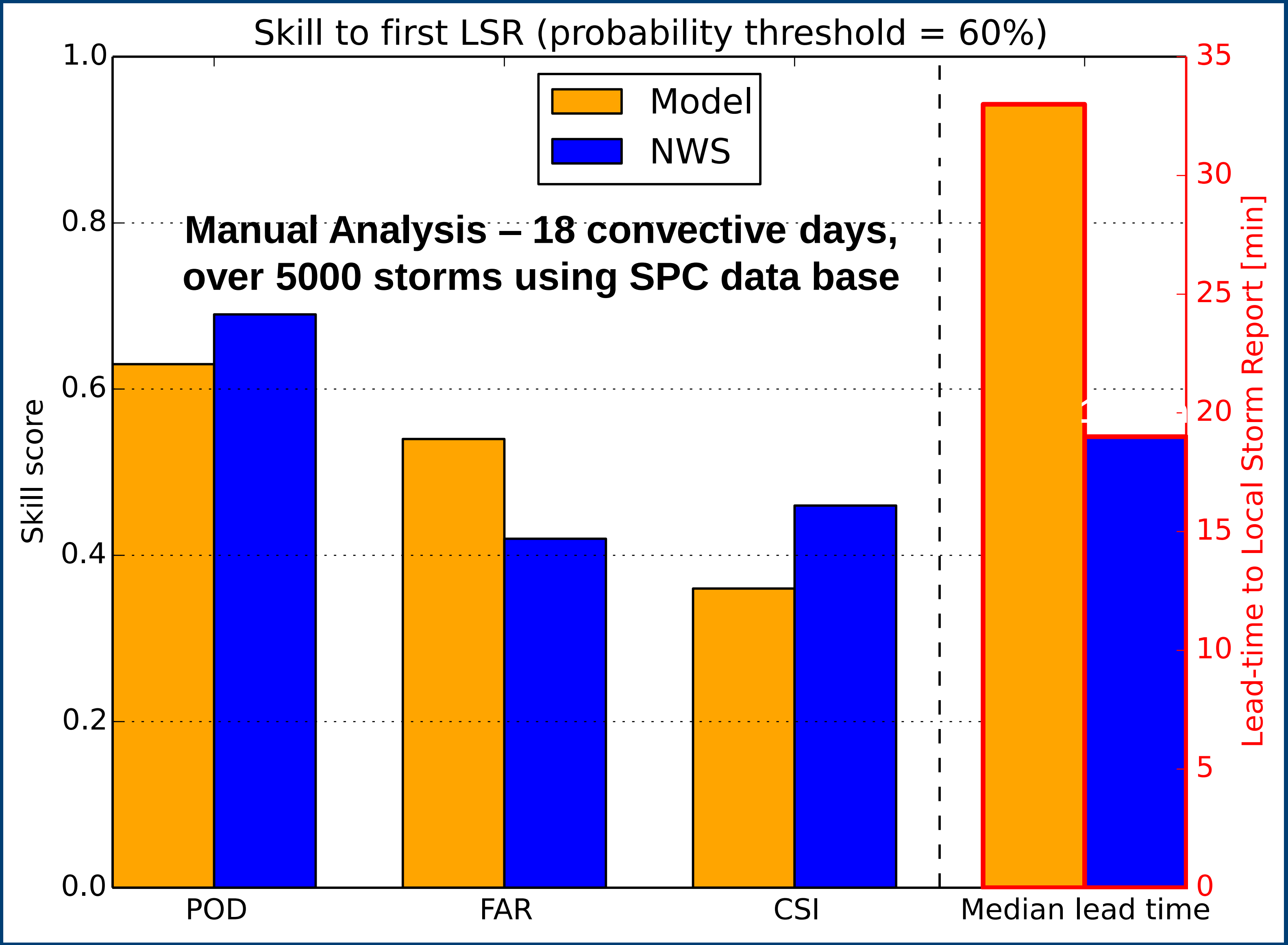
NWP + ~~Satellite~~ + Radar + Lightning

Time (UTC)	With Satellite	Without Satellite
1644	27% (no sat. growth yet)	27%
1646	54%	27%
1648	78%	54%
1728	85%	65%

ProbSevere – Without Lightning

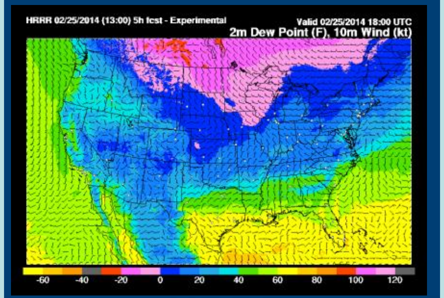


ProbSevere – With Lightning

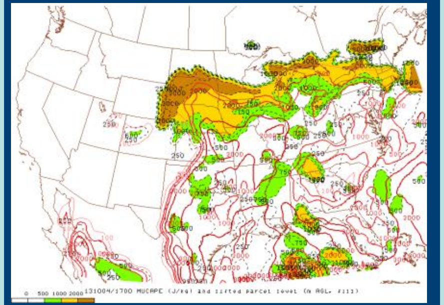


Continued Development

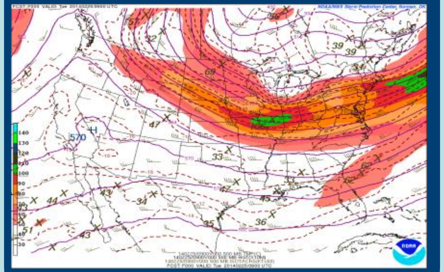
NWP



HRRR

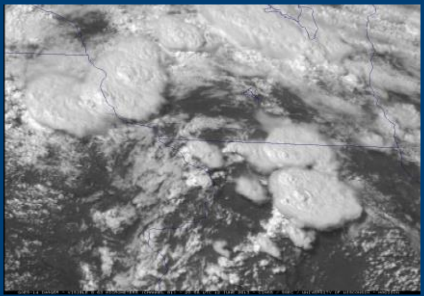


SPC-OA

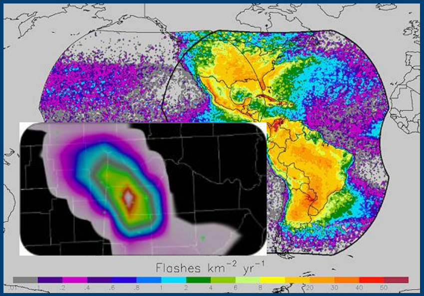


SREF

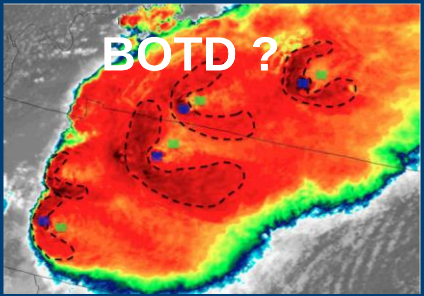
GOES-R



Super-rapid scan

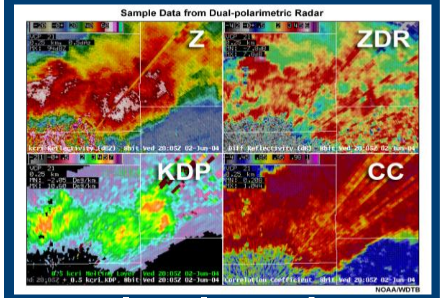


GLM

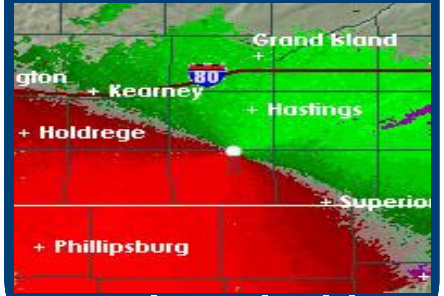


Cb properties

NEXRAD

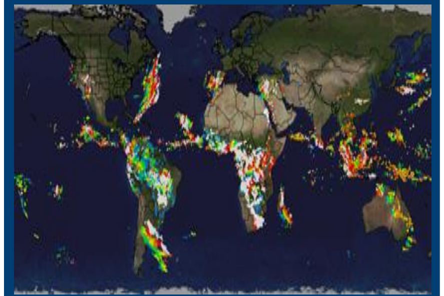


Dual-pol products

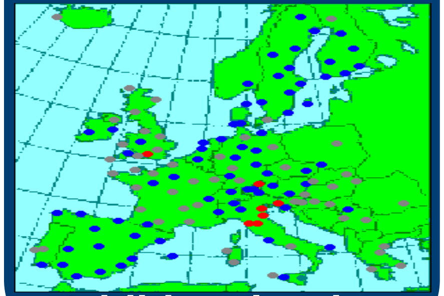


Doppler velocities

Other



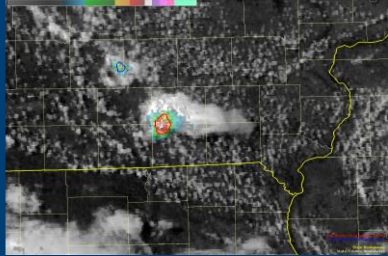
Global lightning



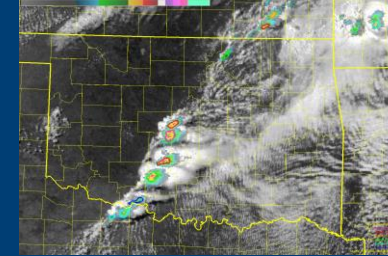
Additional radars

Create more refined and specific forecasts of severe weather (tornado, hail, wind)

Images are from NOAA, NASA, UW-CIMSS, and OU-CIMMS



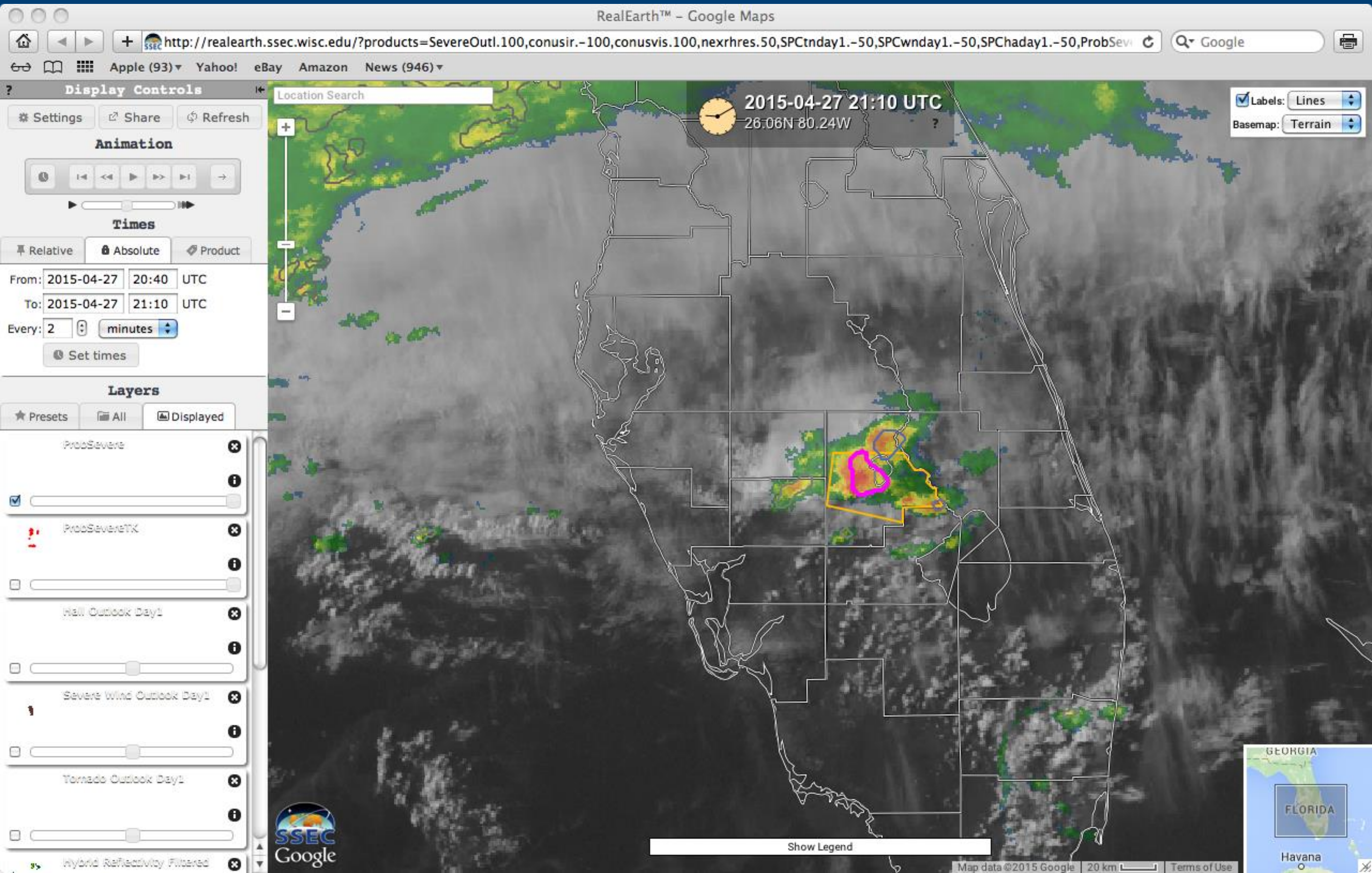




“Big Data” Research in NOAA is:

- Increasing the lead time and accuracy of severe weather warnings
- Supporting the NWS Weather Ready Nation initiative through provision of probabilistic storm scale forecast guidance
- Spawning new research aimed at improving the prediction of specific severe weather hazards and oceanic convection

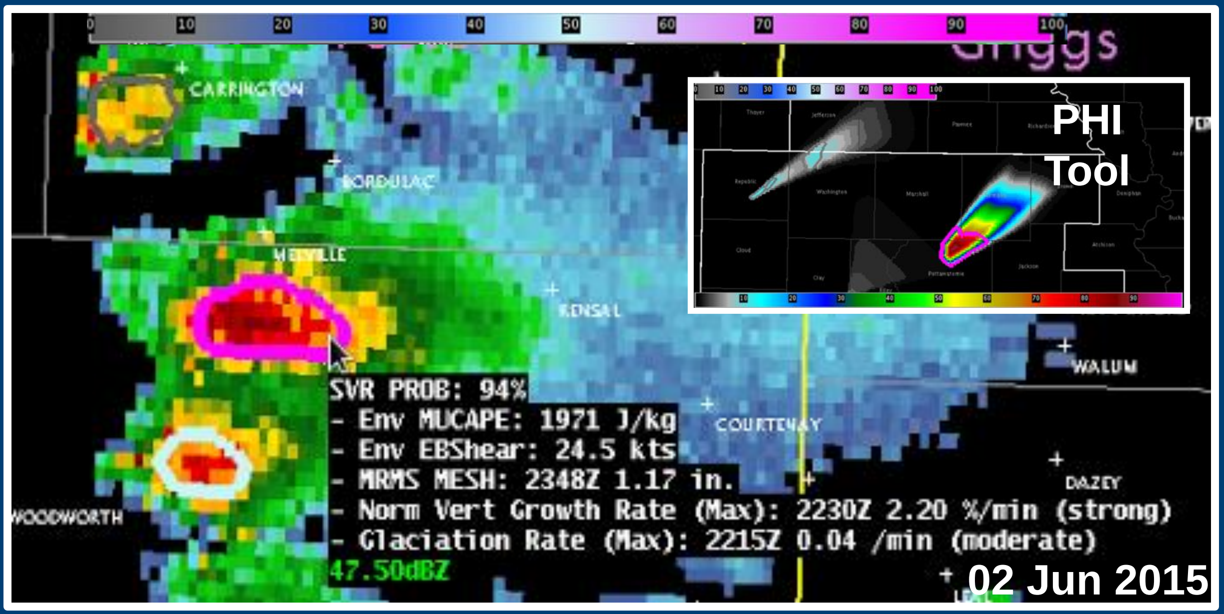

http://cimss.ssec.wisc.edu/severe_conv/probsev.html



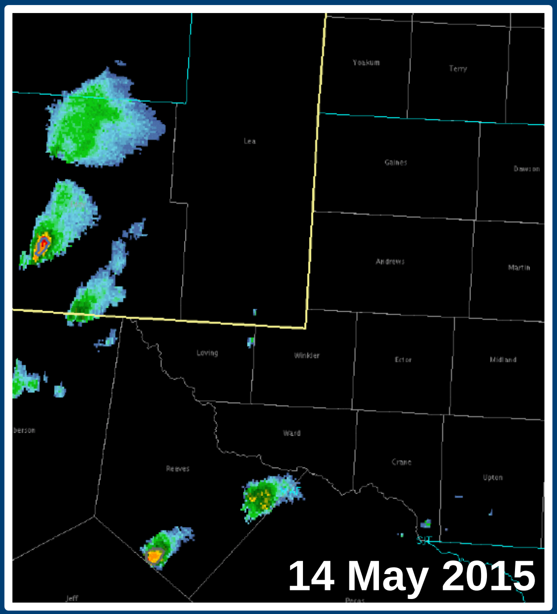
GOES-R Probability of Severe (ProbSevere – Pavolonis)

- **Fuses GOES cloud products, radar information, and RAP-derived environmental fields and uses object-based tracking in both GOES and radar imagery and a statistical model to produce probability of future severe weather.**

Radar reflectivity, ProbSevere contours, ProbSevere readout



Radar reflectivity, ProbSevere contours, HWT Warnings



- ***"It did provide an opportunity to assess the situation quickly and figure out which of the ongoing storms need our attention first." … "Great situational awareness tool"***
- ***"Gave me confidence to load up Warngen and issue after a cursory look at the radar data"***
- **Suggestions: probabilities by specific threat, time series of recent probabilities, use of lightning data as a predictor, improved performance when severe wind was the main threat.**

References

- Pavolonis, M. J., 2010: Advances in Extracting Cloud Composition Information from Spaceborne Infrared Radiances-A Robust Alternative to Brightness Temperatures. Part I: Theory. Journal of Applied Meteorology and Climatology, 49, 1992-2012, doi:10.1175/2010JAMC2433.1 ER.

- Cintineo, John L.; Pavolonis, Michael J.; Sieglaff, Justin M. and Heidinger, Andrew K. Evolution of severe and nonsevere convection inferred from GOES-derived cloud properties. Journal of Applied Meteorology and Climatology, 52 (9), 2013, 2009–2023.

- Cintineo, John L.; Pavolonis, Michael J.; Sieglaff, Justin M. and Lindsey, Daniel T. An empirical model for assessing the severe weather potential of developing convection. Weather and Forecasting, 29 (3), 2014, 639–653.

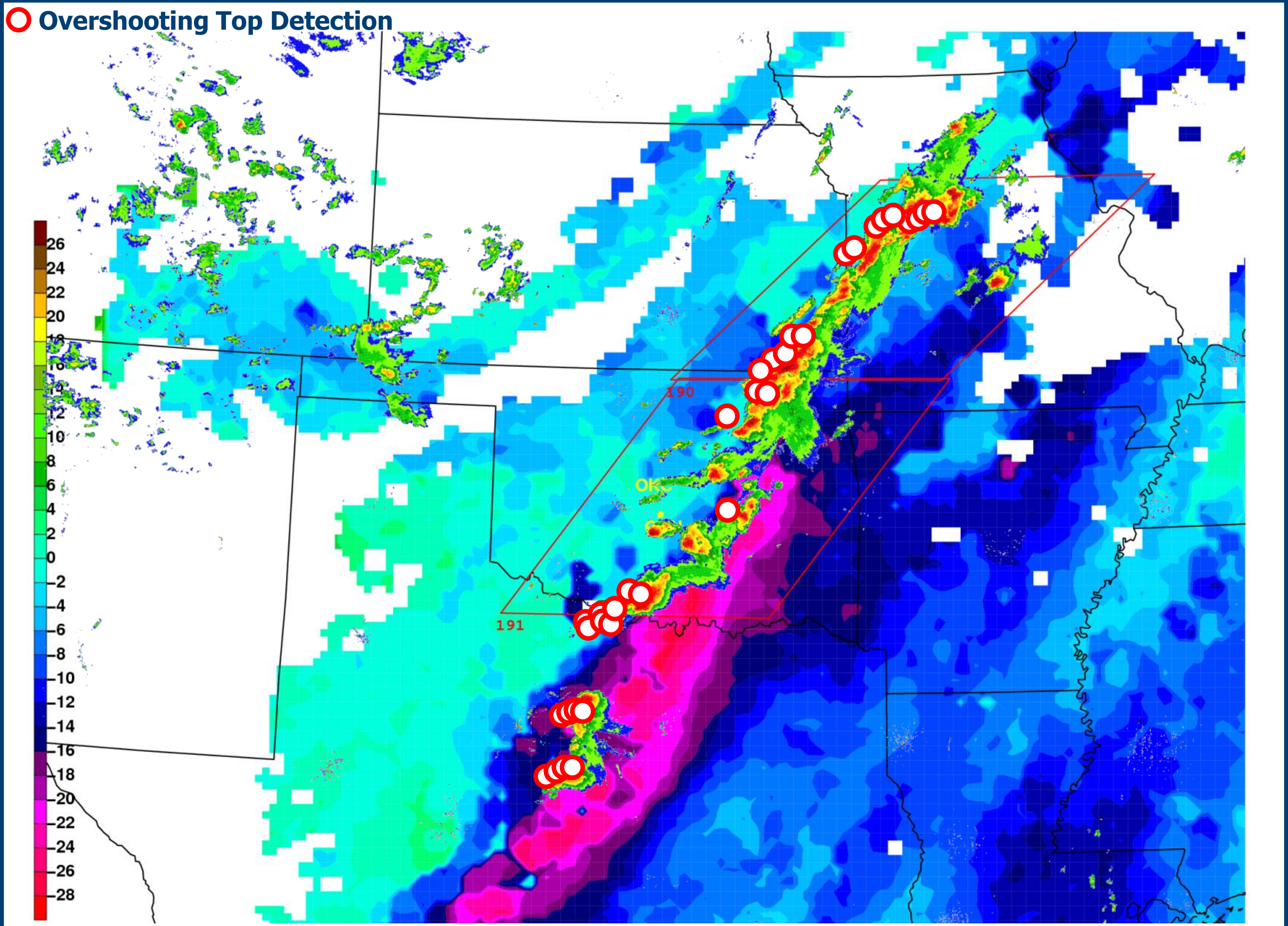
GOES-R Convective Monitoring Demonstration Products

- Day-1 readiness of NOAA funded GOES-R products is accomplished by providing pre-operational products that use the current GOES and/or model data.

- All Sky Total Precipitable Water
  - Jun Li (UW-CIMSS)
  - Current state of thermodynamic profiles, TPW, 3 Layer PW, Stability Indices
  - Availability: Hourly
  - Latency: ~ 2-3 min
- NearCast
  - Ralph Petersen (UW-CIMSS) Bill Line (OU-CIMMS/SPC)
  - Short-term predictions of convective instability
  - Availability: Hourly
  - Latency: ~ 2-3 min
- Convective Initiation
  - John Mecikalski (UAH-ATS)
  - Nowcast (0 to 2 hour) probability of convective initiation
  - Availability: Every GOES Scan
  - Latency: ~ 13-15 min
- Probability of Severe (ProbSevere)
  - Michael Pavolonis (NOAA NESDIS ASPB- Madison, WI)
  - John Cintineo (UW-CIMSS)
  - Assessment of satellite IR, radar, and NWP parameter tendencies
  - Availability: Every Radar/Satellite Scan
  - Latency: ~ 1-2 min
- Overshooting Top Detection
  - Kris Bedka (SSAI – NASA Langley)
  - Detection and magnitude of overshooting tops
  - Availability: Every GOES Scan
  - Latency: ~ 5-6 min

How can these products be used in a data-fusion process prior to convective initiation and during convective warning operations?

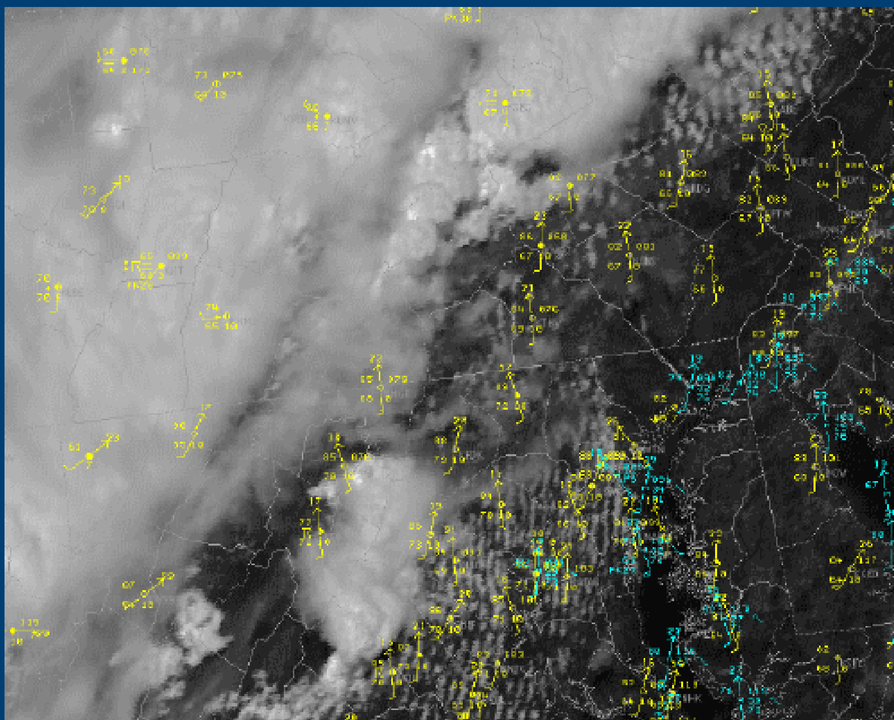
GOES-R Overshooting Top Detection (Bedka)



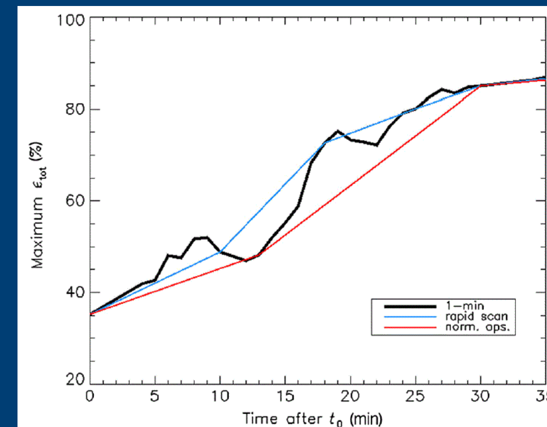
NearCast Mid-Low Theta-E Difference 03-h FCST valid 20 May 2013 at 2200 UTC
30-min Overshooting Top Detection Accumulation valid 20 May 2013 at 2202 UTC
WSR-88D Composite Reflectivity valid 20 May 2013 at 2202 UTC

GOES-14 SRSOR (1-min) Imagery and Algorithms

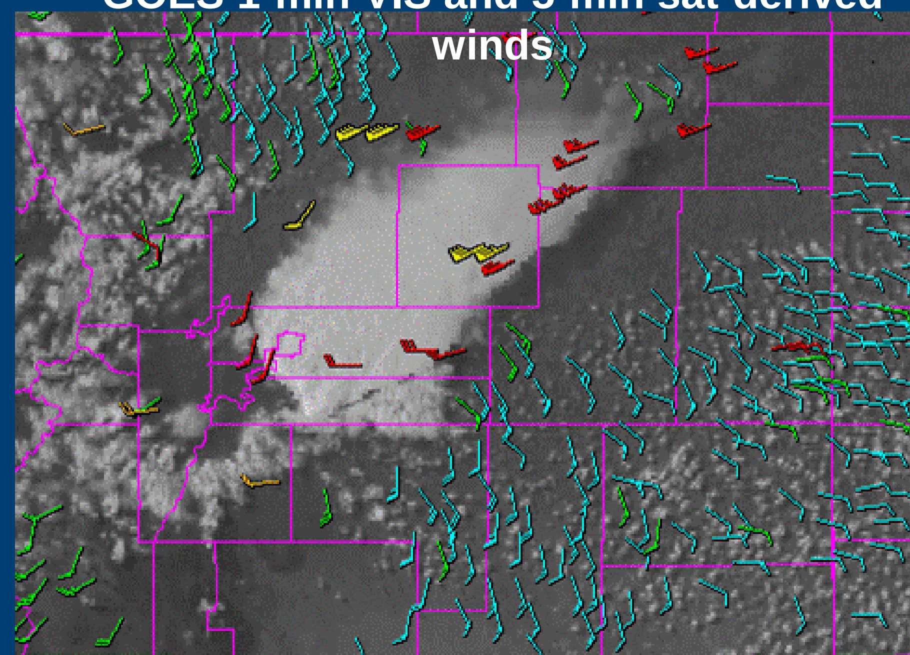
GOES 1-min VIS and automated-OTD



Infrared Cloud-top cooling



GOES 1-min VIS and 5-min sat-derived winds



"It is nice to be able to quantify the OTs, something you can't do quickly without an algorithm."

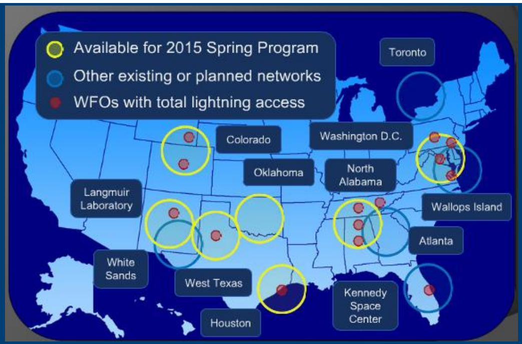
GOES-R Convective Monitoring Demonstration Products

- Day-1 readiness of NOAA funded GOES-R products is accomplished by providing pre-operational products that use the current GOES and/or model data.
  - All Sky Total Precipitable Water
    - Jun Li (UW-CIMSS)
    - Current state of thermodynamic profiles, TPW, 3 Layer PW, Stability Indices
    - Availability: Hourly
    - Latency: ~ 2-3 min
  - NearCast
    - Ralph Petersen (UW-CIMSS) Bill Line (OU-CIMMS/SPC)
    - Short-term predictions of convective instability
    - Availability: Hourly
    - Latency: ~ 2-3 min
  - Convective Initiation
    - John Mecikalski (UAH-ATS)
    - Nowcast (0 to 2 hour) probability of convective initiation
    - Availability: Every GOES Scan
    - Latency: ~ 13-15 min
  - Probability of Severe (ProbSevere)
    - Michael Pavolonis (NOAA NESDIS ASPB- Madison, WI)
    - John Cintineo (UW-CIMSS)
    - Assessment of satellite IR, radar, and NWP parameter tendencies
    - Availability: Every Radar/Satellite Scan
    - Latency: ~ 1-2 min
  - Overshooting Top Detection
    - Kris Bedka (SSAI – NASA Langley)
    - Detection and magnitude of overshooting tops
    - Availability: Every GOES Scan
    - Latency: ~ 5-6 min
  - Pseudo Geostationary Lightning Mapper
    - Geoffrey Stano (NASA SPoRT)
    - Total Lighting Flash Extent Density
    - Availability: Every 2 min
    - Latency: ~ 3-4 min

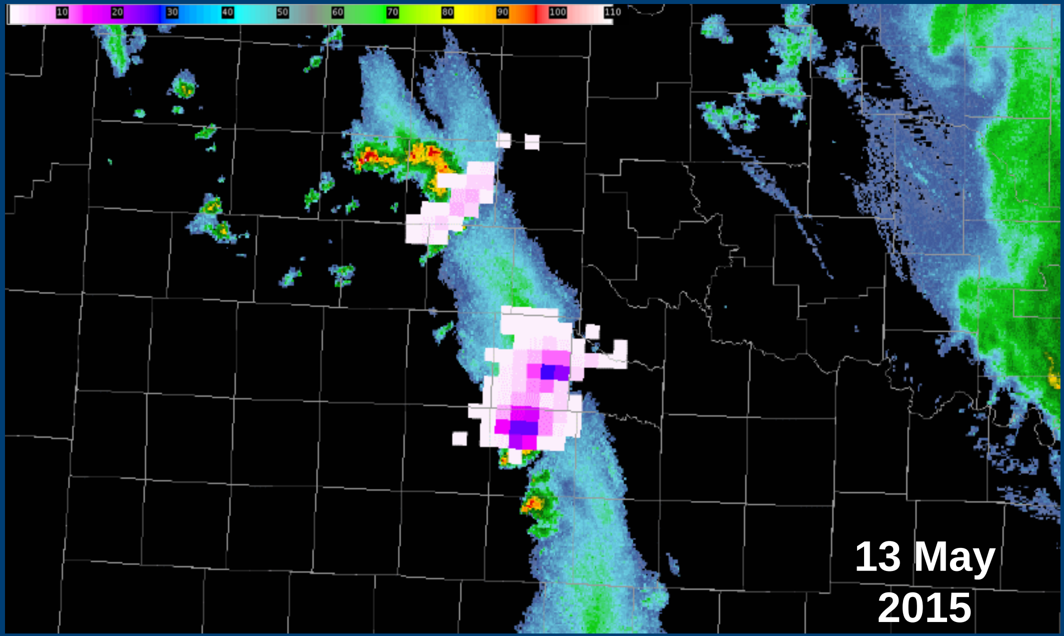
How can these products be used in a data-fusion process prior to convective initiation and during convective warning operations?

GOES-R Pseudo Geostationary Lightning Mapper (PGLM) Total Lightning

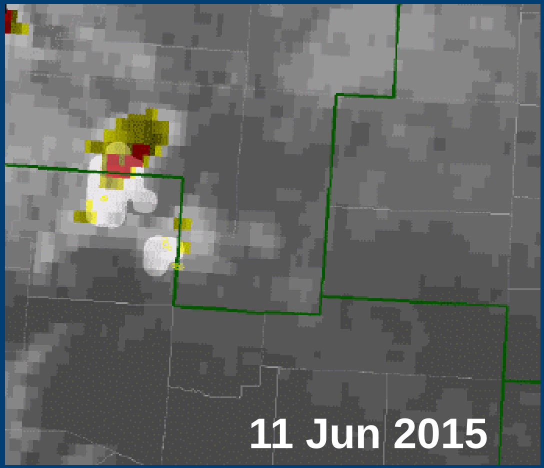
- **Pseudo Geostationary Lightning Mapper (PGLM) total lightning products were created using Lightning Mapping Array (LMA) data from regional networks around the US.**



PGLM FED, radar reflectivity



PGLM FED, GOES 1-min IRW



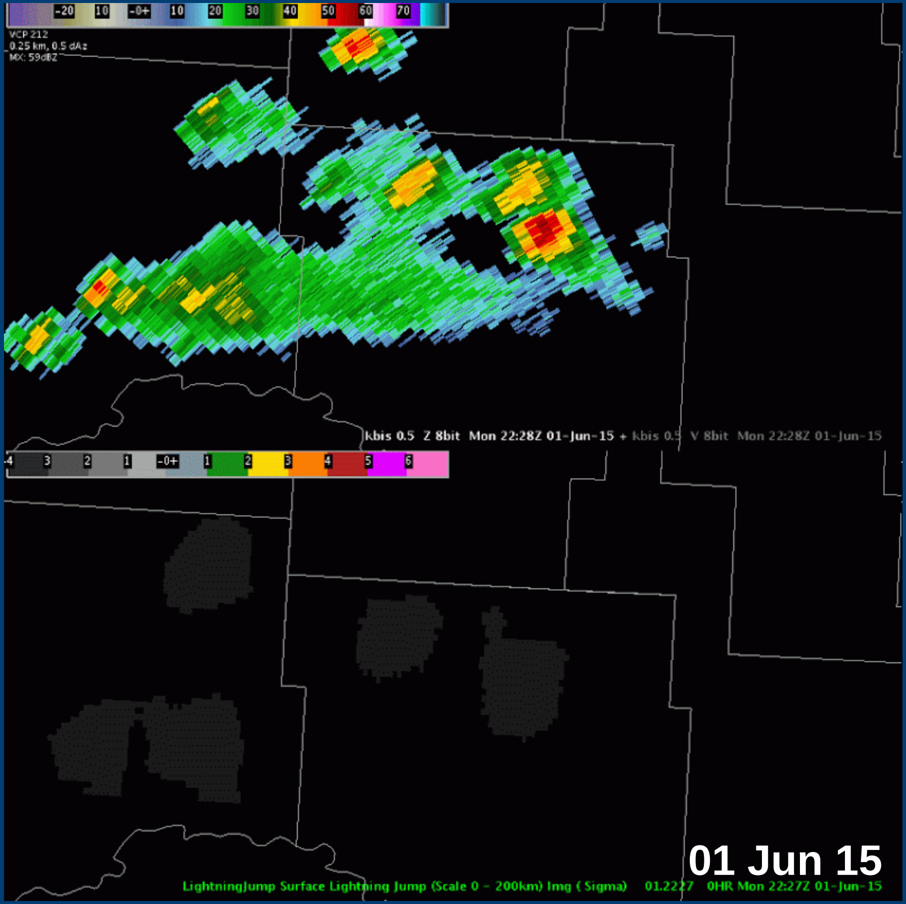
- ***"One of the primary ways to monitor convective growth and changes in storm intensity."***
  - **Many comments related to the value of total lightning products for Decision Support Services for locations such as outdoor venues as well as for marine and fire weather forecasting.**

❖ **Suggestions: improved training on the proper incorporation of total lightning information into the warning-decision process.**

GOES-R Pseudo Geostationary Lightning Jump Algorithms

- The Lightning Jump Algorithm (LJA) demonstrated in 2015 uses data from the Earth Networks Total Lightning Network and computes the degree of jump (sigma-level) in total lightning activity for a tracked storm object.

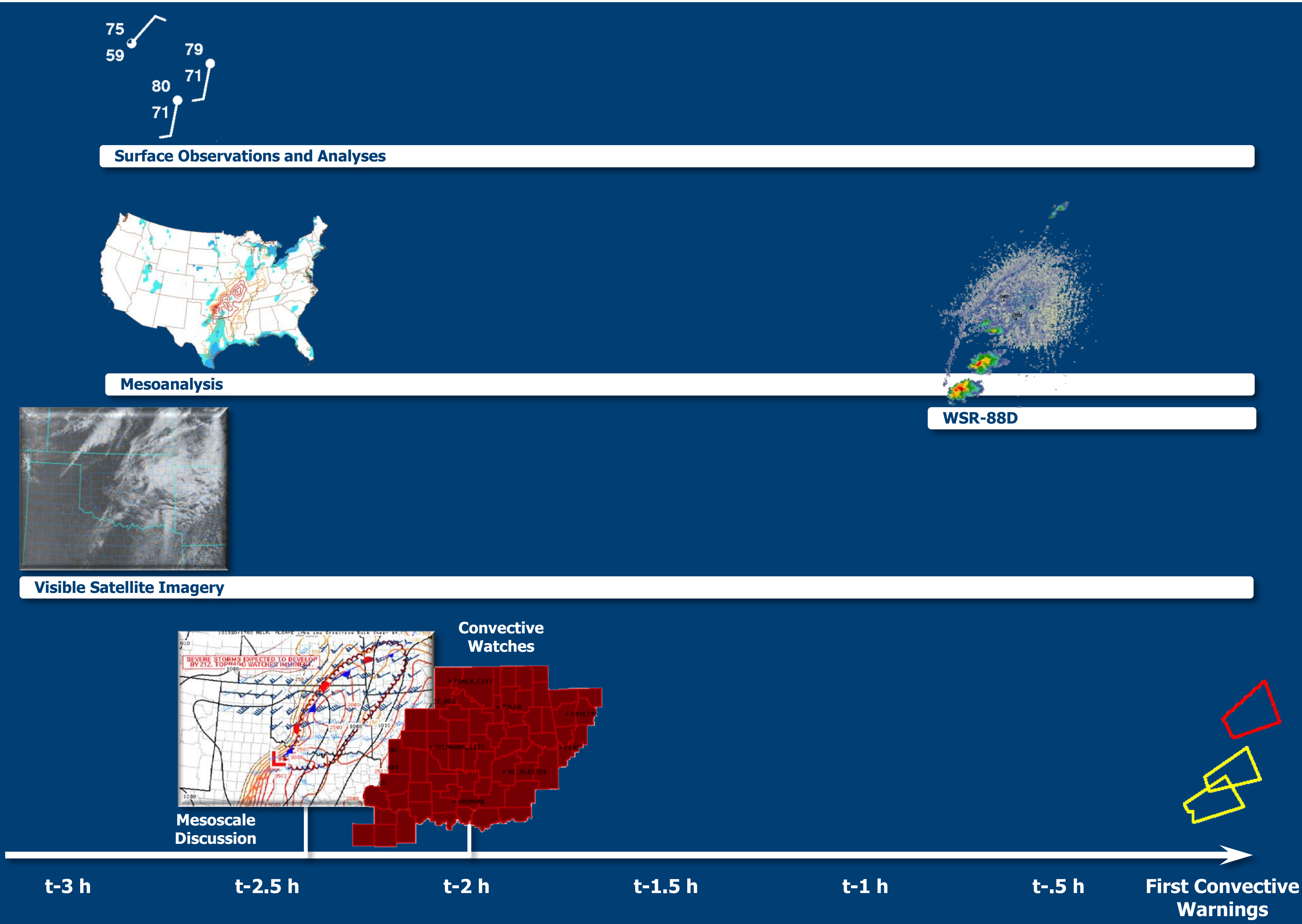
Radar reflectivity (Top) Lightning Jump sigma-level (bottom)



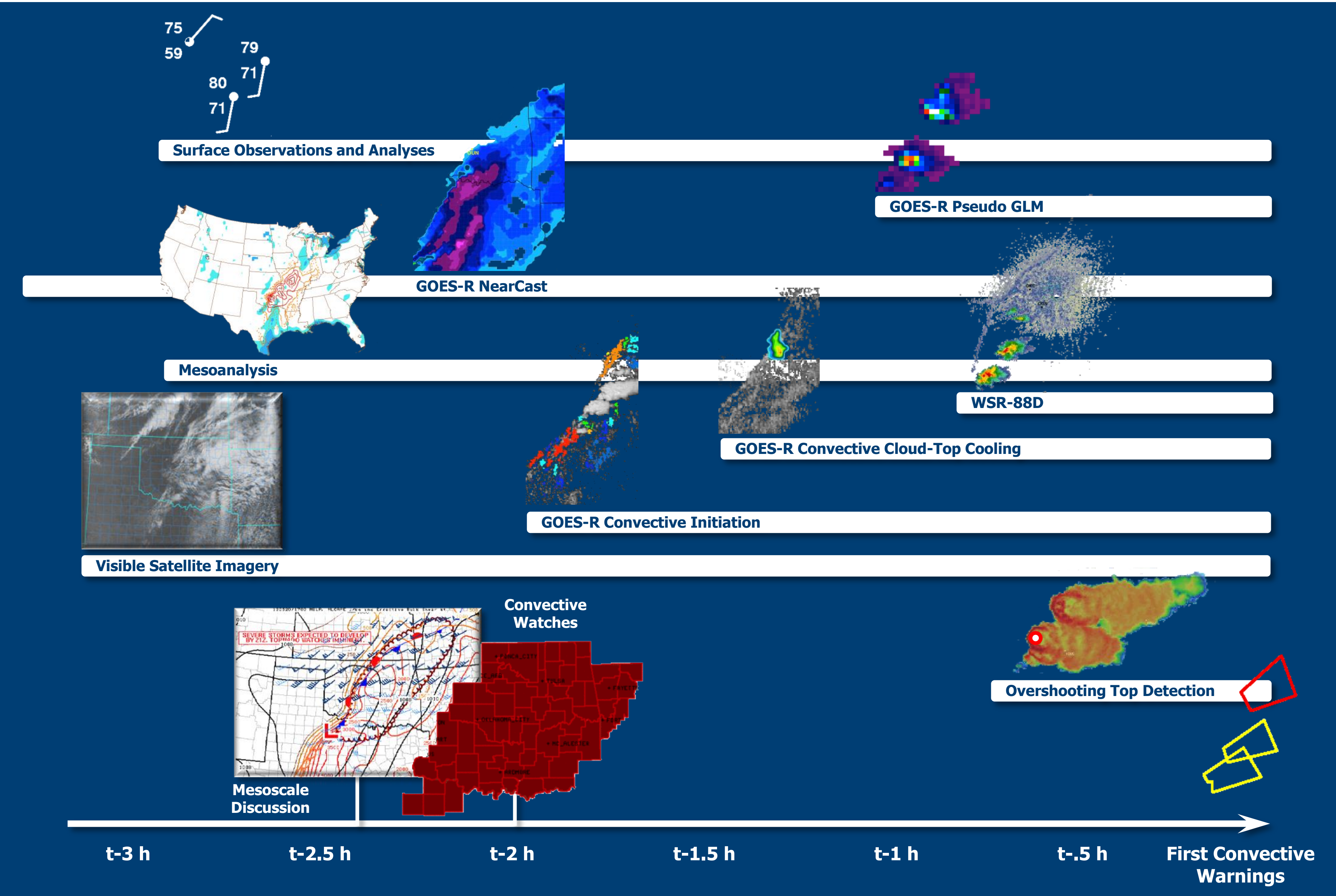
- *"The LJA really helped with both warning operations and situational awareness. It was one of the first products to identify rapid intensification."*
- *"I found it to be very useful for a quick visualization... having a product that was an easy 0-6 scale made for fast analysis."*

❖ Suggestions: improved training on the use of LJA in operations, metadata added to the LJA grid, time-series information.

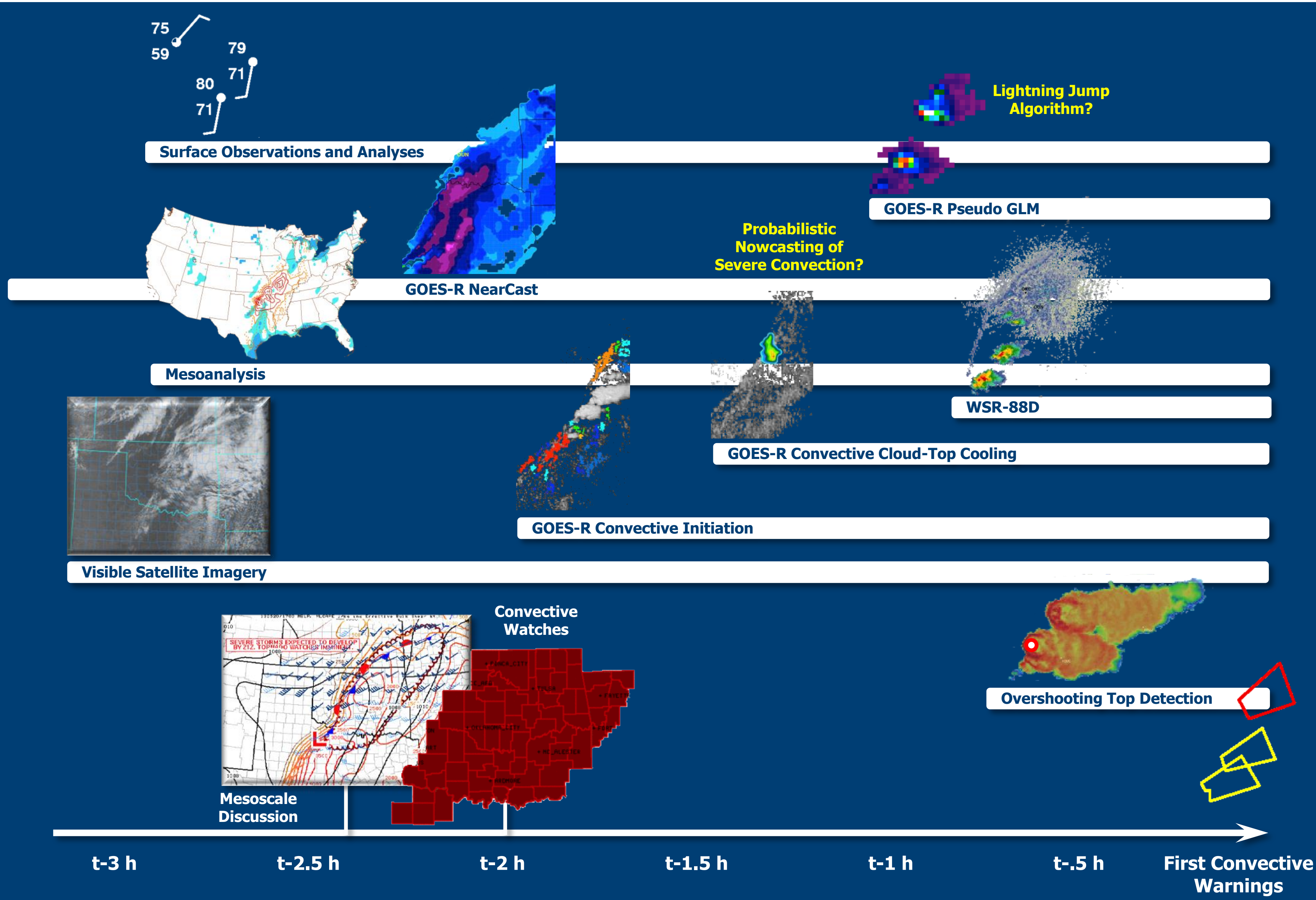
The -3-0 h Convective Forecasting Timeline



The -3-0 h Convective Forecasting Timeline



The -3-0 h Convective Forecasting Timeline

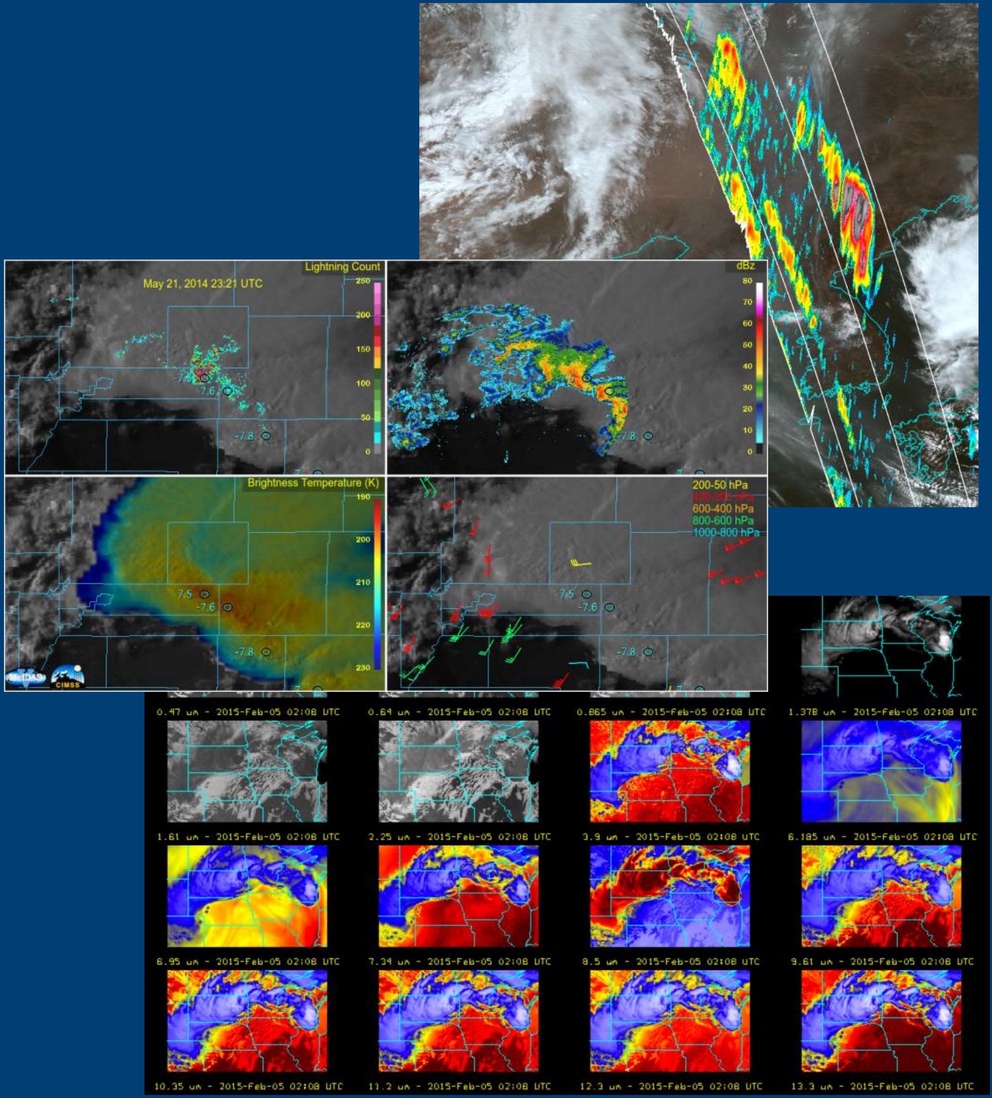


Summary

- GOES-R Proving Ground provides mechanism to:
  - Involve NOAA Cooperative Institutes, National Centers, NOAA Testbeds and National Weather Service WFOs in user readiness
  - Get prototype GOES-R products in hands of forecasters
  - Keep lines of communication open between developers and forecasters
  - Allow end user to have say in final product, how it is displayed and integrated into operations
- With adjustments based on user feedback…Proving Ground continues to grow and plans are in place for 2016 and beyond.
- For GOES-R to be a success, forecasters must be able to use GOES-R products on Day 1!
- Fused Approach at many WFOs using Convective Initiation and Probability of Severe Convection already exists
  - Products compliment each other

Using McIDAS-V with the next Generation of Satellite Sensors

- **GOES-R and Himawari**
  - Straight forward Himawari-8 data access and display.
  - GOES-R Sample data can be displayed in McIDAS-V. The scripting API provides ease of use for scheduled tasks.
- **Combining Sensors and Products**
  - Multiple datasets from GOES-13 1 minute data are easily displayed on a common projection.
  - 3D capabilities and automated projection capabilities provide a simple way to combine satellite sensor data with other meteorological observations in a meaningful way.



QUESTIONS???

American Meteorological Society

Joint 21st Satellite Meteorology, Oceanography and Climatology Conference and 20th Conference on Air-Sea Interaction

15 – 19 August 2016 Madison, WI

Important Dates

Short Abstract Submission Deadline:	08 April 2016
Acceptance Emails Sent:	Early May 2016
Registration Opens:	TBD
Pre-Registration Closes:	01 July 2016
Hotel Reservation Deadline:	07 July 2016
Presentation Upload Date:	05 August 2016
No Refunds Deadline:	29 July 2016
Extended Abstract Deadline:	19 September 2016
Recorded Presentations Available:	15 September 2016

https://www.ametsoc.org/ams/index.cfm/meetings-events/ams-meetings/joint-21st-satellite-meteorology-oceanography-and-climatology-conference-and-20th-conference-on-air-sea-interaction/