Applying Probabilistic Aviation Forecast Grids from the LAMP/HRRR Meld

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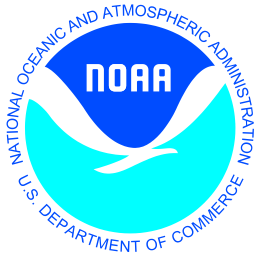
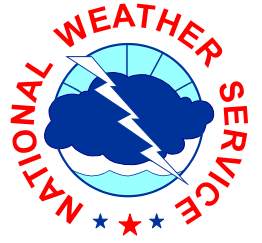


18th Conference on Aviation, Range, and Aerospace Meteorology

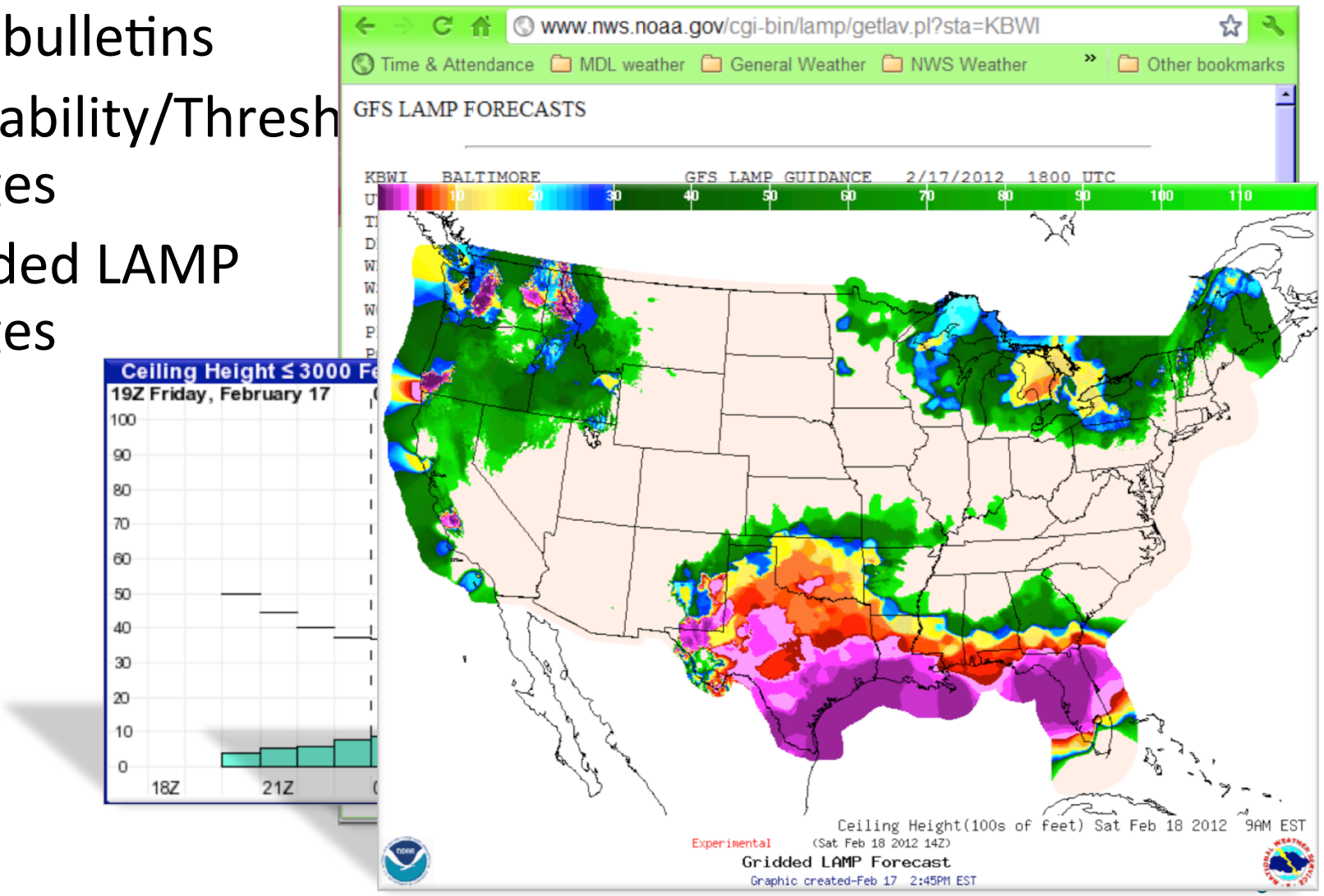


Outline

- LAMP Background/Upgrades
- Forecast Challenges
- LAMP/HRRR Meld Predictors
- Verification
- Example Forecast
- Probability Applications

LAMP Ceiling and Visibility Guidance

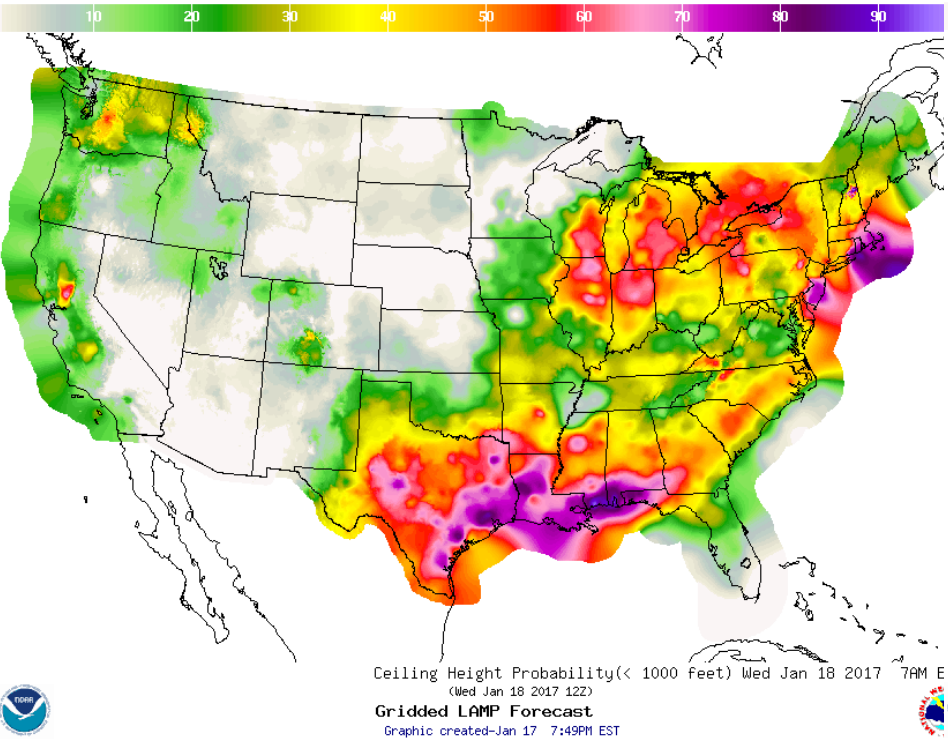
- Products:
  - Text bulletins
  - Probability/Thresh images
  - Gridded LAMP images



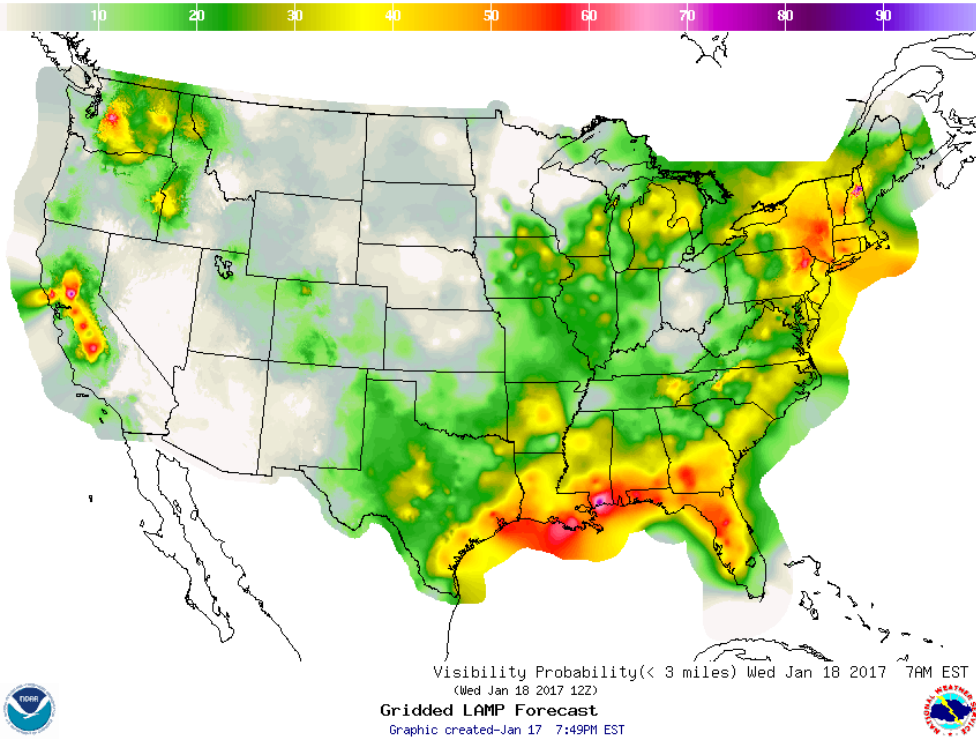
2016/17 LAMP Upgrades

- May 2016 – Implemented Gridded LAMP Ceiling and Visibility probabilities for three levels (LIFR, IFR, and MVFR thresholds)

Probability Ceiling < 1000 ft

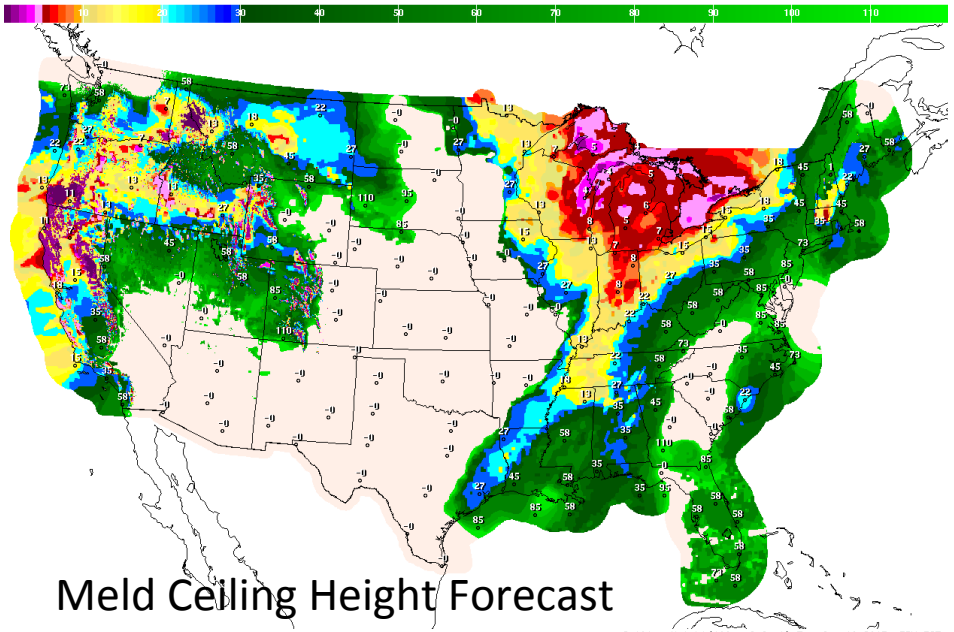


Probability Visibility < 3 mile



2016/17 LAMP Upgrades

- Spring 2017 – Implementing **LAMP/HRRR Meld** upgrade to Ceiling and Visibility
  - Upgrades to station based (text bulletin) categorical forecast guidance
  - Upgrades to Probabilistic and Deterministic gridded forecast guidance
  - Statistical blend of LAMP and HRRR
  - Improved Skill



Meld Ceiling Height Forecast

Ceiling and Visibility Forecast Challenges

- Often chaotic and discontinuous
- Often driven by small scale boundary layer meteorology
- Small moisture and temperature differences can make all the difference

Conveying an estimated probability of an event is often essential for good decision support due to the inherent challenges in making an accurate single forecast.

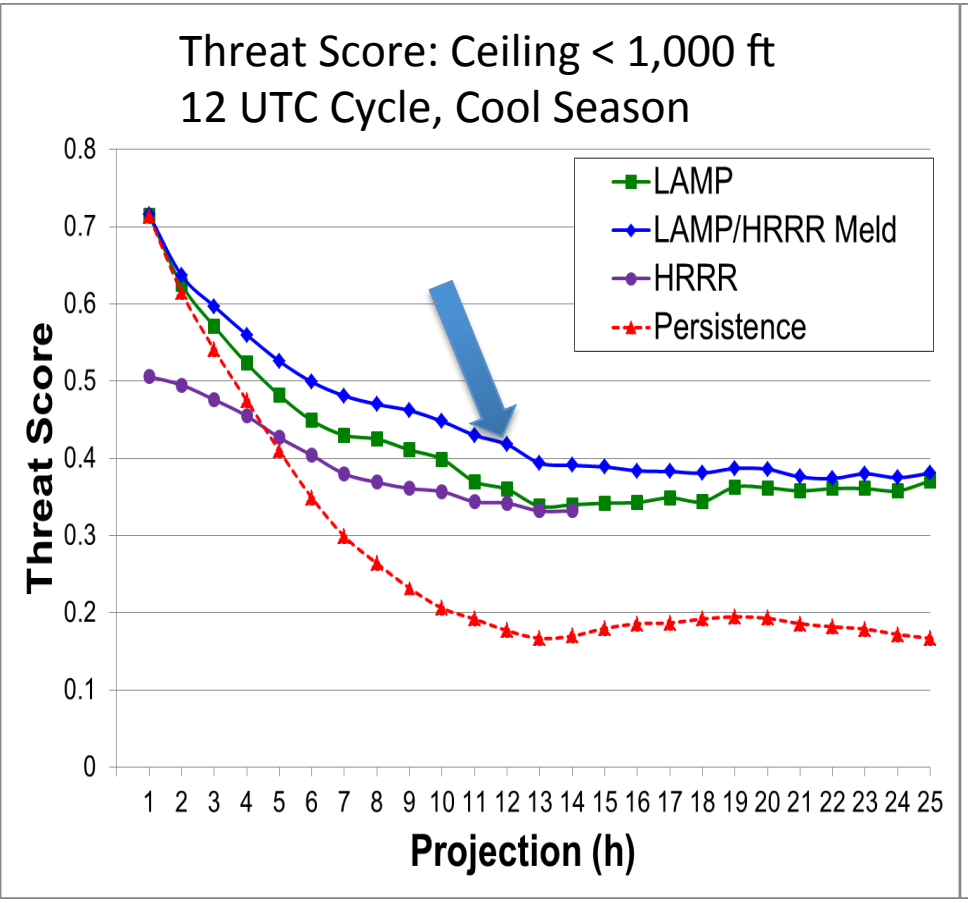

TWIN STAR

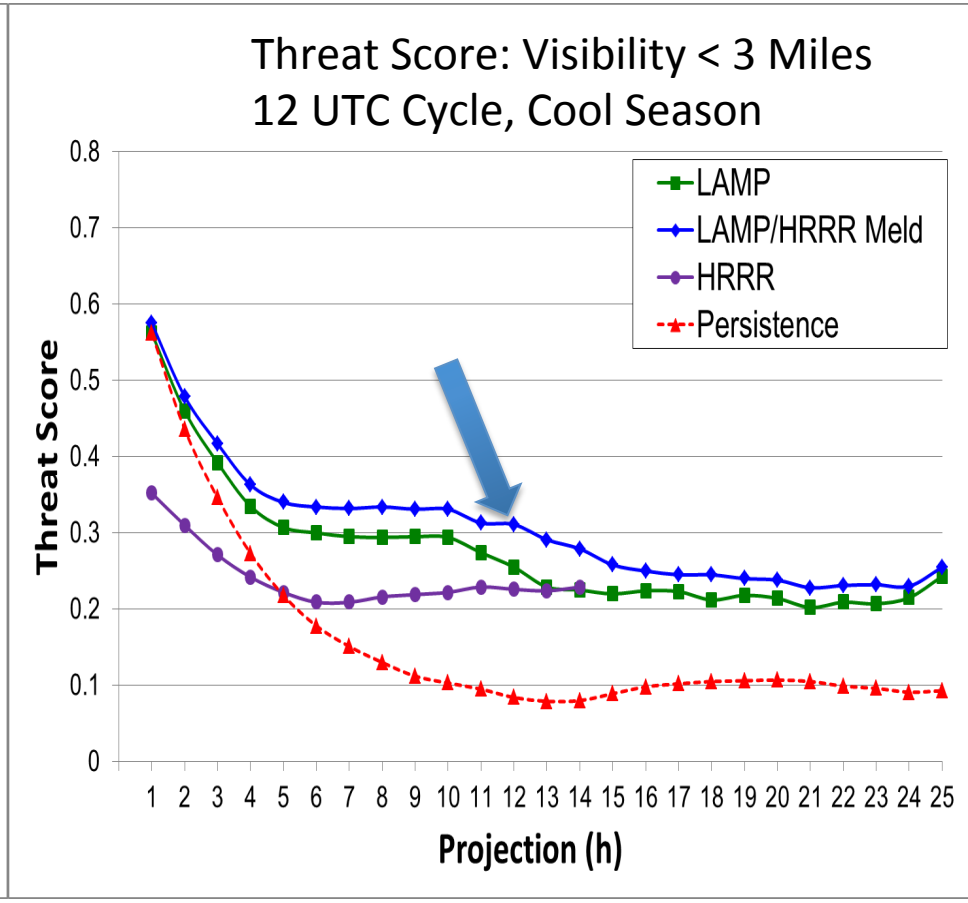
HRRR	GFS-LAMP
High Resolution Convection allowing physical model	Statistical Model based on predictors from broad scale global model
Tuned through physical processes parameterization	Calibrated for single stations statistically
Hourly observation assimilation	Hourly observation assimilation
~ 60 minutes latency from observations to forecast	~ 30 minute latency from observations to forecast
Runs Hourly -> 18-hr forecast	Runs Hourly -> 25-hr forecast

Different types of weather forecasting models have their own strengths.

Ceiling & Visibility: Threat Score

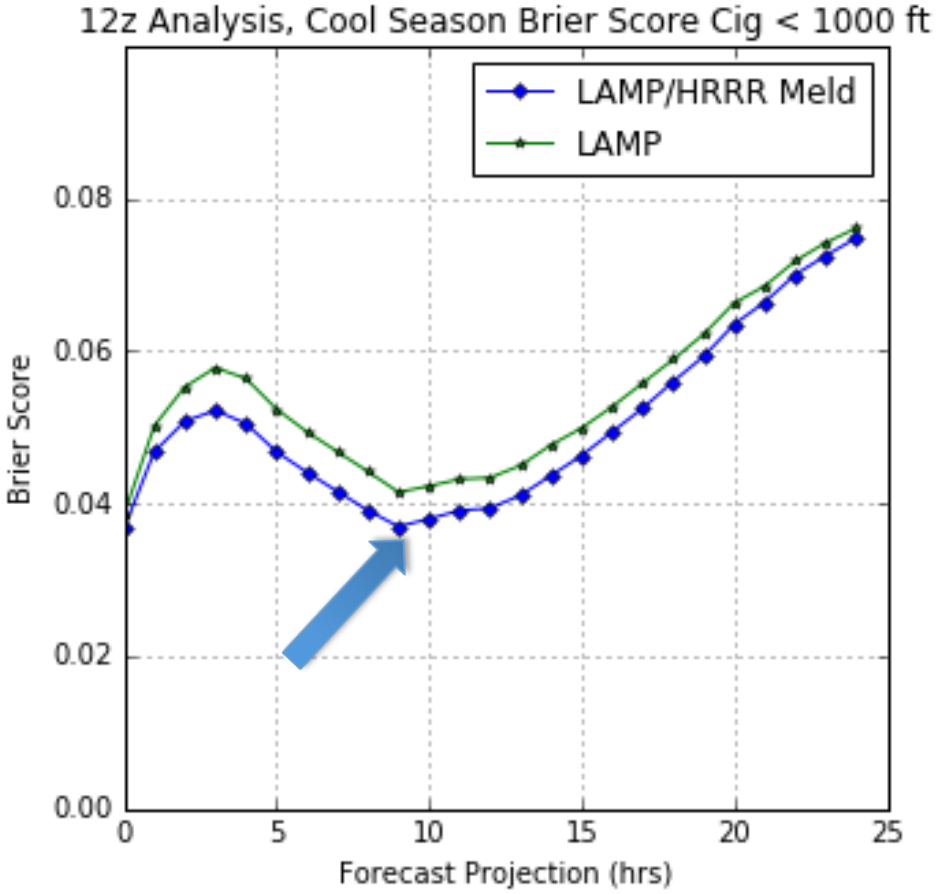
Four Month METAR Site Verification

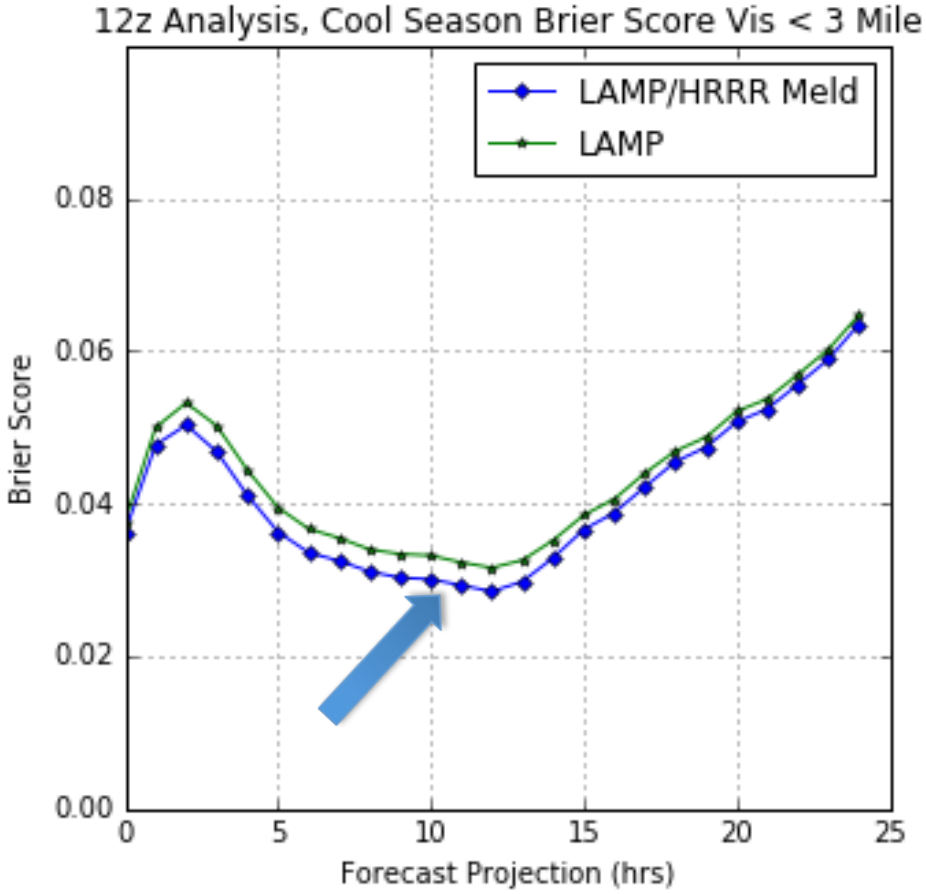




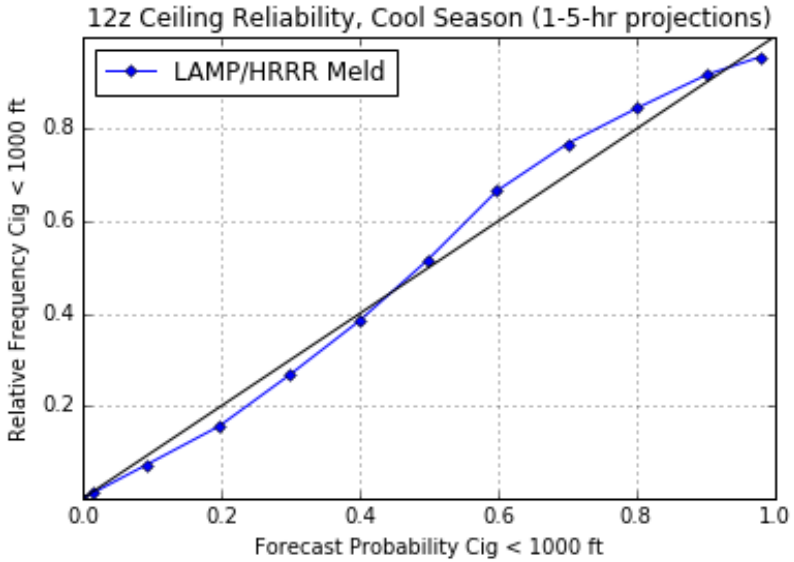
Ceiling & Visibility: Brier Score

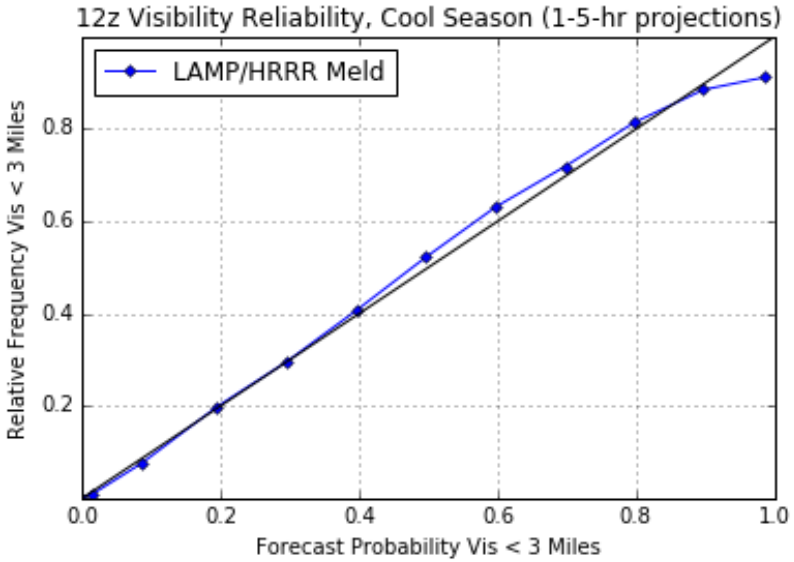
Four Month METAR Site Verification

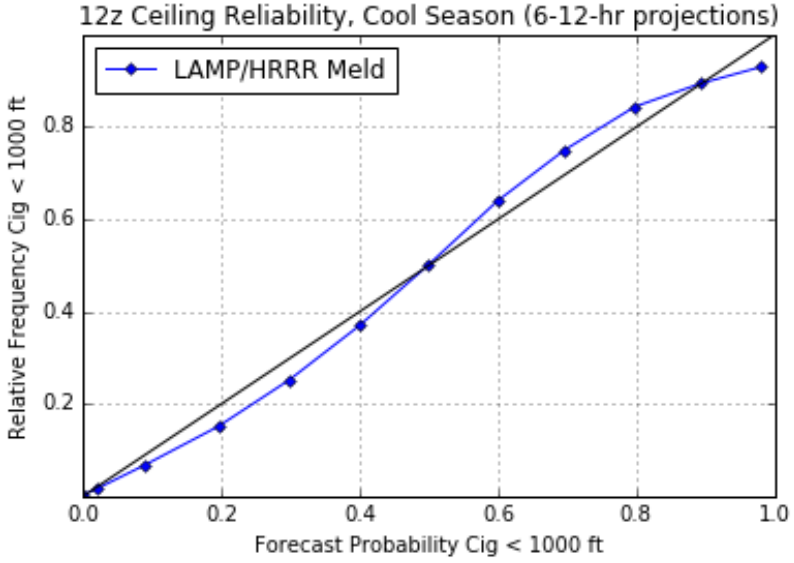


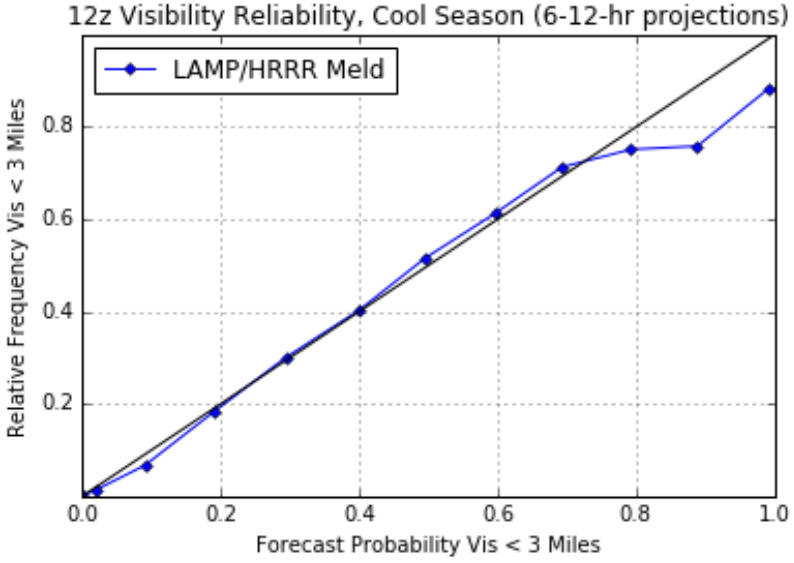


Ceiling & Visibility: Probability Reliability



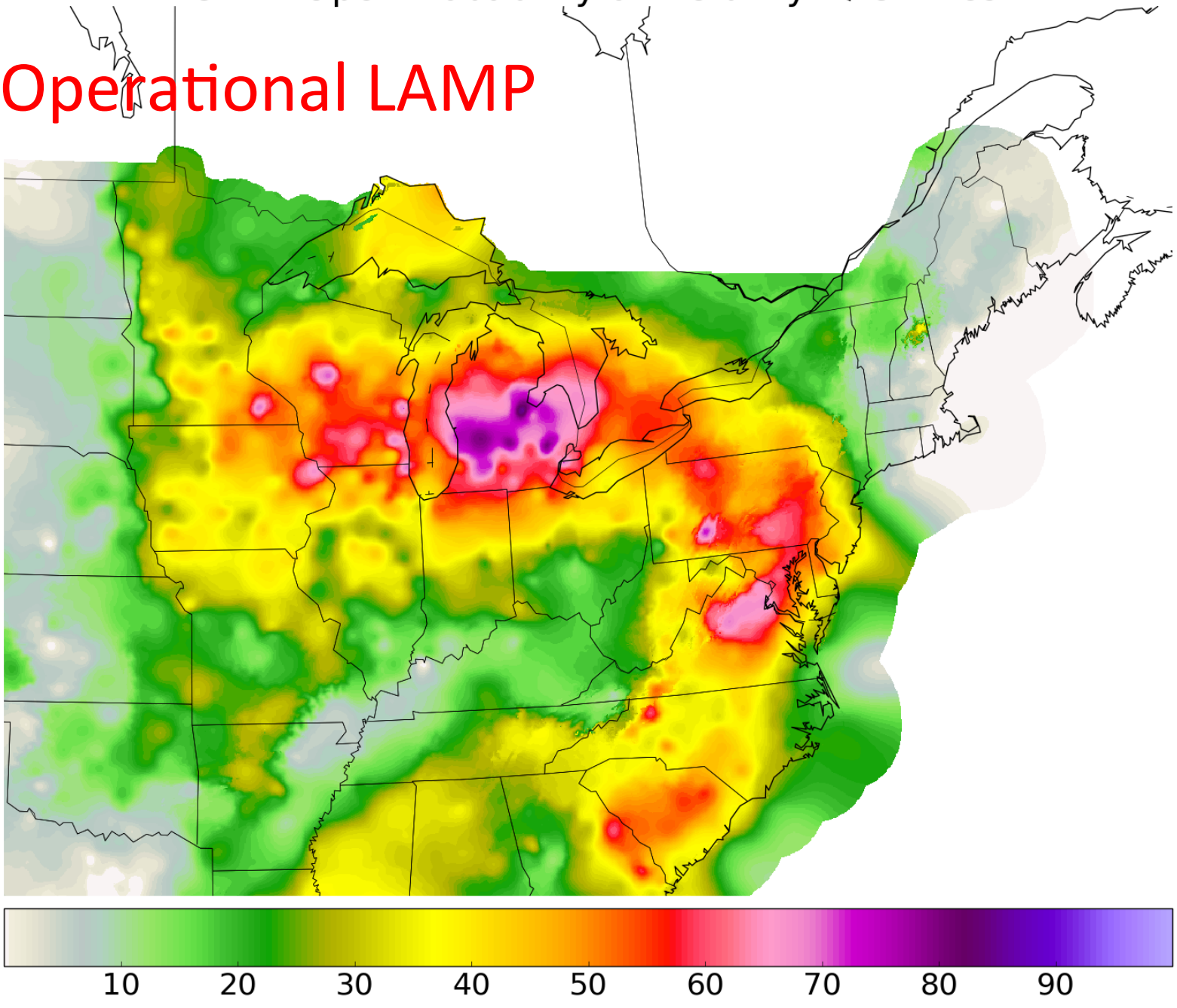


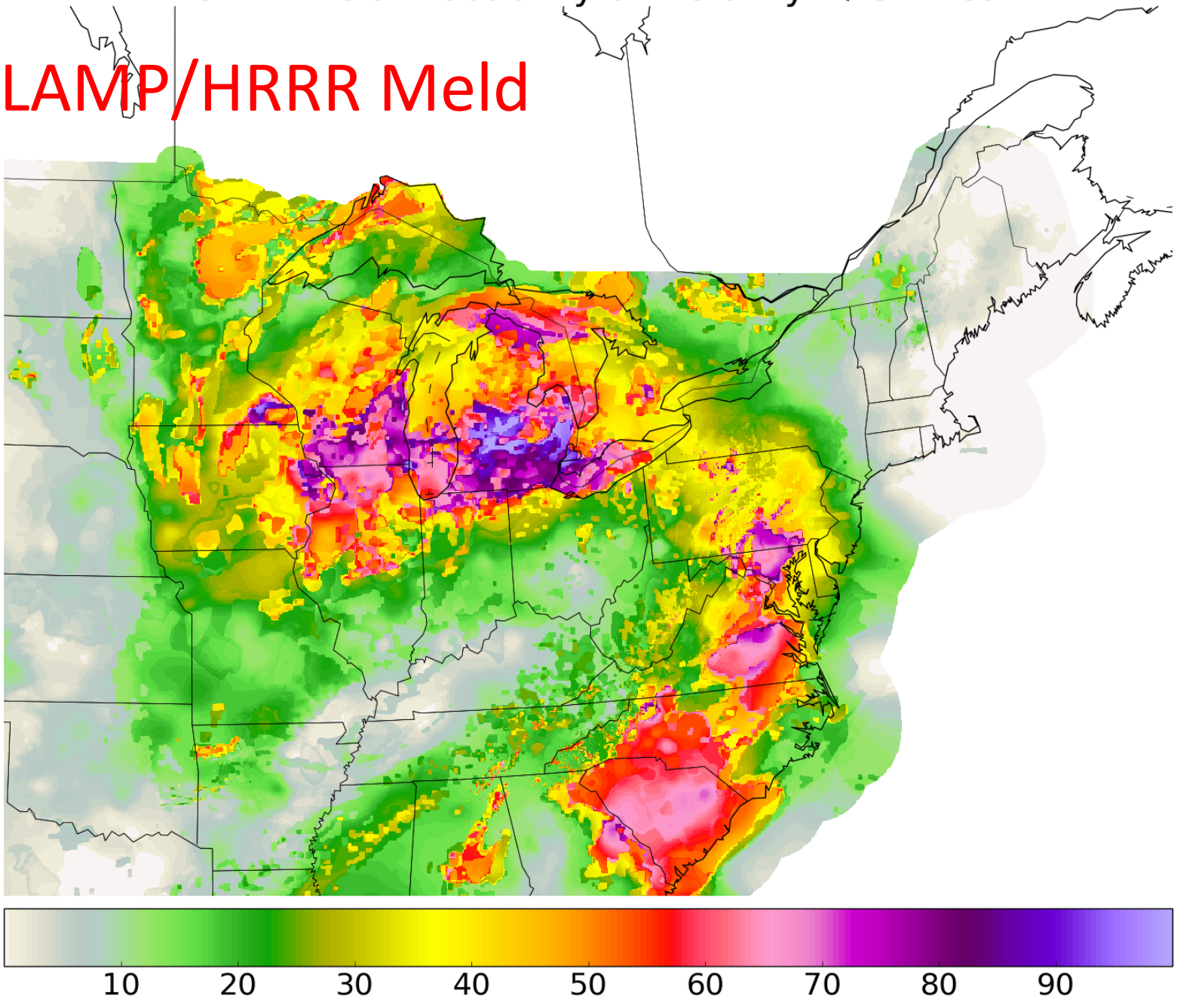




Forecast grids

- Deterministic grids are derived from probability grids by applying thresholds
  - Deterministic forecasts can vary significantly in time and space; even when probability forecasts only vary slightly
- HRRR provides high detail predictors that resolve shape of mesoscale meteorological features
- Gridded analysis of LAMP probabilities provide smooth probability predictors
- Combination of the two are skillful and create reasonably smooth probability grids that have sufficient detail to generate awareness of mesoscale features


14-hr Forecast Valid at 14z on January 17, 2017
GLMP Oper Probability of Visibility < 3 Miles
Operational LAMP
10
20
30
40
50
60
70
80
90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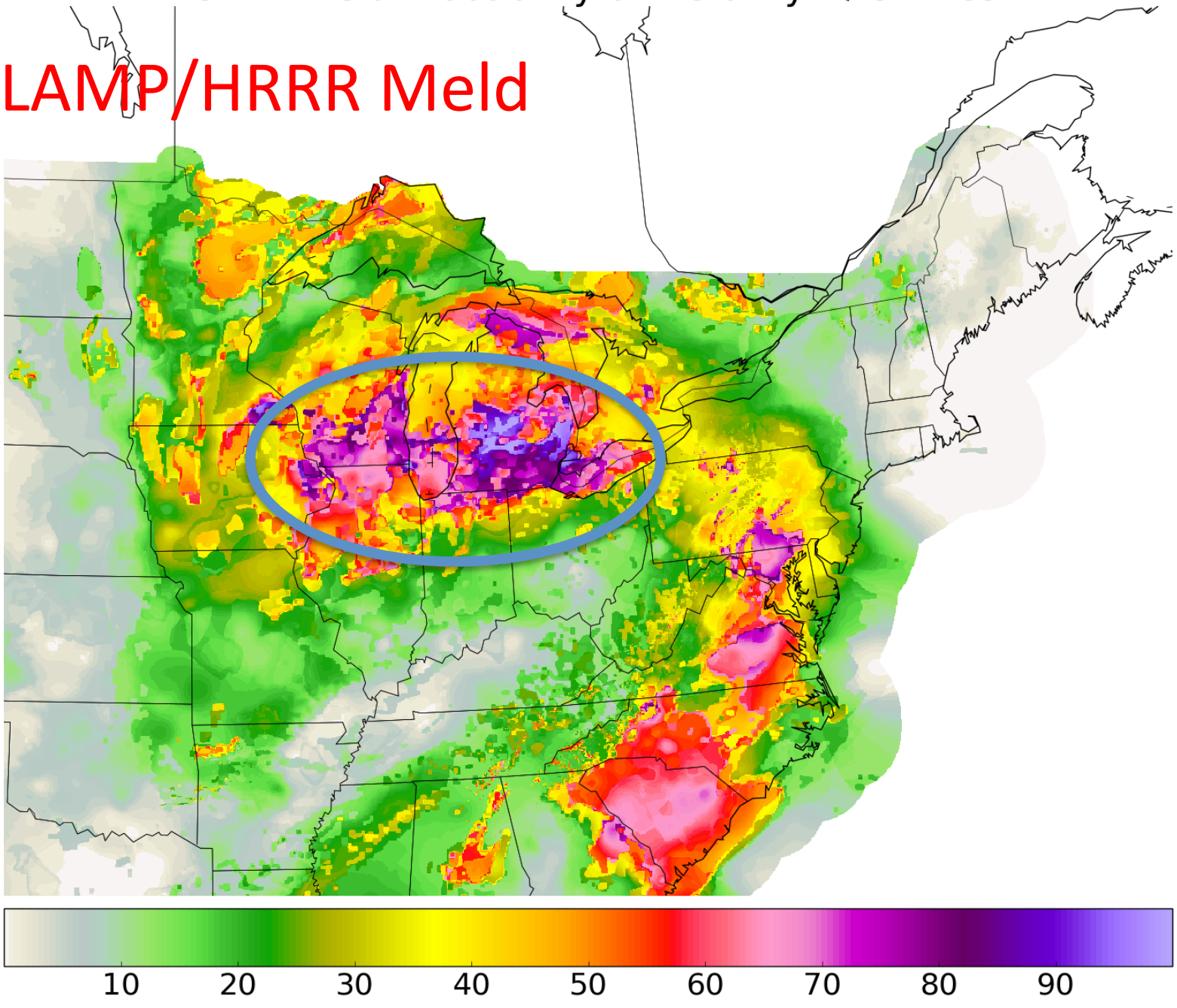
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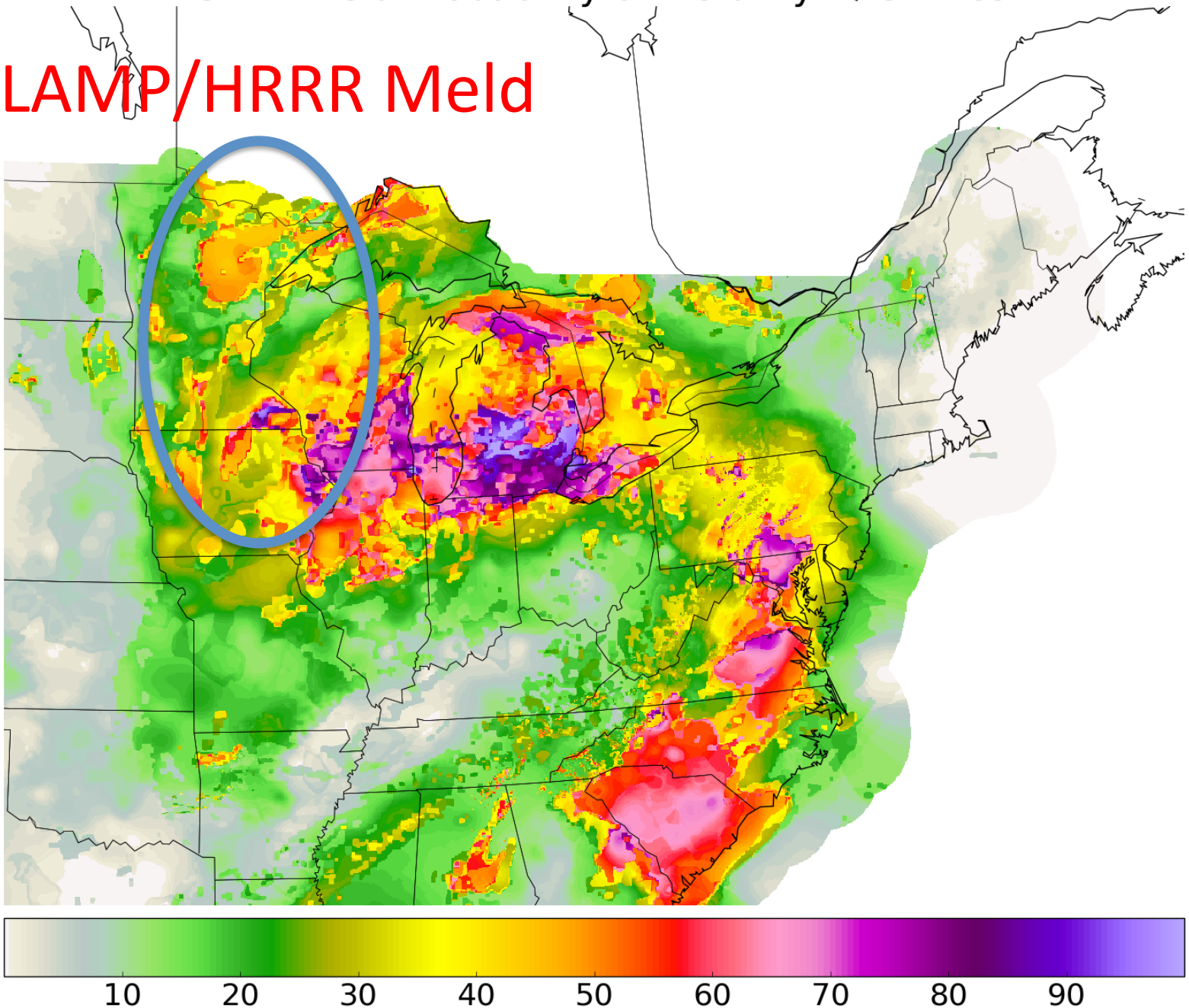
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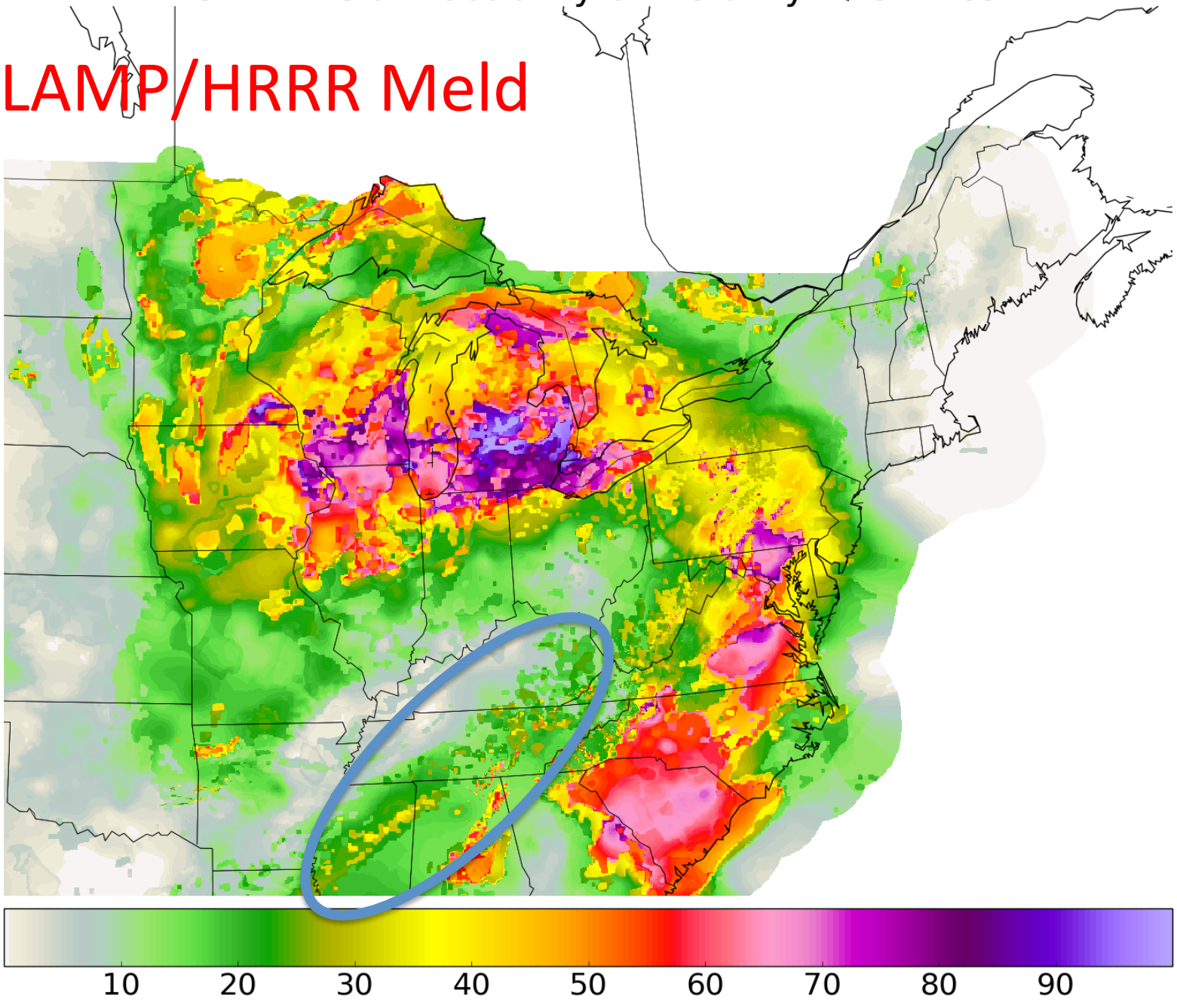
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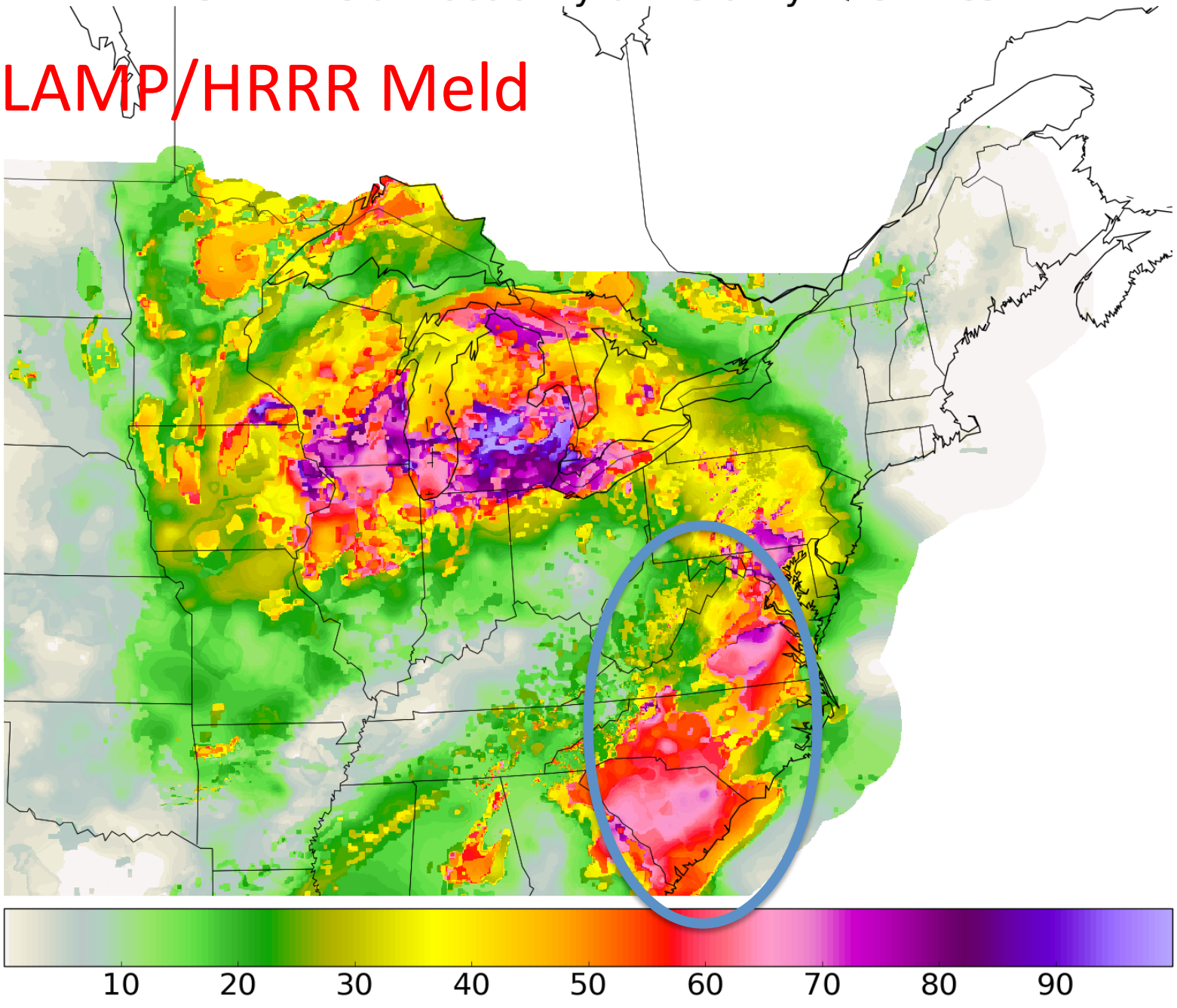
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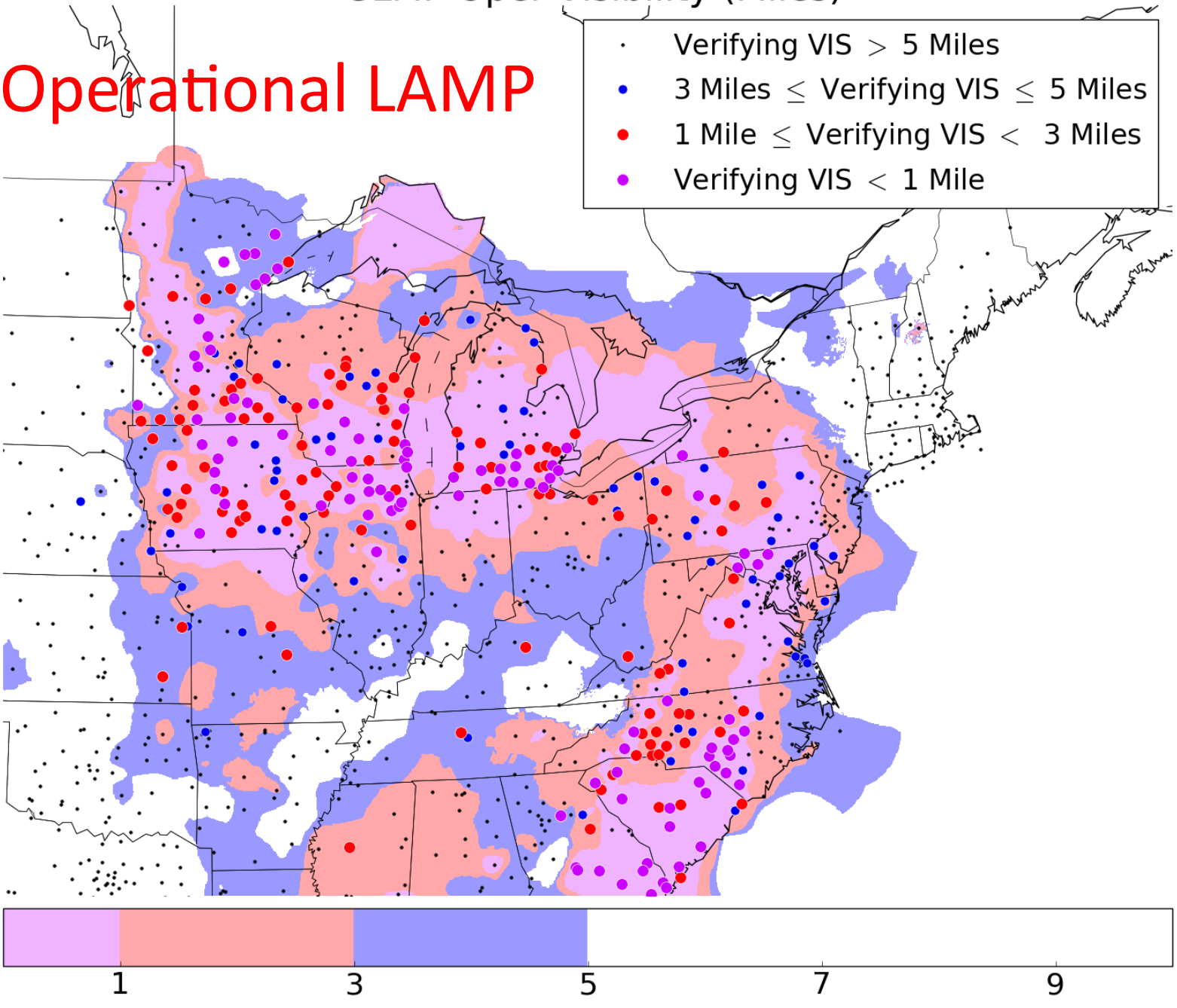
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GLMP Oper Visibility (Miles)
Operational LAMP
Verifying VIS > 5 Miles
3 Miles ≤ Verifying VIS ≤ 5 Miles
1 Mile ≤ Verifying VIS < 3 Miles
Verifying VIS < 1 Mile
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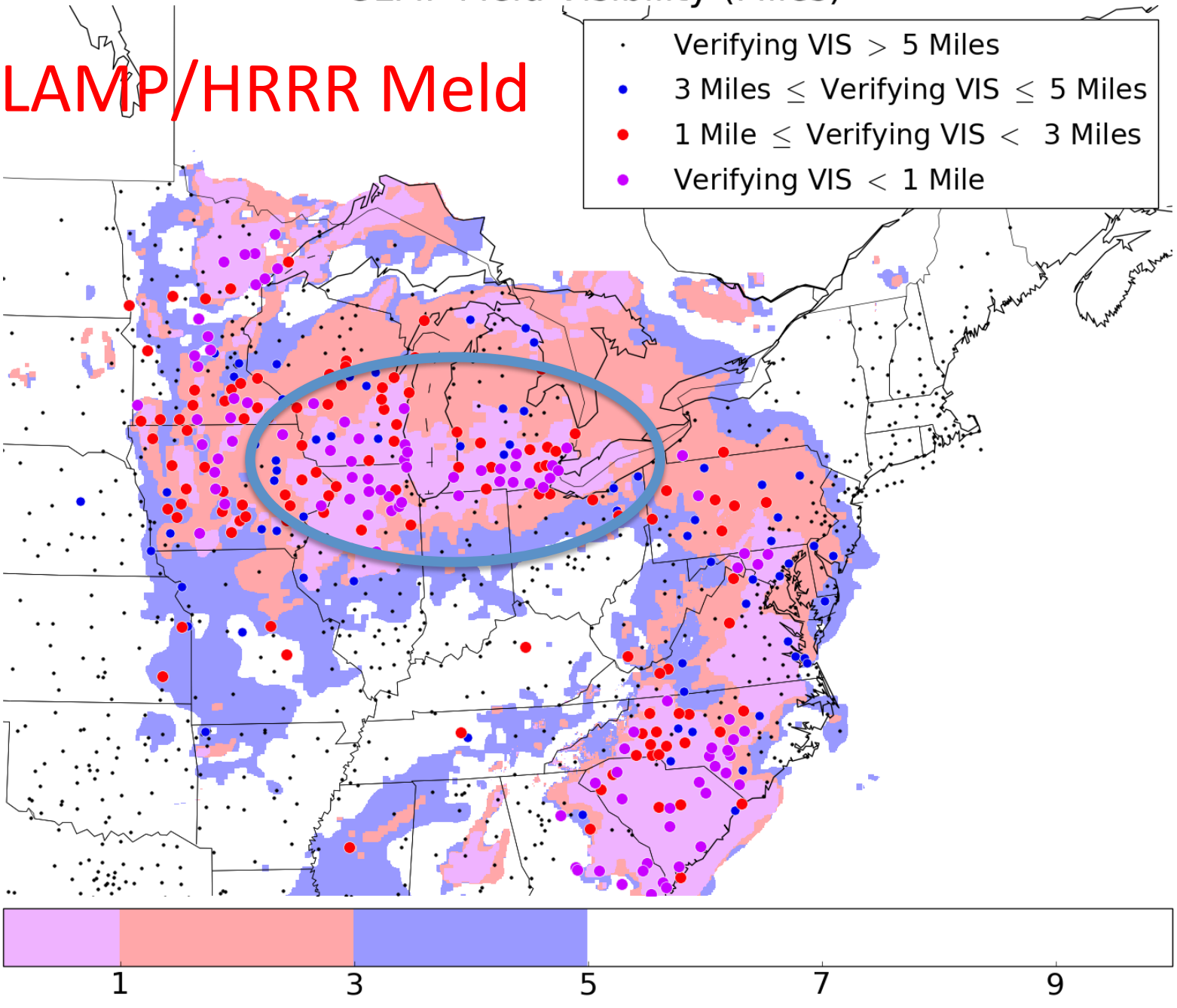
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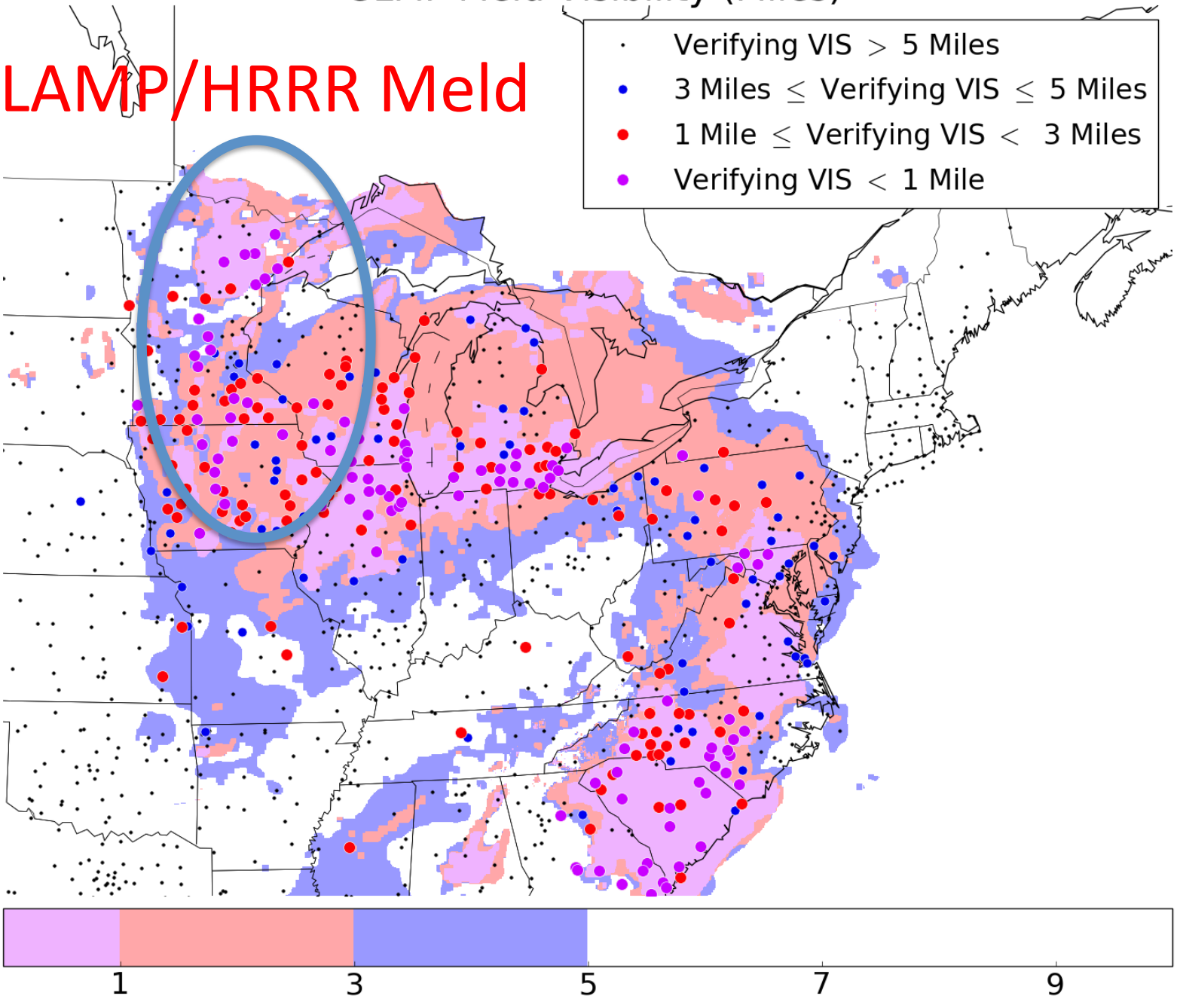
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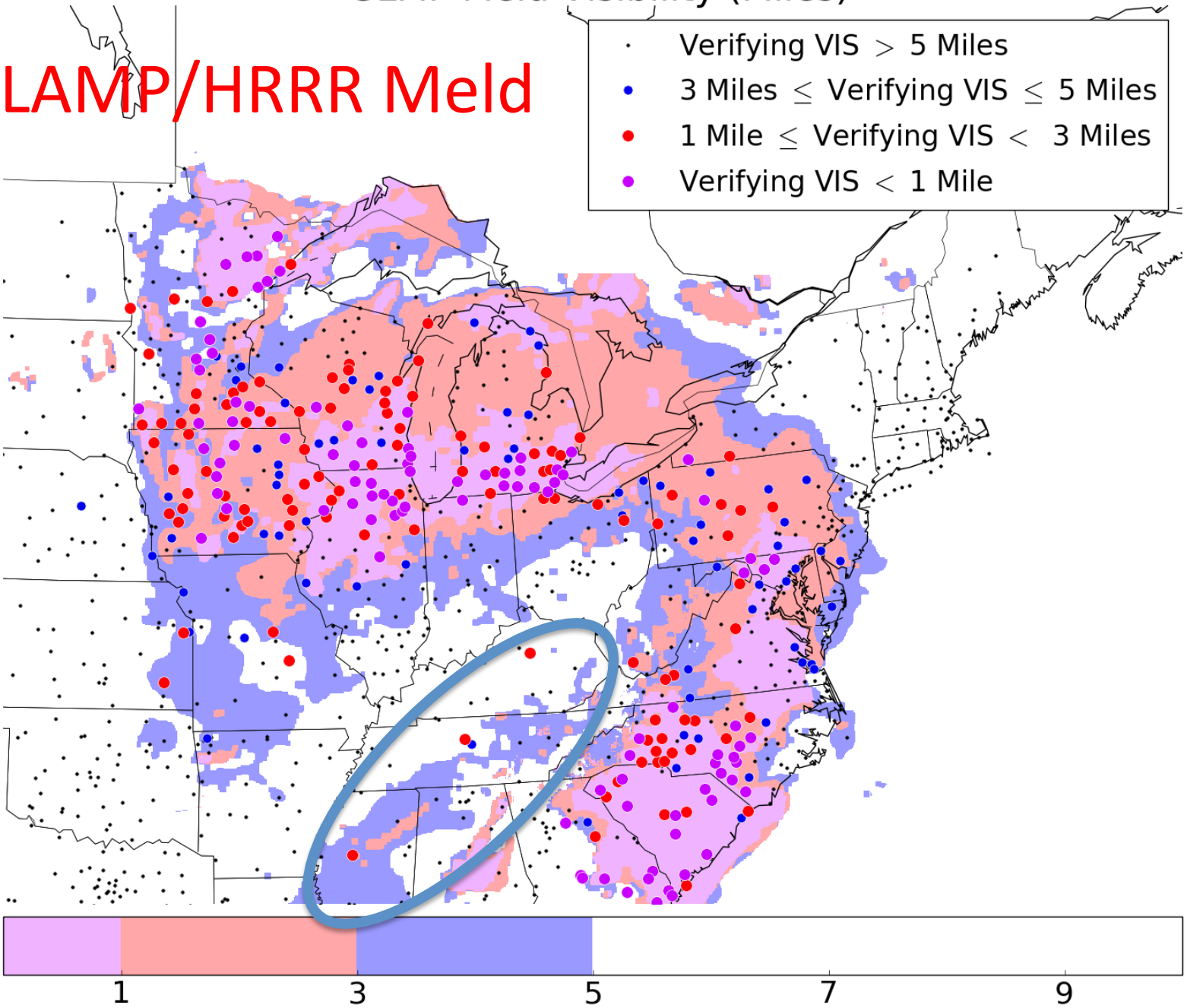
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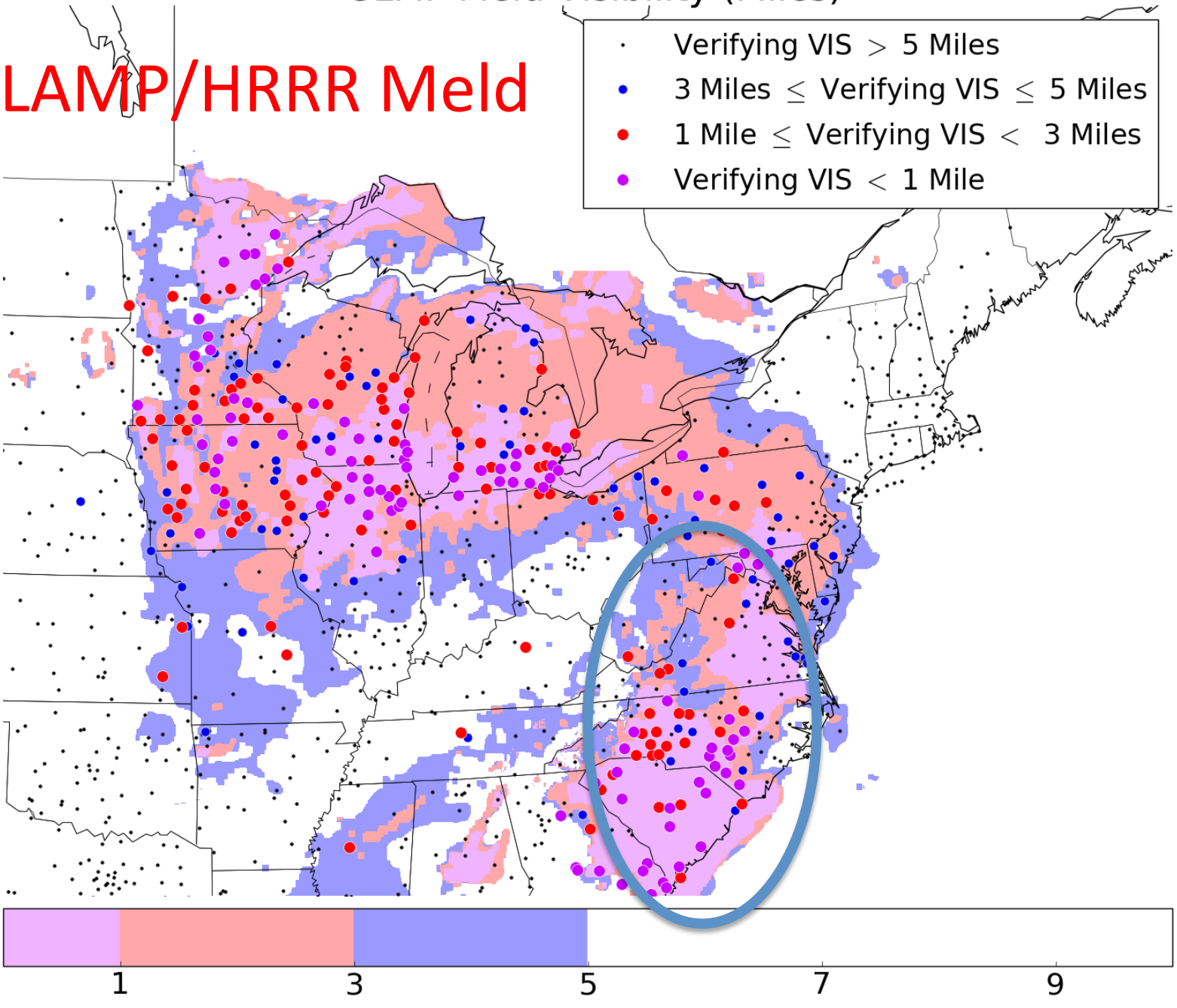
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Verifying VIS < 1 Mile
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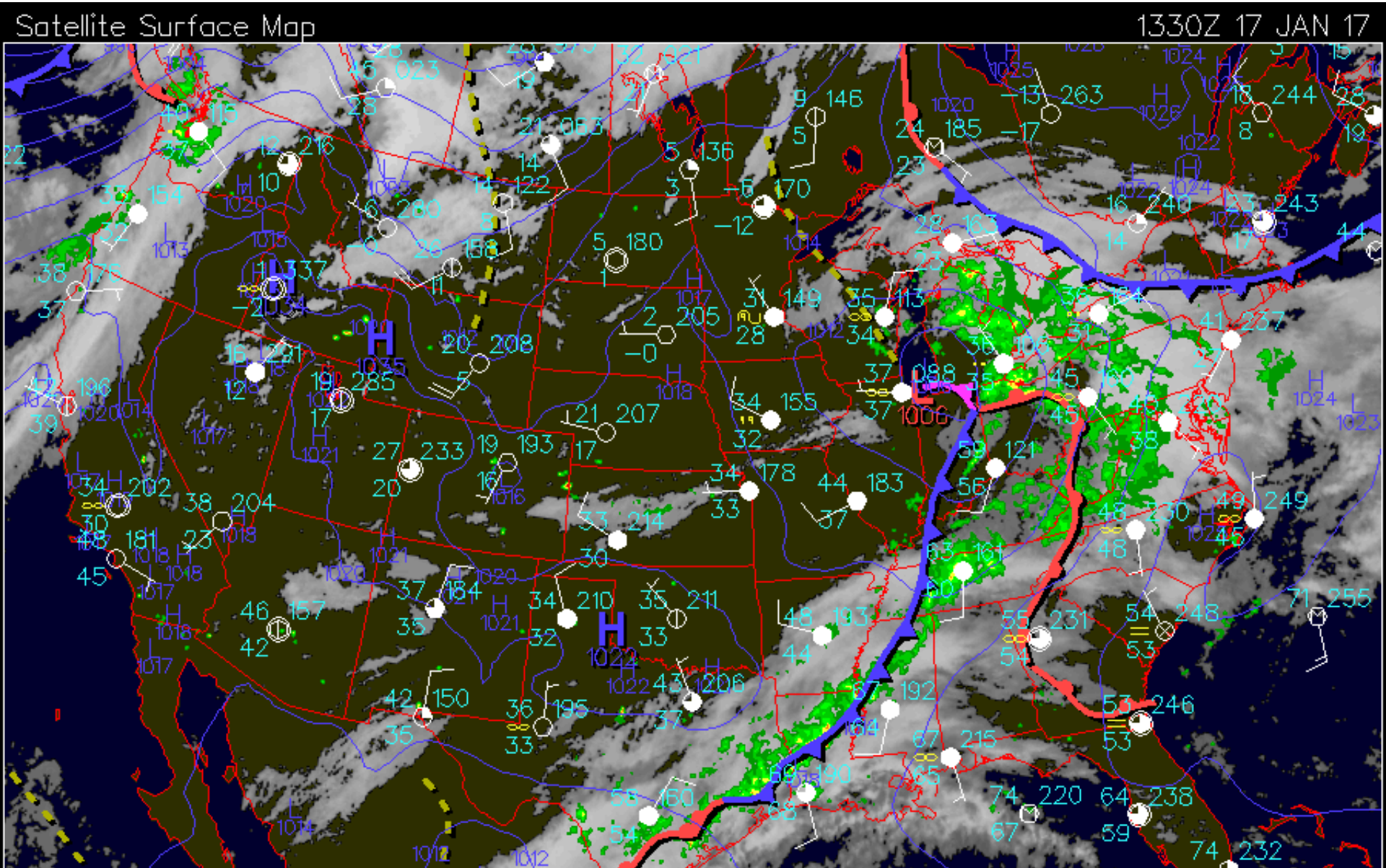
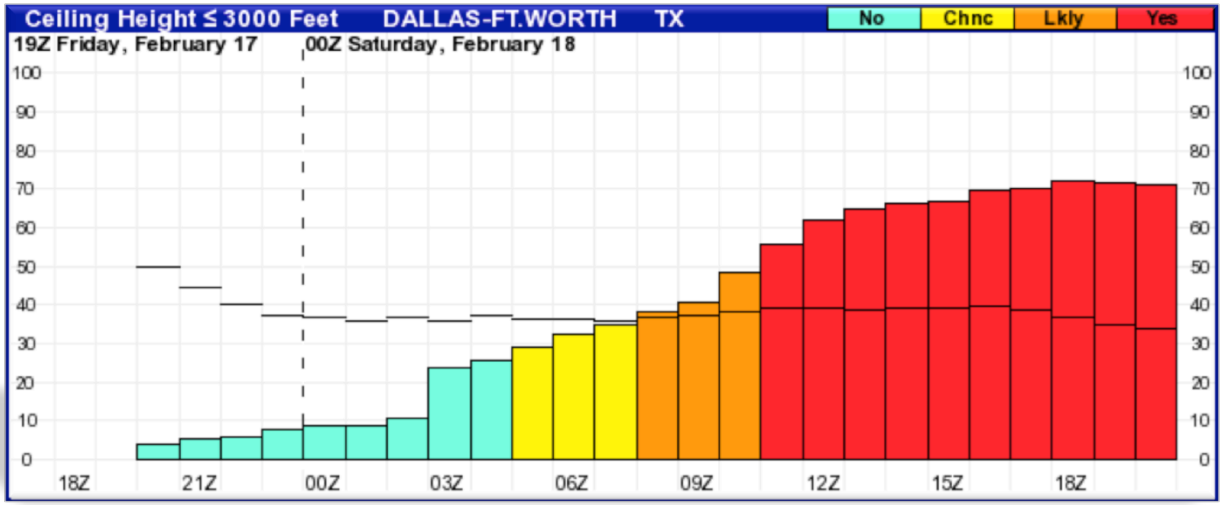
13:30z Surface Analysis



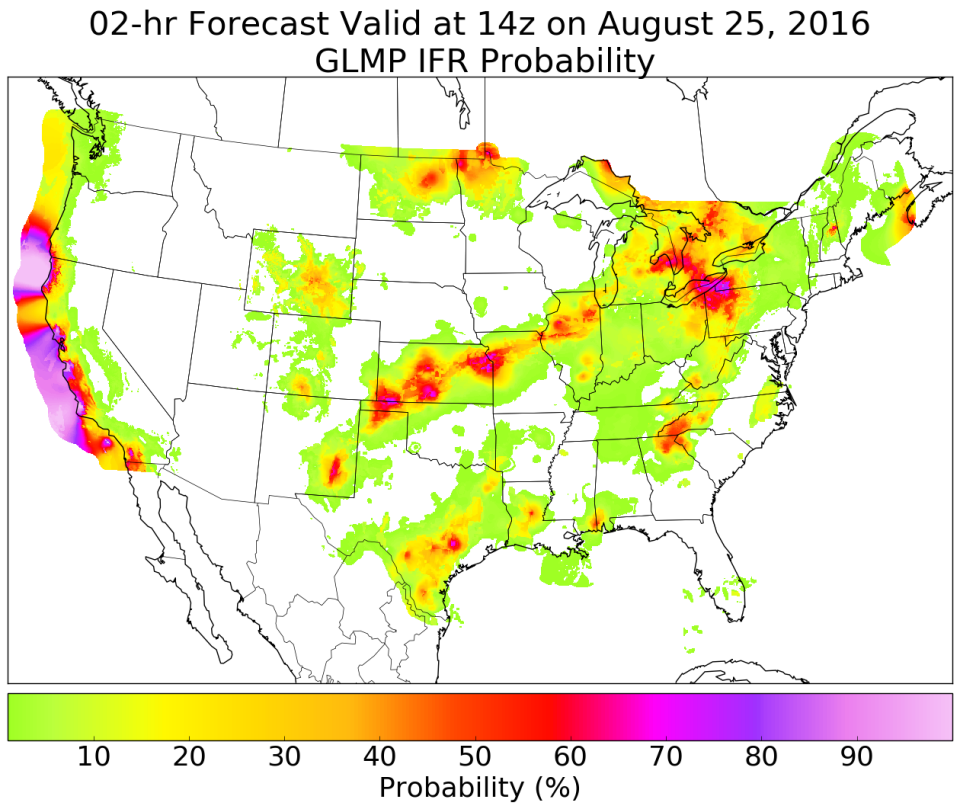
Probability Forecast Applications

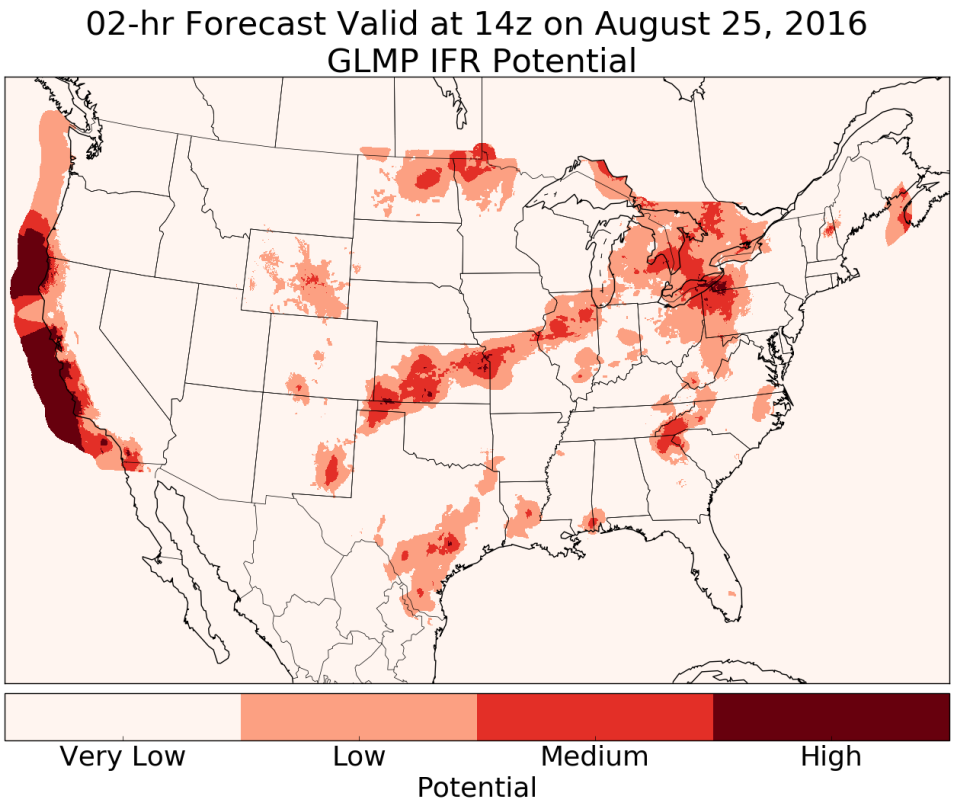
- Risk models are innately based on the probability of some event(s) occurring
- Aviation operations are often threshold oriented and lend themselves to using a probability of that threshold being met or exceeded
- Improved communication of weather information can improve planning, situational awareness, increase safety, productivity, and reliability, and mitigate loss



Work in Progress

- Probabilistic guidance for flight category (LIFR, IFR, MVFR)





Thank You!

NCEP Implementation of LAMP/HRRR Meld Ceiling and Visibility Guidance expected in Spring 2017.

(Replacement of Operational LAMP)

LAMP website: http://weather.gov/mdl/lamp_home

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