

# Aviation Products from the Localized Aviation MOS Program (LAMP)

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Gray, ME

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# Outline

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- LAMP Overview
- Brief LAMP Verification
- Current Status and Products
- Example of LAMP Application
- Future Plans

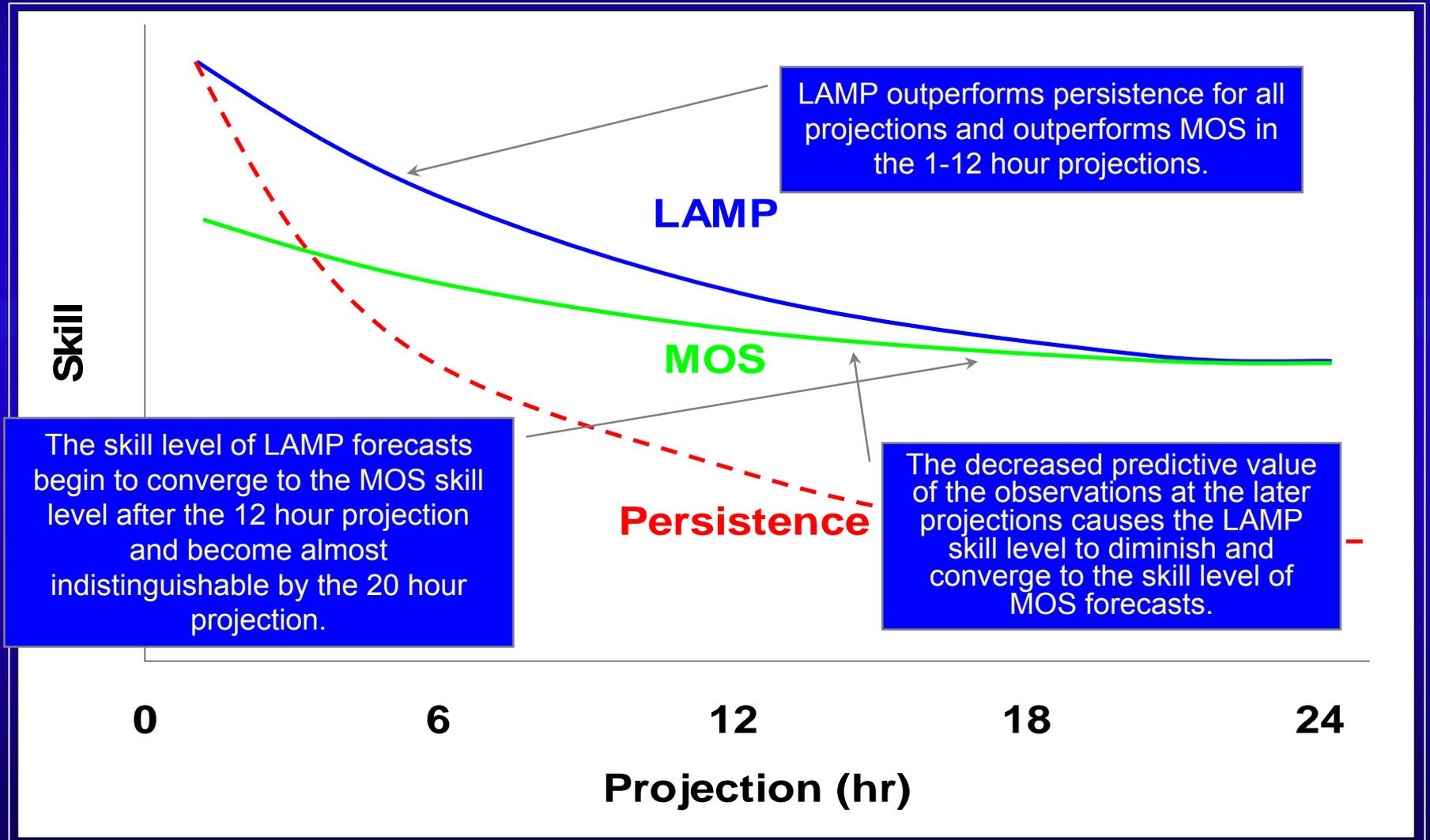
# LAMP Overview

# Localized Aviation MOS Program (LAMP) Background

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- LAMP is a system of objective analyses, simple models, regression equations, and related thresholds which together provide guidance for sensible weather forecasts
- LAMP acts as an update to GFS MOS guidance
- Guidance is both probabilistic and non-probabilistic
- LAMP provides guidance for aviation elements
- LAMP bridges the gap between the observations and the MOS forecast

# Theoretical Model Forecast Performance of LAMP, MOS, and Persistence



# LAMP Guidance Details

LAMP guidance is in the range of 1- 25 hours in 1 hour projections

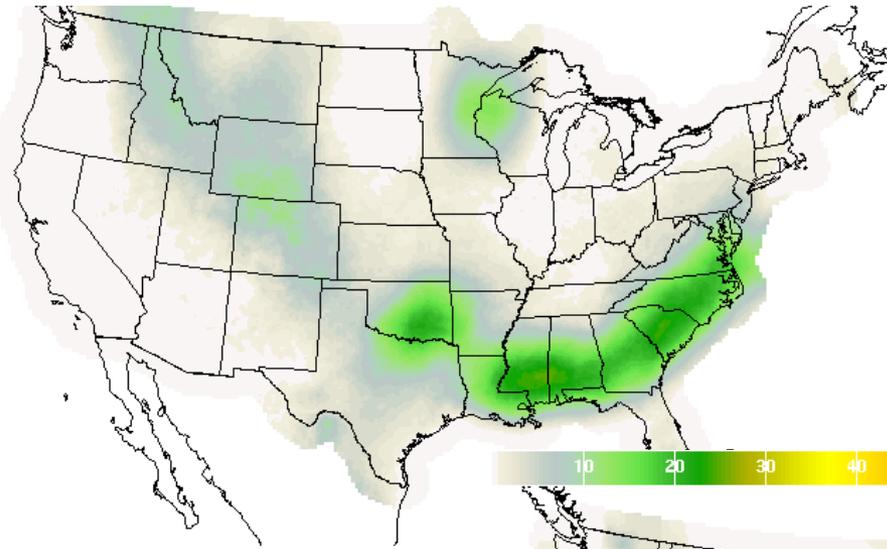
- LAMP provides station-oriented guidance for:
  - all LAMP forecast elements ←
  - ~1600 stations
  - CONUS, Alaska, Hawaii, Puerto Rico
- LAMP provides grid-oriented guidance for:
  - Thunderstorms:
    - Probability of thunderstorm occurrence in a 2 hour period in a 20-km grid box
    - Best Category Yes/No of thunderstorm occurrence in a 2 hour period in a 20-km grid box
  - CONUS only
- As of November 13, 2008, LAMP is running 24 times a day (every hour) in NWS operations

- Temperature and dewpoint
- Wind speed, direction, and gusts
- Probability of precipitation (on hr)
- Probability of measurable precipitation (6- and 12-h)
- Precipitation type
- Precipitation characteristics
- Thunderstorms
- Ceiling height
- Conditional ceiling height
- Total sky cover
- Visibility
- Conditional visibility
- Obstruction to vision

# Example of blending Observations and MOS

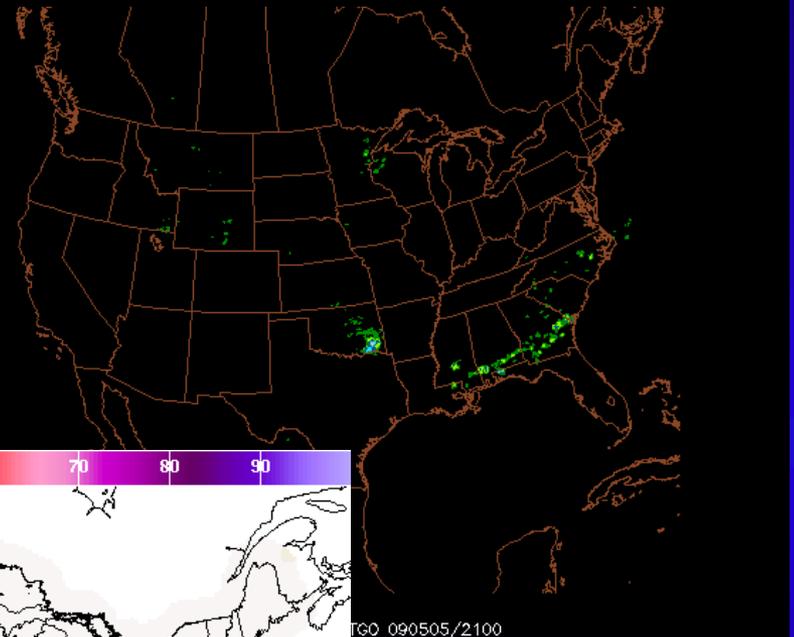
# 1-3 hr LAMP Thunderstorm forecast

Predictor: 12 UTC MOS Thunderstorm  
Prob – Valid 22 – 00 UTC

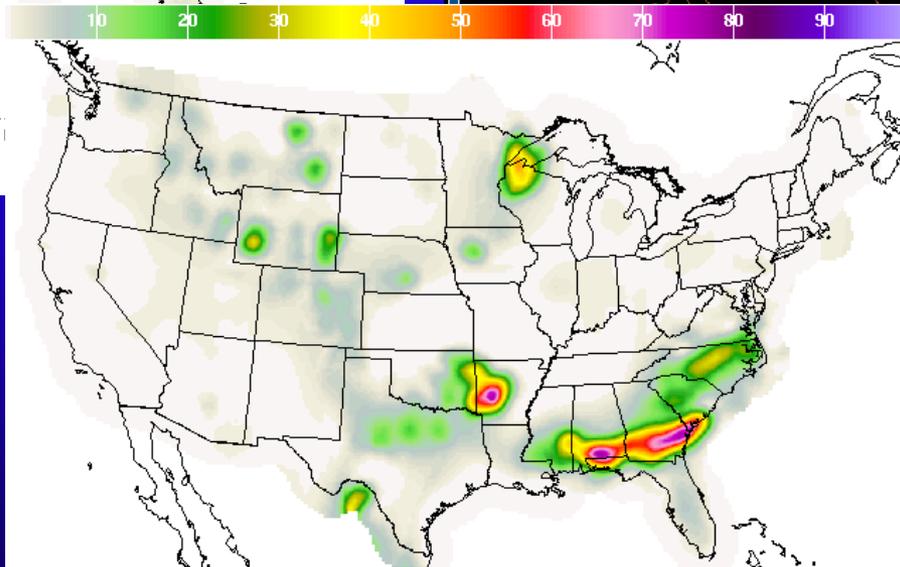


Thunderstorm Prob Val  
(Wed 1

Predictor: 21 UTC lightning strike data



TGC 090505/2100



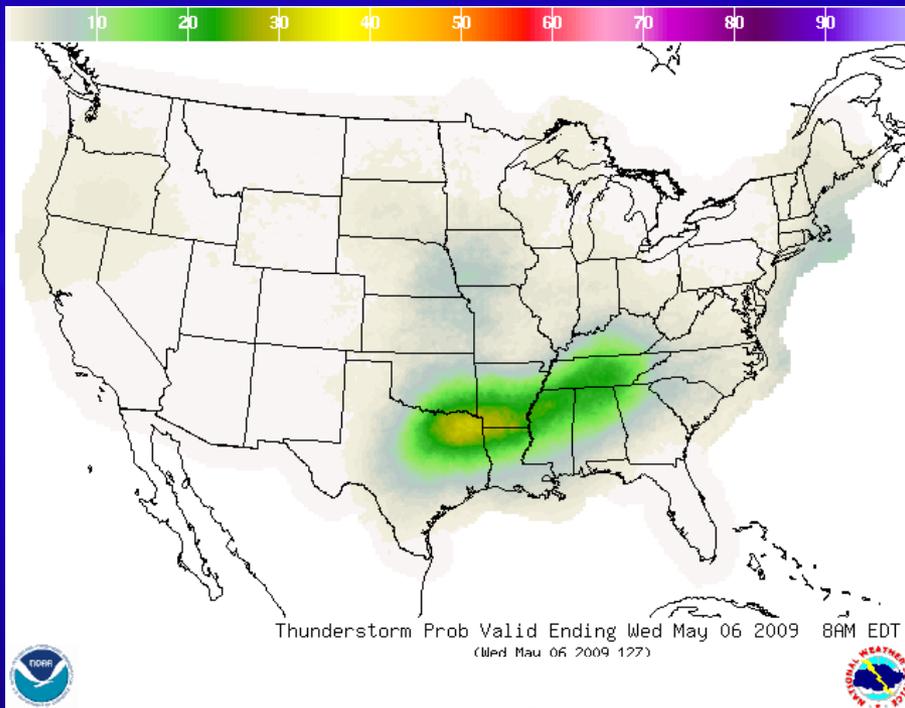
21 UTC LAMP Thunderstorm  
Probability Valid 22-00 UTC

3PM EDT

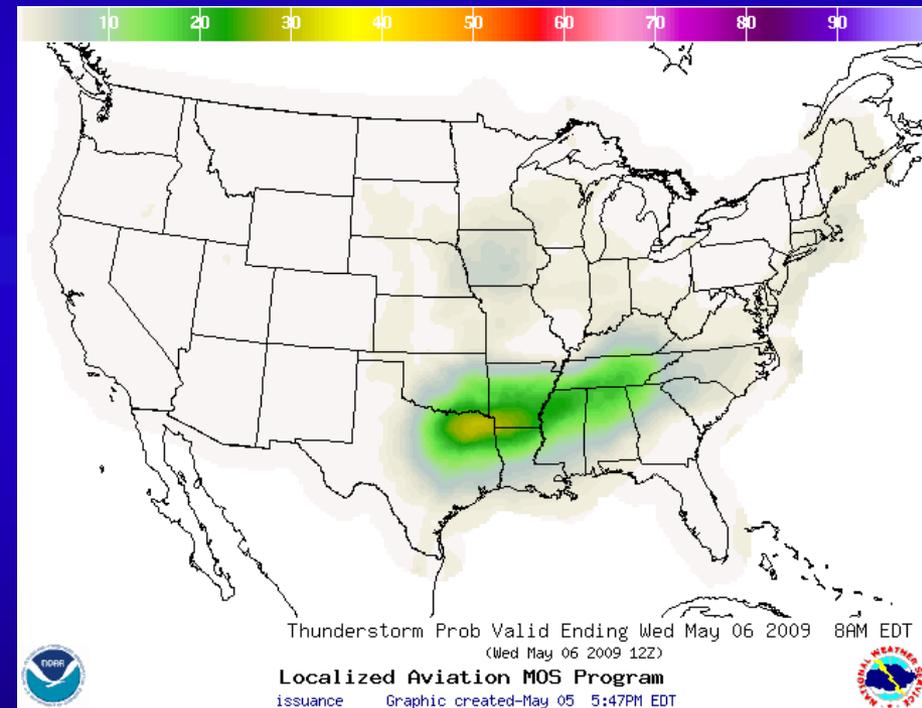


# 13-15 hr LAMP Thunderstorm forecast

12 UTC MOS Thunderstorm Probability  
– Valid 10 – 12 UTC (next day)

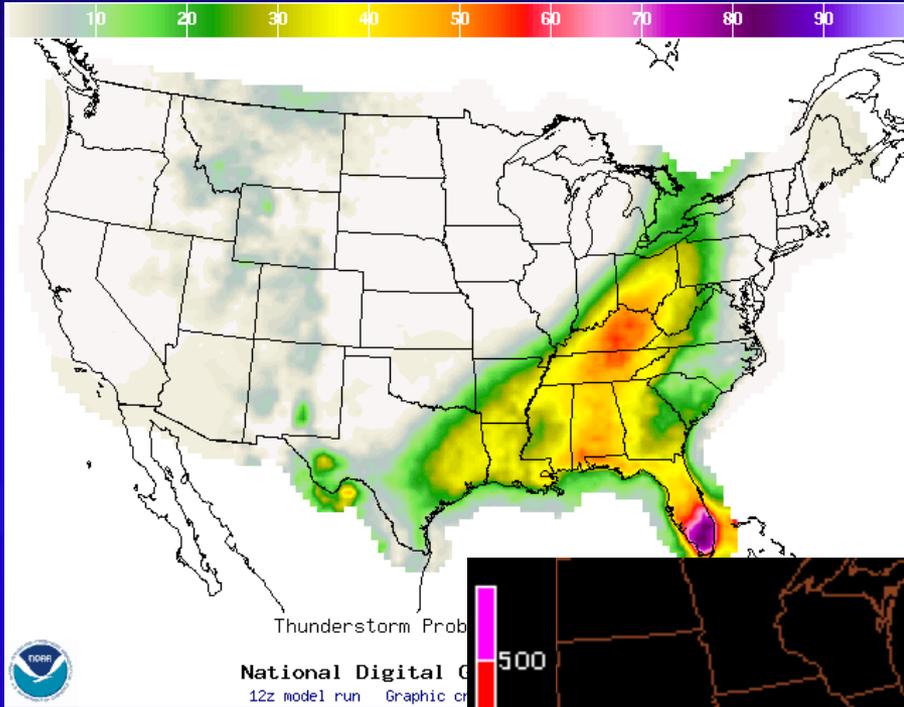


21 UTC LAMP Thunderstorm Probability  
– Valid 10 – 12 UTC (next day)

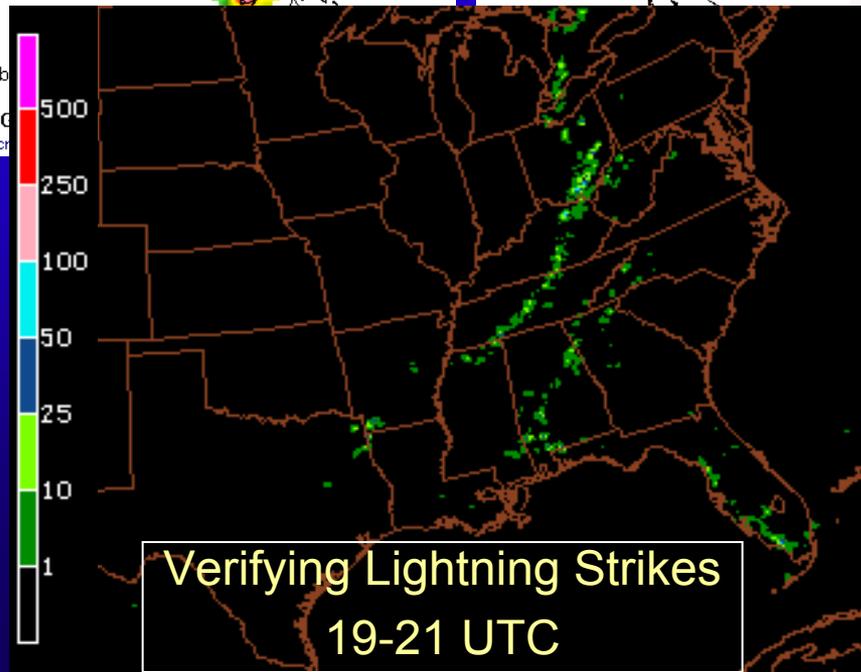
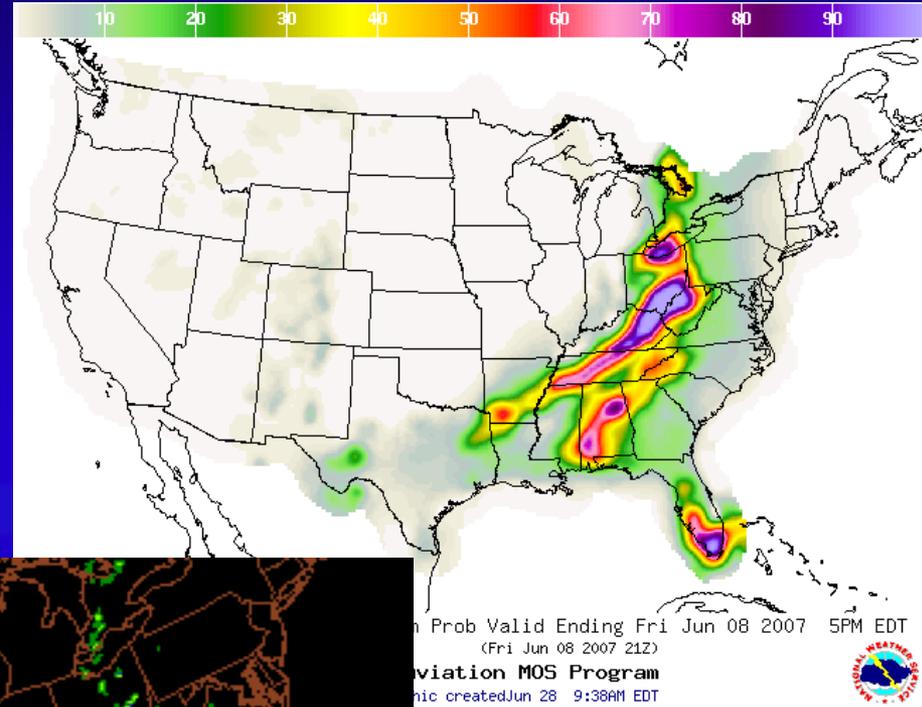


# June 8, 2007

## 12 UTC GMOS - Valid 18-21 UTC



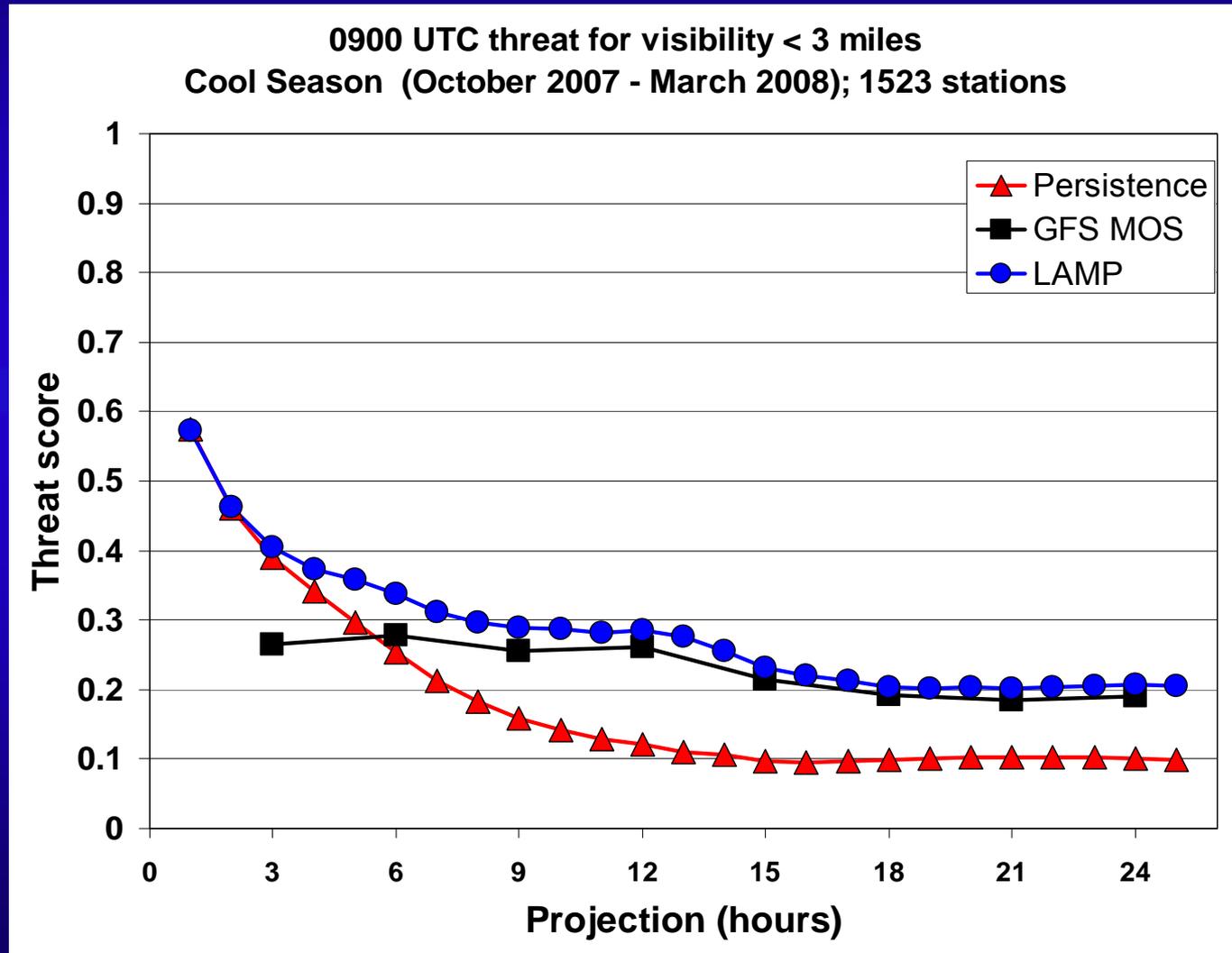
## 18 UTC LAMP - Valid 19-21 UTC



# Brief LAMP Verification

# 0900 UTC LAMP compared to MOS

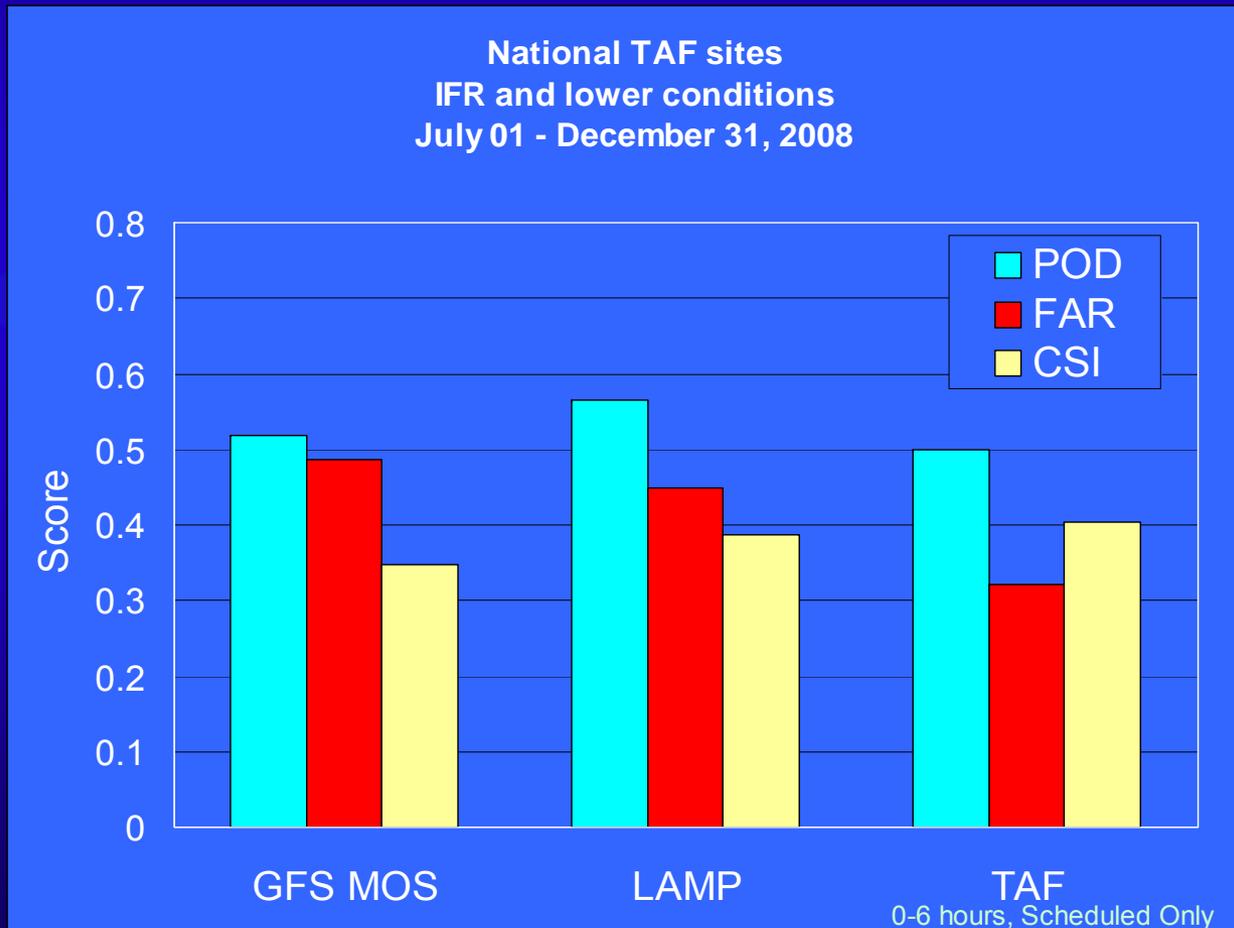
## Categorical Visibility < 3 miles



0900 UTC LAMP verified against 0000 UTC GFS MOS

# Current Results

LAMP in Stats on Demand:



# Current Status and Products

# Current Status and Products

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- Guidance sent out from NCEP on SBN/NOAAPort and NWS FTP Server
  - ASCII text bulletin
  - BUFR data
  - GRIB2 thunderstorm data
- Available Products:
  - Guidance viewable in AWIPS D2D and AvnFPS
  - Website products:
    - Text bulletins
    - Station plots
    - Meteograms
    - Probability/Threshold images
    - Gridded Thunderstorm images

# Overview of Available AWIPS Products

- Available to NWS forecasters via AWIPS
  - Guidance is viewed as text or graphically by forecasters
  - Guidance is input into software for preparing TAFs

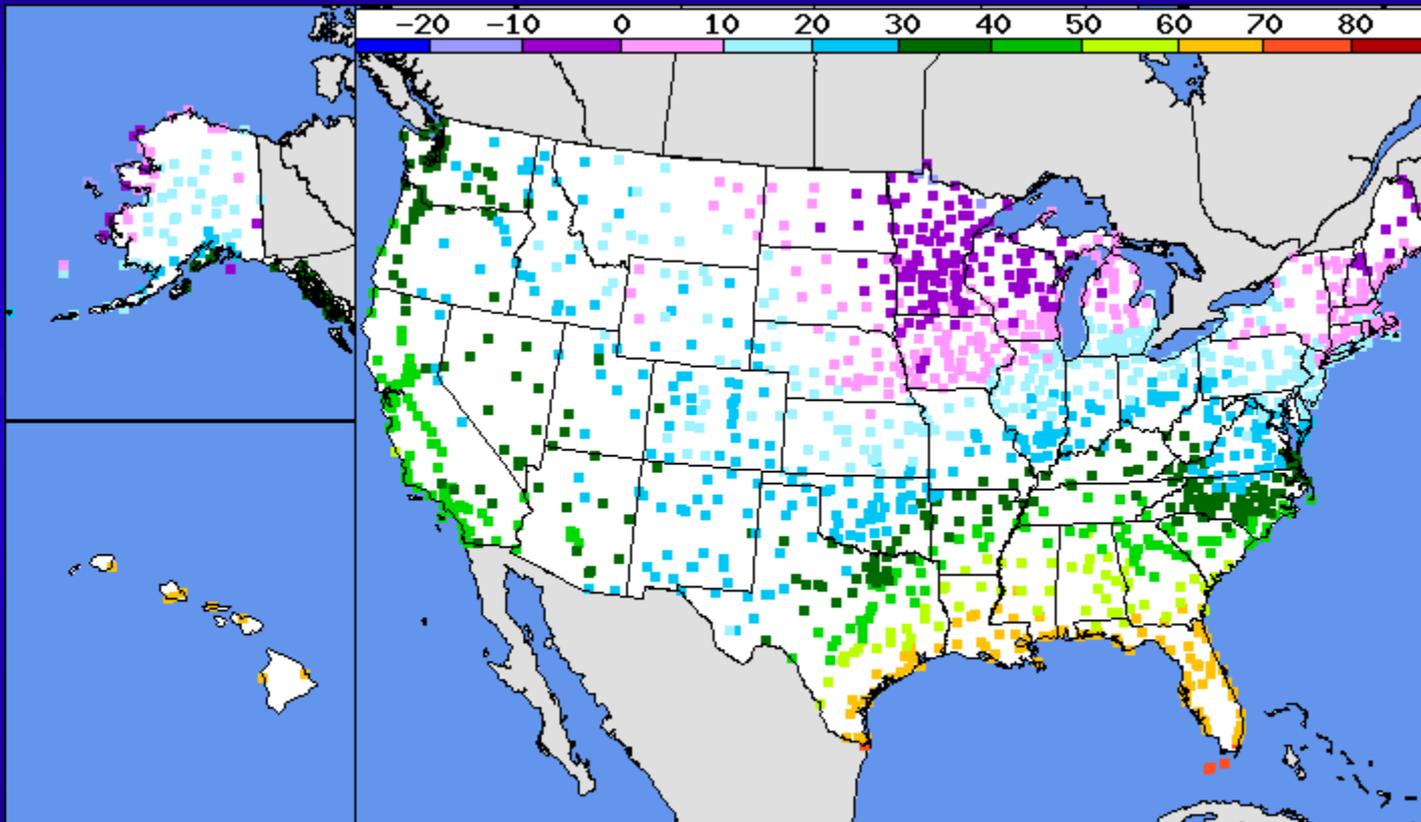
The screenshot displays the AWIPS software interface. At the top, a menu bar includes 'File', 'Edit', 'Options', 'Version', 'Tools', 'Scripts', 'Products', and 'Help'. Below the menu bar, the 'Text 1: AWIPS:LAVBWI' window is active. The 'Site ID' is set to 'KHHU'. The 'Flight Categories' are set to 'VFR', 'MVFR', 'IFR', and 'LIFR'. The 'Metars' tab is selected, and the 'LAMP' sub-tab is active. The 'Format' is set to 'table', and 'Flight Categories' is checked. The main display area shows 'GFSLAMP Guidance 03/13/08 1200 UTC' and a TAF for KHHU. The TAF text is as follows:

```
TAF
KHHU 131720Z 131818 17013G20KT P6SM OVC015
FM2300 16012G19KT 4SM BR OVC015
FM0000 16010KT 4SM BR OVC007
FM0300 18010KT 6SM BR OVC007
FM0400 18008KT 4SM BR BKN007
FM0600 19008KT 4SM BR SCT250
FM0700 20005KT 4SM BR OVC007
FM1000 22004KT 1 1/2SM BR BKN007
FM1100 22003KT 1/2SM FG OVC003
FM1300 23003KT 1/4SM FG BKN003=
```

# Website: LAMP Station Plots

## Elements

- Flight Category
- Ceiling Height
- Visibility
- Obstruction to Vision
- Total Sky Cover
- Precipitation Type
- Probability of Precipitation
- Wind Speed
- Wind Gust
- Wind Direction
- Temperature
- Dewpoint



12 UTC GFS-LAMP Dewpoint  
19 HOUR FORECAST VALID FOR 02-22-2008 07 UTC

[Click an element name on this slide to see its plot](#)



# Website: LAMP Station Meteograms



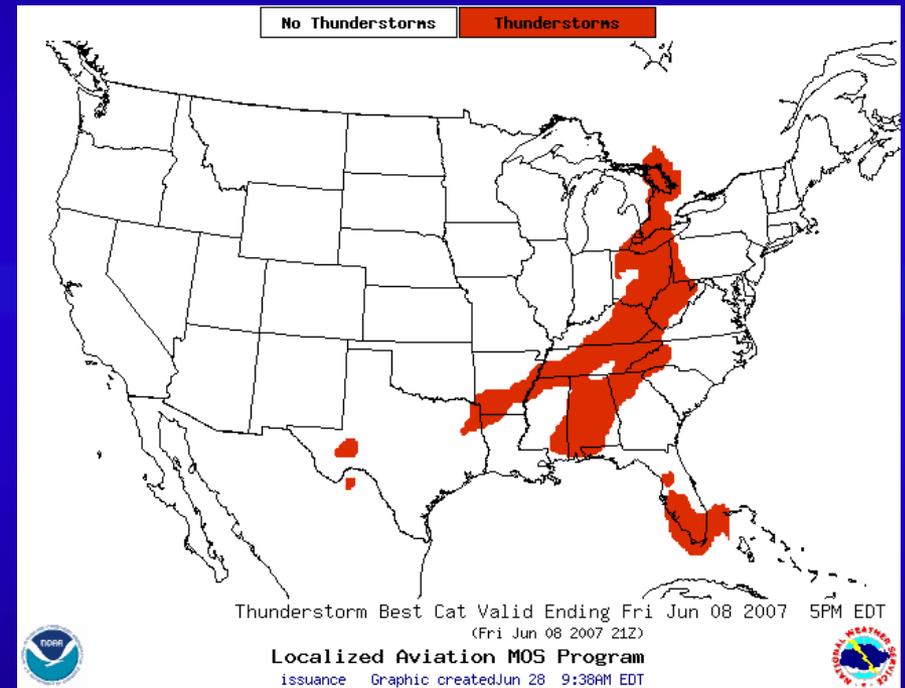
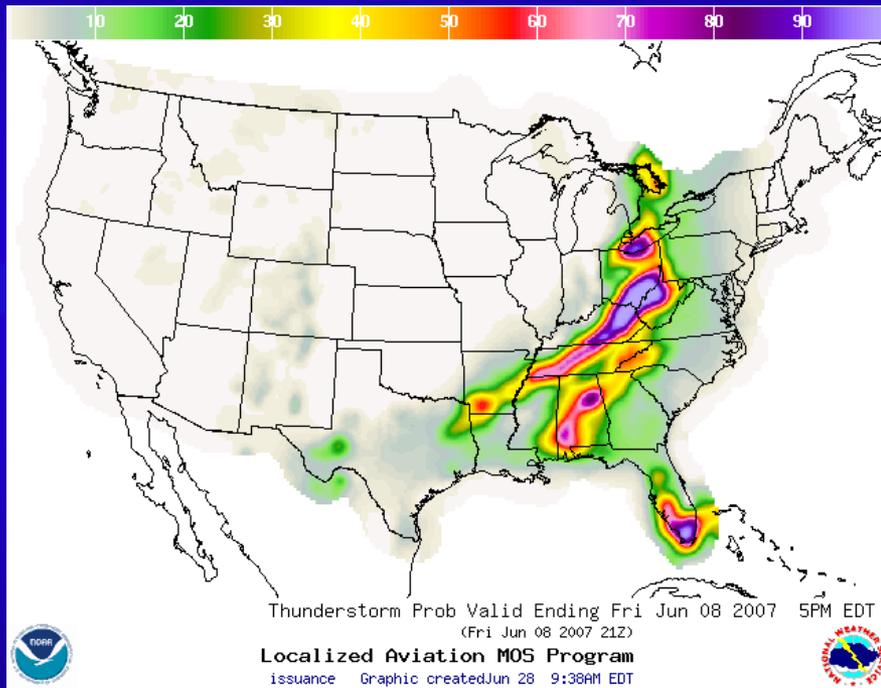
## Features

- Up to 12 displayable LAMP forecast elements
- Real-time verification of current and past cycles
- Verification of completed past cycles including the corresponding GFS MOS forecast

# Website: LAMP Thunderstorms

## Probabilities and Best Category (Y/N)

### All Projections



# New website graphics

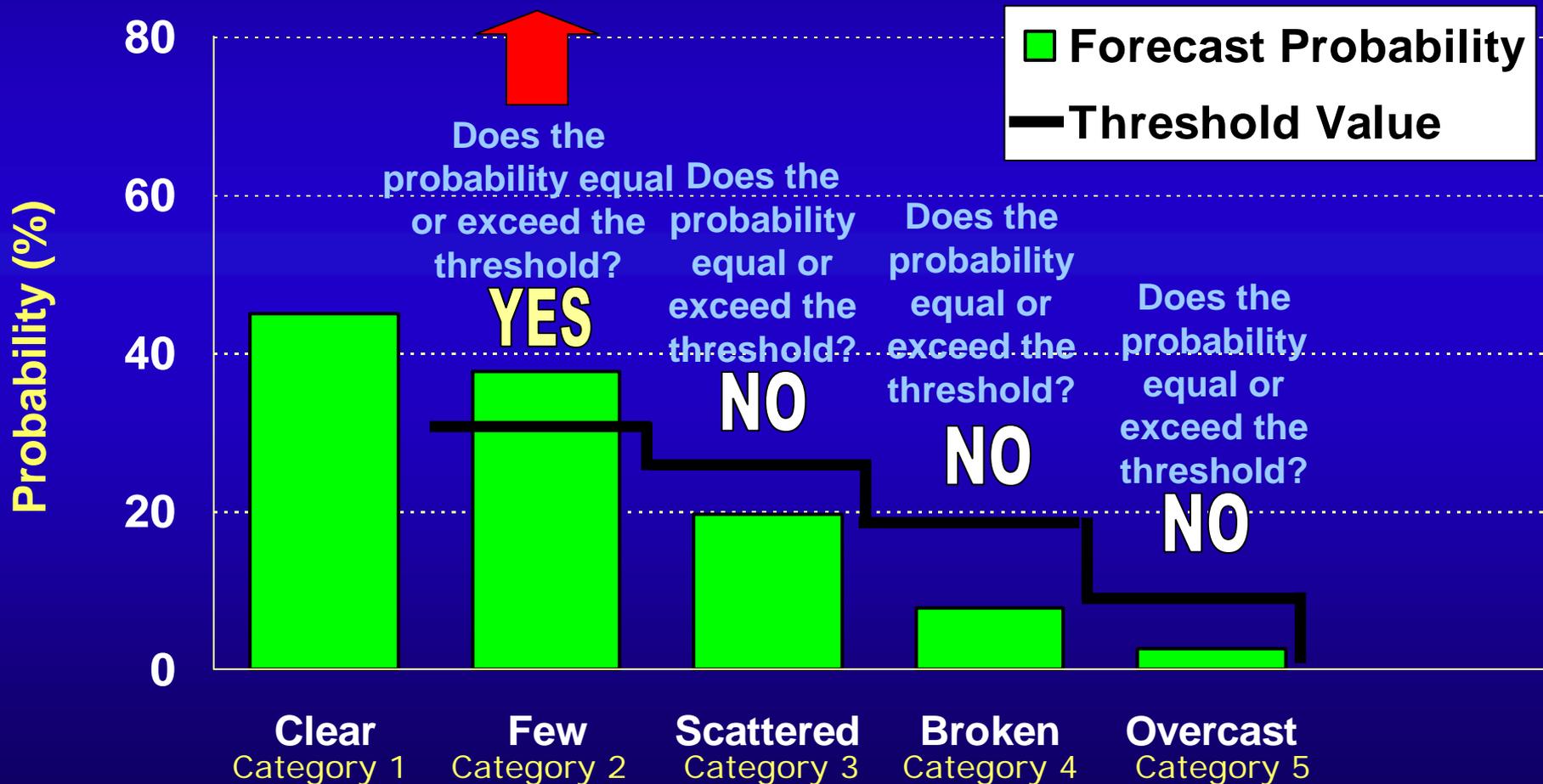
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New LAMP probability/threshold graphics available on LAMP website:

- Goal is to depict the LAMP probabilities and information about the related thresholds so that users can have more information about the probabilities underlying the best category forecasts from LAMP
- One would have more confidence in a chosen category if the probability exceeded the threshold by a large amount, compared to the probability just barely exceeding the threshold.
- Graphics for stations:
  - Line plots show probabilities and thresholds by element
  - Color coded bar charts indicate the confidence in choosing a category by indicating how close the probability was to the threshold
- Aviation probabilities and associated thresholds easily viewable for all LAMP stations and cycles

# LAMP Categorical Forecast Selection Process

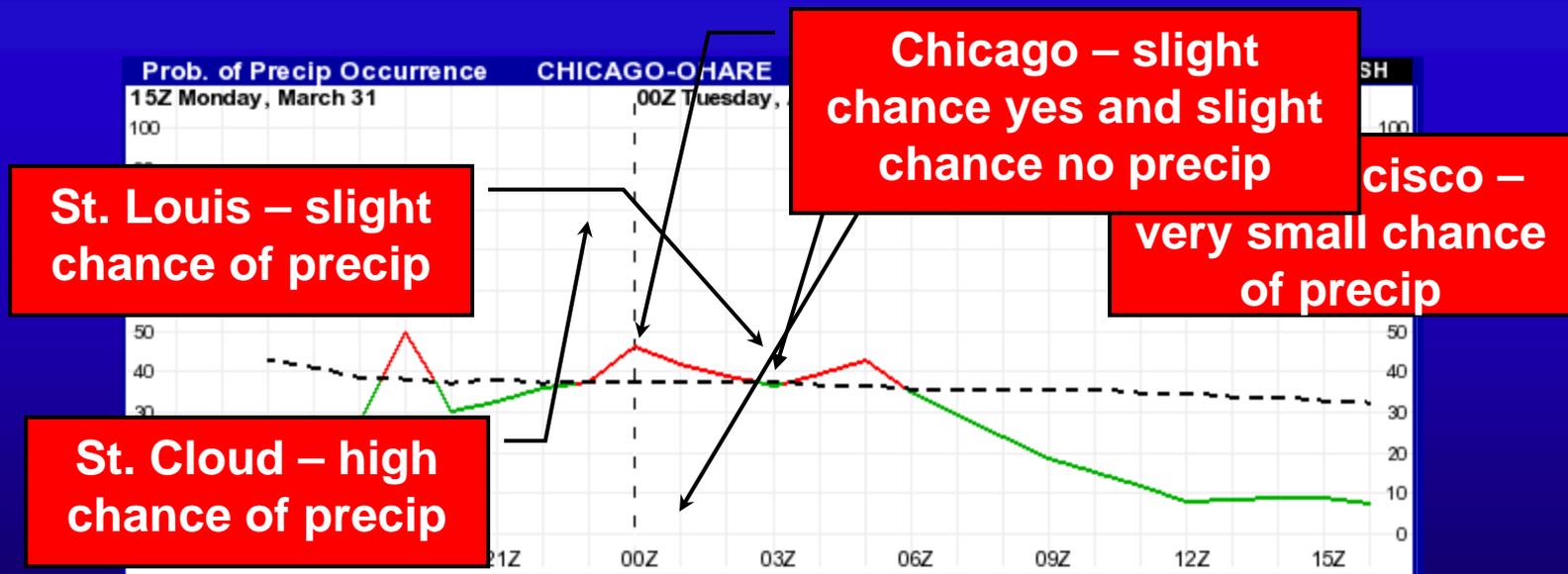
The probability of "few" exceeds the threshold value for "few" – therefore LAMP categorical forecast is "few"



# Depicting Probabilistic Information

Purpose: indicate to user the uncertainty associated with the Best Category forecasts given the probabilistic information

Threshold = dashed black line  
Probability < thres = green line  
Probability  $\geq$  thres = red line

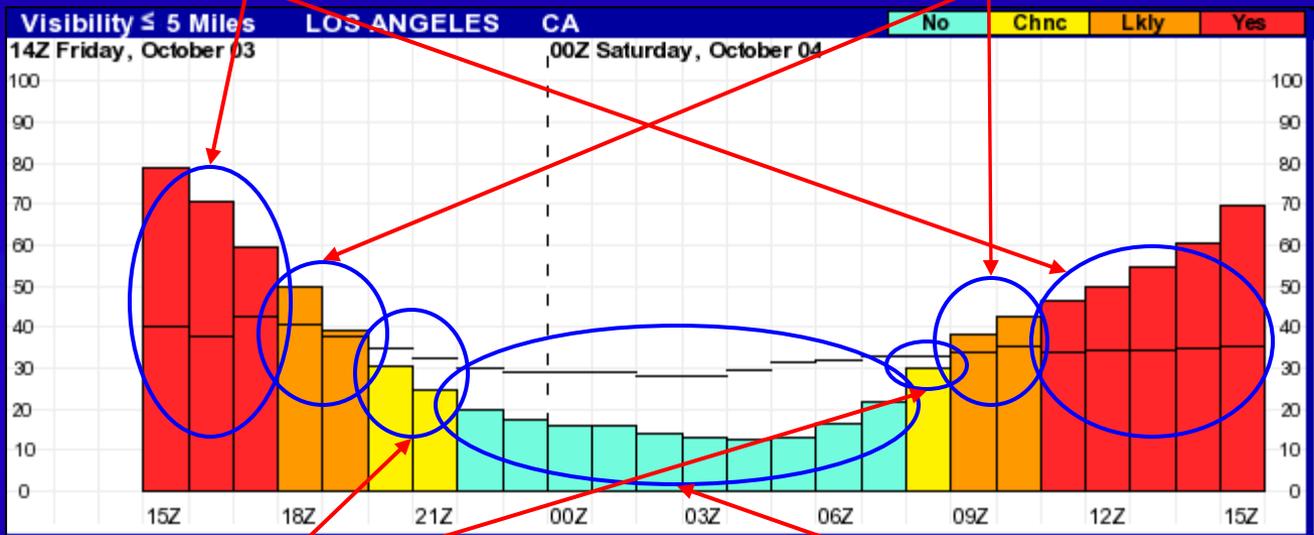


# LAMP Probabilities and Thresholds for Flight Categories

## Uncertainty Plot Tab – looking at vis $\leq$ 5 miles

Red=Yes  
Probability  
exceeds threshold  
by more than 10%

Orange=Likely  
Probability exceeds  
threshold but NOT  
by more than 10%



Yellow = Chance  
Probability is less  
than t  
wi

Cyan = No  
Probability is less

Note that this shows you one condition (e.g., vis  $\leq$  5 miles). To determine the most likely condition, you should consider rarer conditions first.

# Example of LAMP Application

# LAMP/CCFP Hybrid

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- Customers can access LAMP guidance and develop products from it.
- Example: Customers are retrieving LAMP thunderstorm grids from NDGD and producing a LAMP/CCFP Hybrid thunderstorm product:

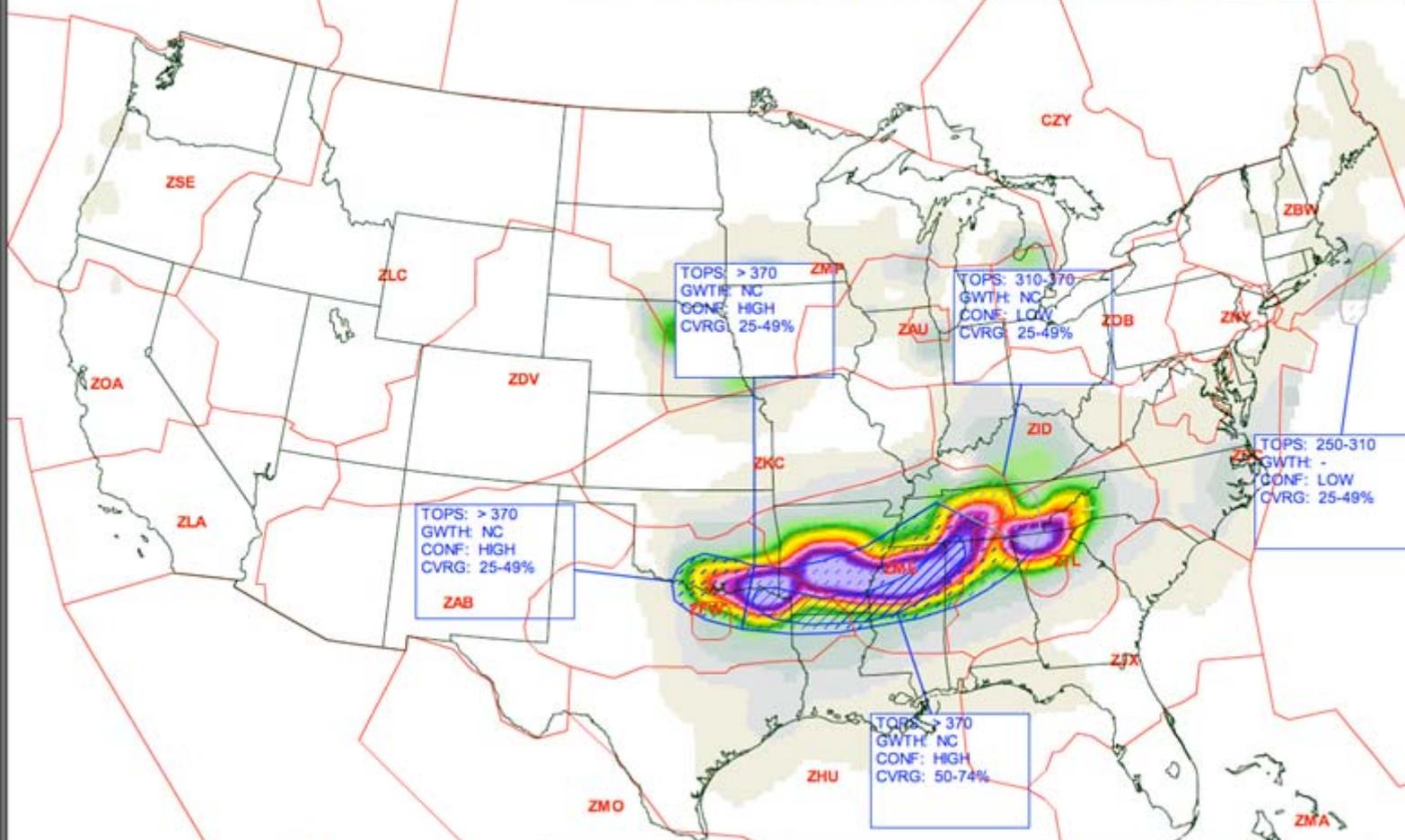
<http://www.lampccfp-hybrid.com/LAMP.swf>

- **Background** (<http://www.avmet.com/LCH/>):  
“The Collaborative Decision Making (CDM) stakeholders chartered the Weather Evaluation Team (WET) to evaluate and recommend an 8-24 hour convective forecast product to be used for operational planning. For the 2009 convective season, the WET proposed to evaluate the use of LAMP as a complement to the CCFP for convective forecasting. The LAMP-CCFP Hybrid webpage is the outcome of this proposal and is currently a prototype product.”

# LAMP-CCFP Hybrid



No Canadian or Gulf LAMP data 50 miles outside of the US Border.



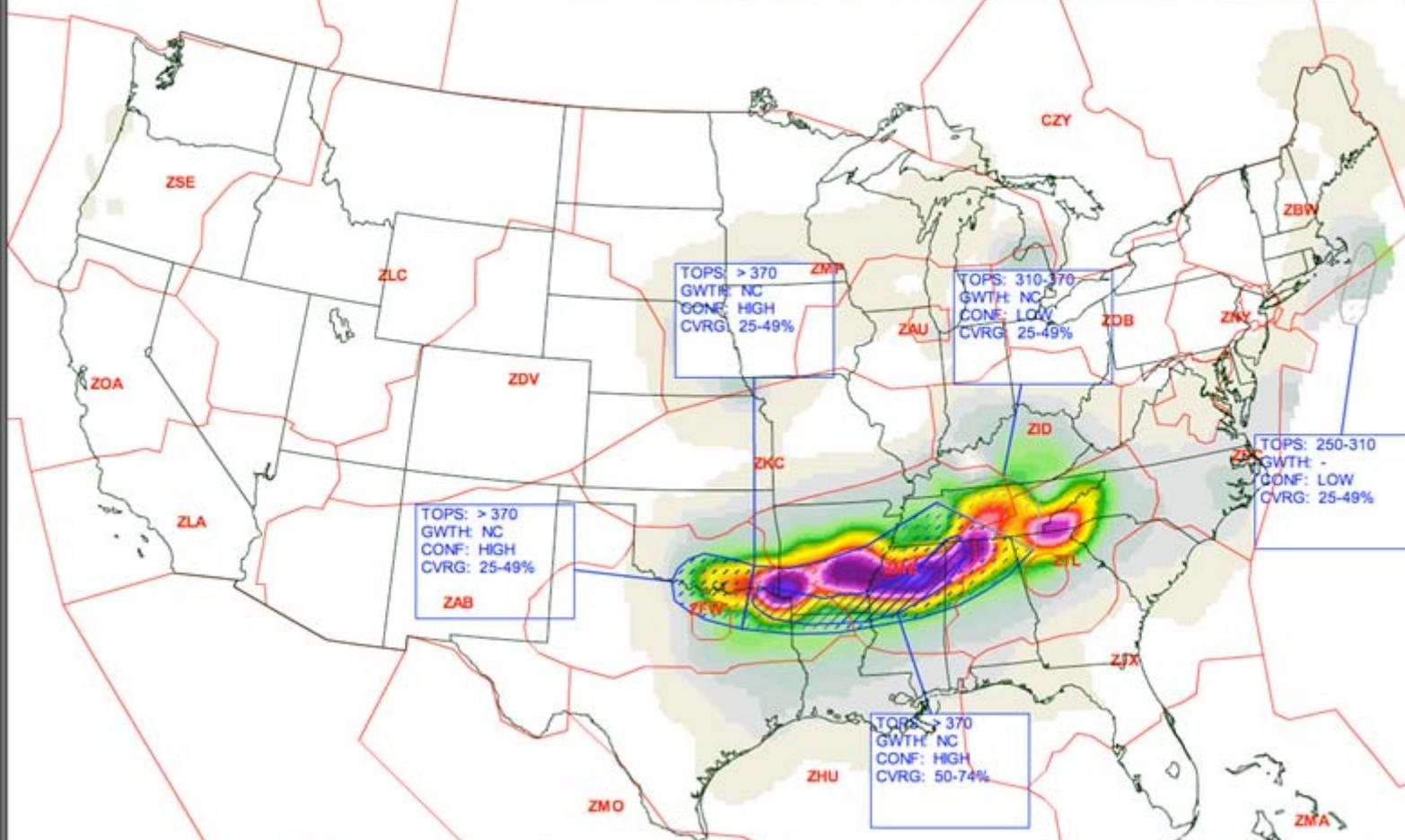
Forecast	Hours +	Issued	Valid	Current Time:
LAMP	+1 - +3	1100	1200 - 1400	1234 / 05-06-09
CCFP	+4	0900	1300	Version: 1.06

LAMP/CCFP Hybrid

# LAMP-CCFP Hybrid



No Canadian or Gulf LAMP data 50 miles outside of the US Border.



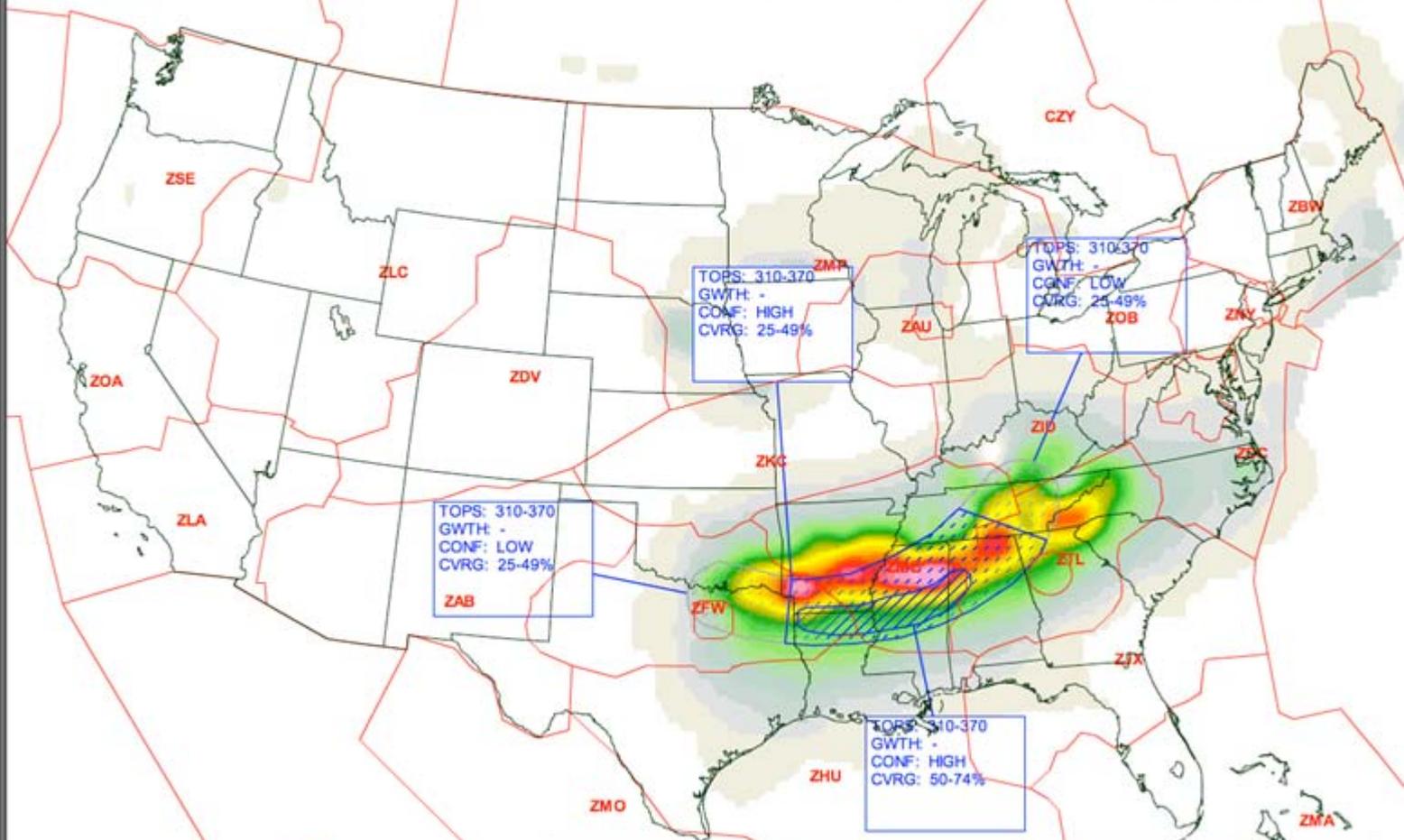
	Forecast	Hours +	Issued	Valid	Current Time:
LAMP		+2 - +4	1100	1300 - 1500	1235 / 05-06-09
CCFP		+4	0900	1300	Version: 1.06

LAMP/CCFP Hybrid

# LAMP-CCFP Hybrid



No Canadian or Gulf LAMP data 50 miles outside of the US Border.



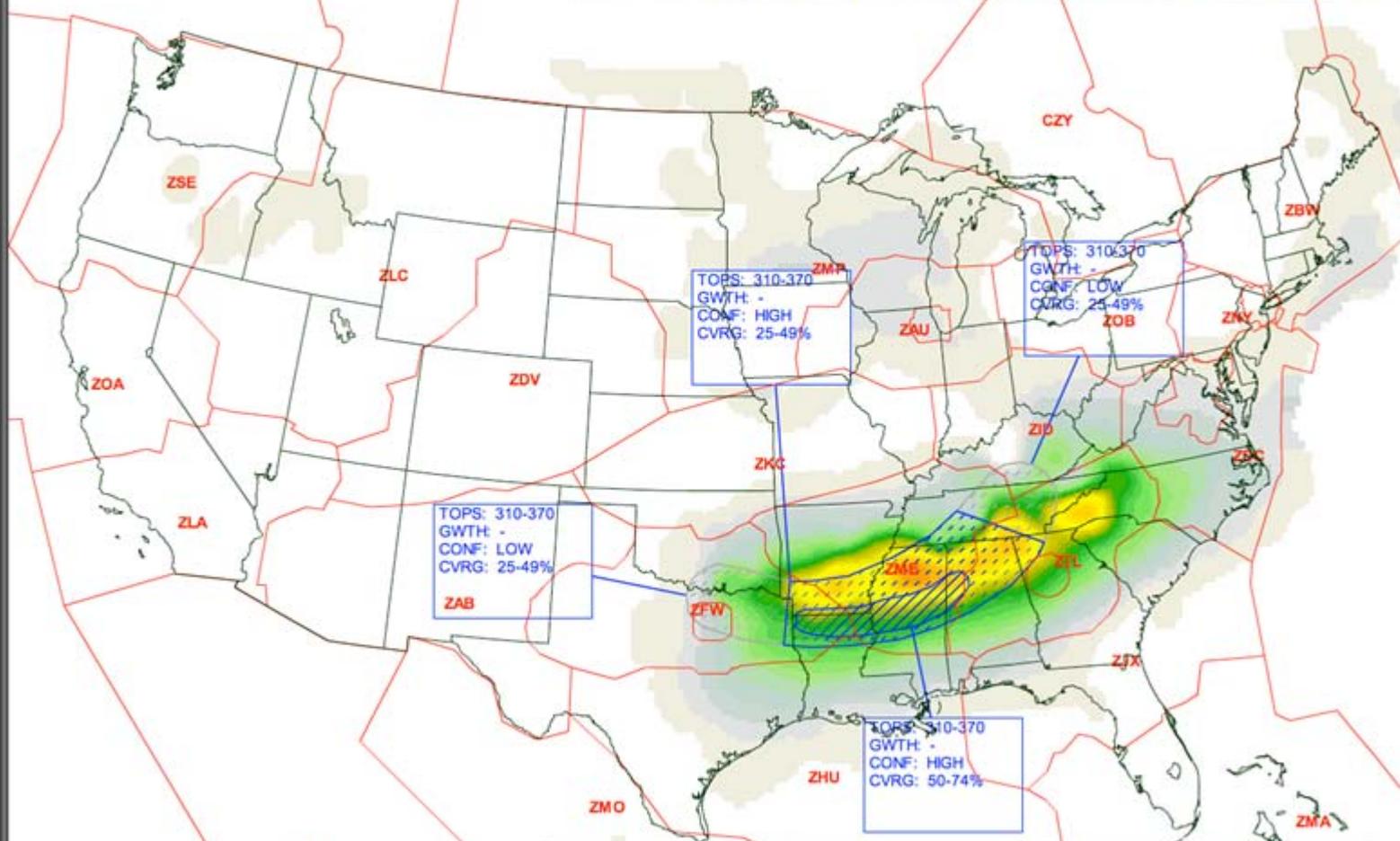
Forecast	Hours +	Issued	Valid	Current Time:
LAMP	+3 - +5	1100	1400 - 1600	1236 / 05-06-09
CCFP	+6	0900	1500	Version: 1.06

LAMP/CCFP Hybrid

# LAMP-CCFP Hybrid



No Canadian or Gulf LAMP data 50 miles outside of the US Border.



TOPS: 310-370  
 GWTH: -  
 CONF: HIGH  
 CVRG: 25-49%

TOPS: 310-370  
 GWTH: -  
 CONF: LOW  
 CVRG: 25-49%

TOPS: 310-370  
 GWTH: -  
 CONF: LOW  
 CVRG: 25-49%

TOPS: 310-370  
 GWTH: -  
 CONF: HIGH  
 CVRG: 50-74%



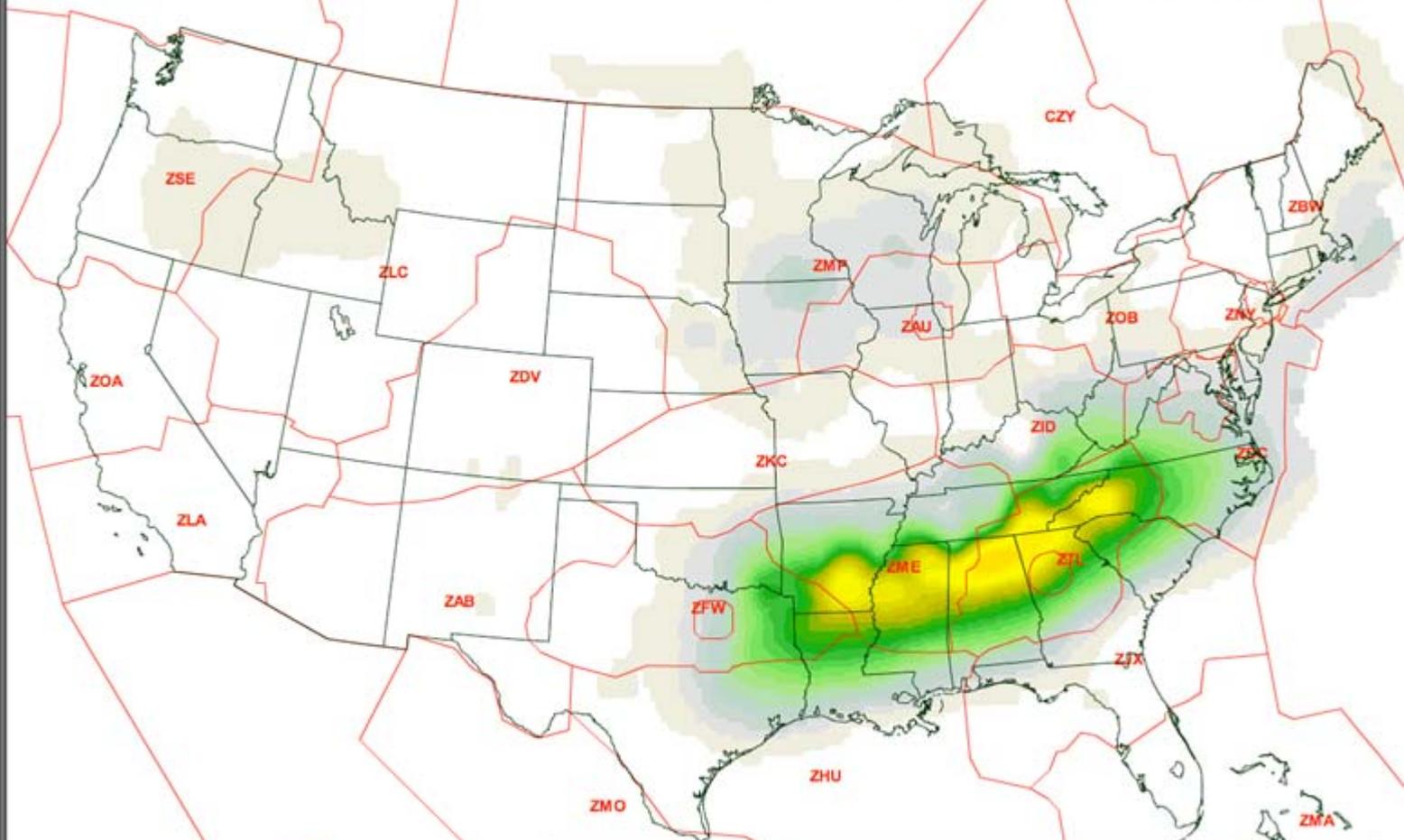
	Forecast	Hours +	Issued	Valid	Current Time:
LAMP		+4 - +6	1100	1500 - 1700	1236 / 05-06-09
CCFP		+6	0900	1500	Version: 1.06

LAMP/CCFP Hybrid

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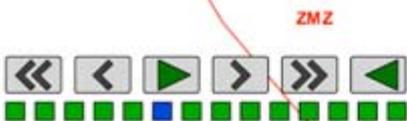
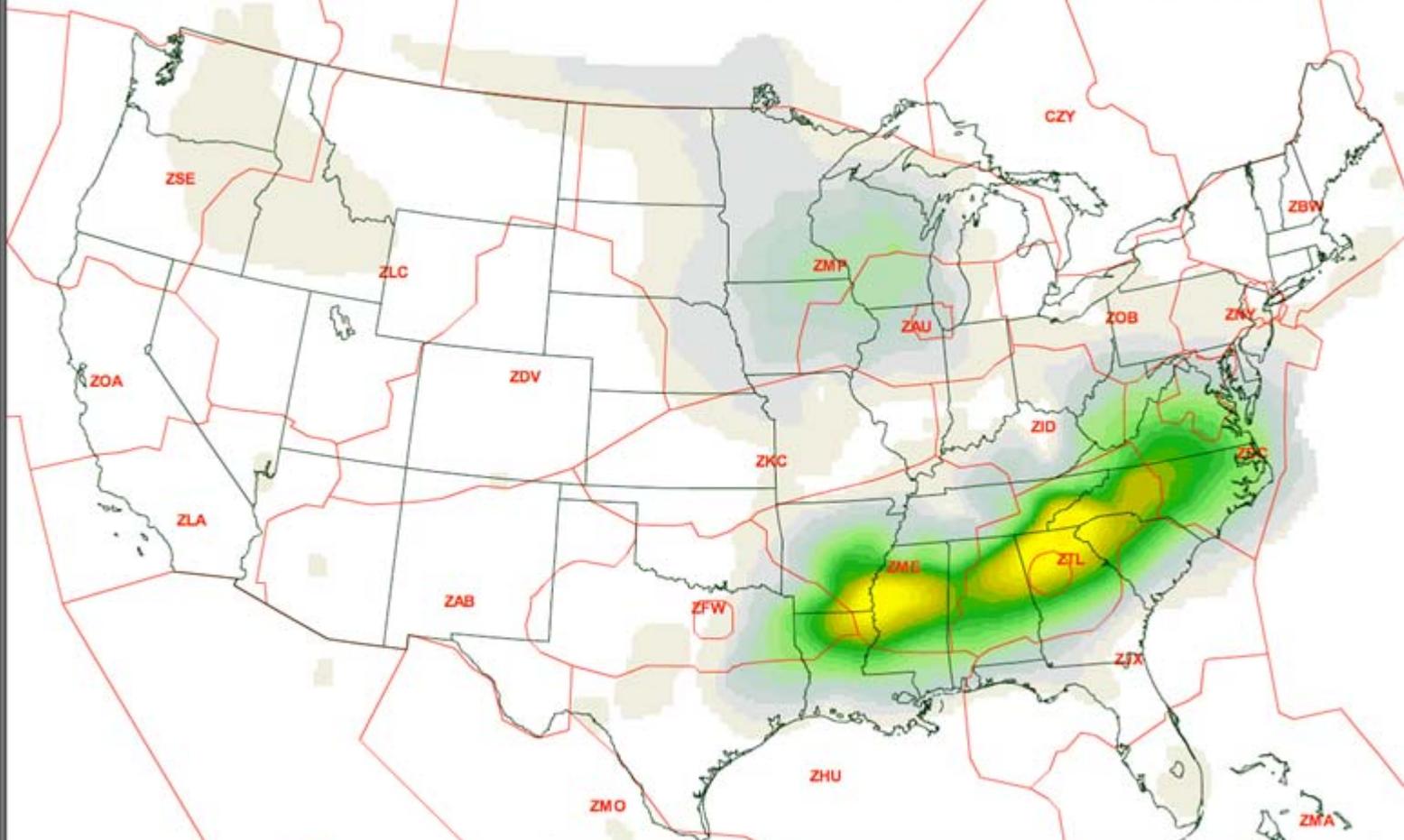
Forecast	Hours +	Issued	Valid	Current Time:
LAMP	+5 - +7	1100	1600 - 1800	1236 / 05-06-09
CCFP	NA	NA	NA	Version: 1.06

LAMP/CCFP Hybrid

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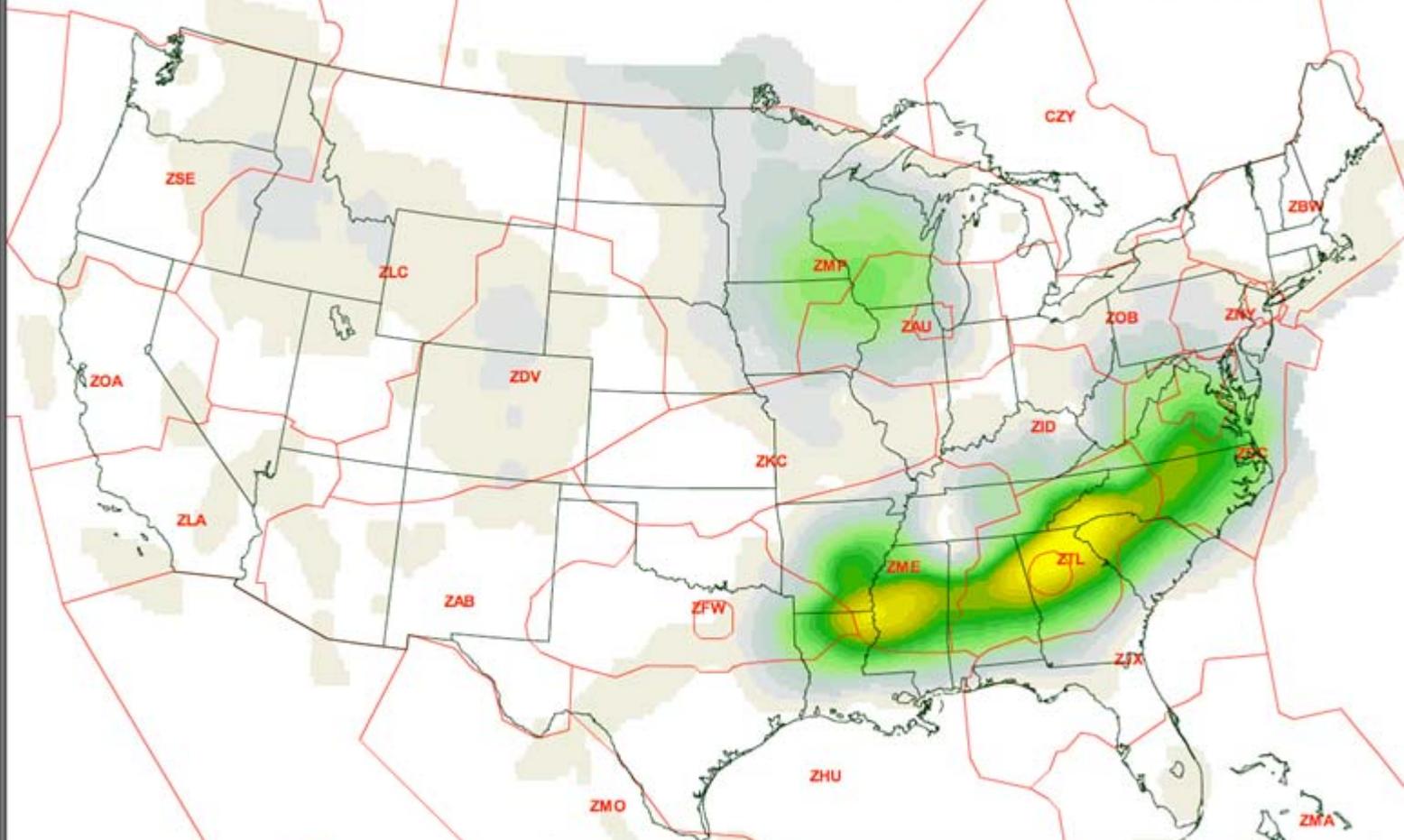
Forecast	Hours +	Issued	Valid	Current Time:
LAMP	+7 - +9	1100	1800 - 2000	1237 / 05-06-09
CCFP	NA	NA	NA	Version: 1.06

LAMP/CCFP Hybrid

# LAMP-CCFP Hybrid



No Canadian or Gulf LAMP data 50 miles outside of the US Border.

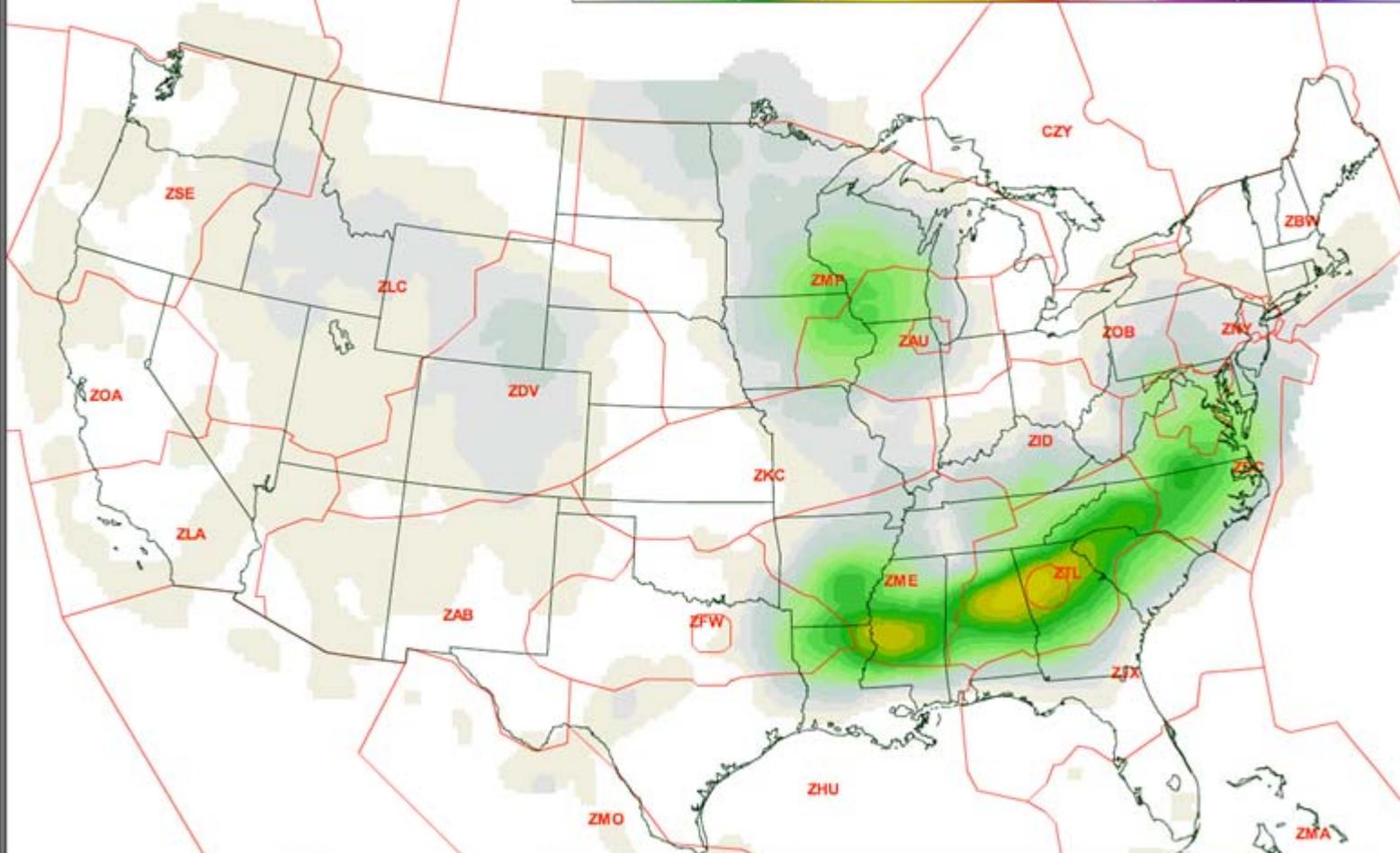


Forecast	Hours +	Issued	Valid	Current Time:
LAMP	+9 - +11	1100	2000 - 2200	1237 / 05-06-09
CCFP	NA	NA	NA	Version: 1.06

# LAMP-CCFP Hybrid



No Canadian or Gulf LAMP data 50 miles outside of the US Border.



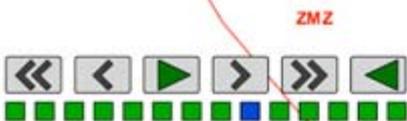
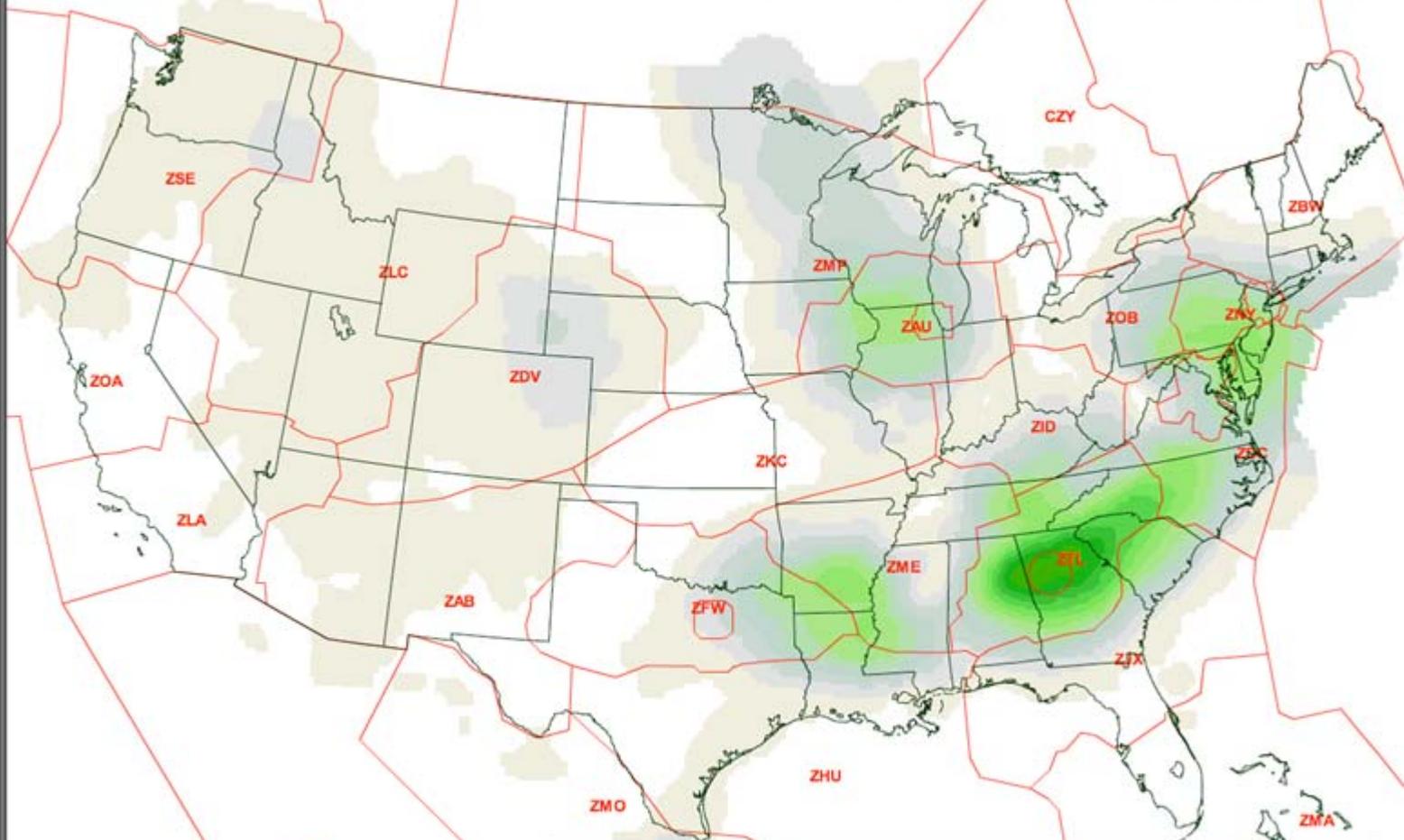
Forecast	Hours +	Issued	Valid	Current Time:
LAMP	+11 - +13	1100	2200 - 0000	1237 / 05-06-09
CCFP	NA	NA	NA	Version: 1.06

LAMP/CCFP Hybrid

# LAMP-CCFP Hybrid



No Canadian or Gulf LAMP data 50 miles outside of the US Border.



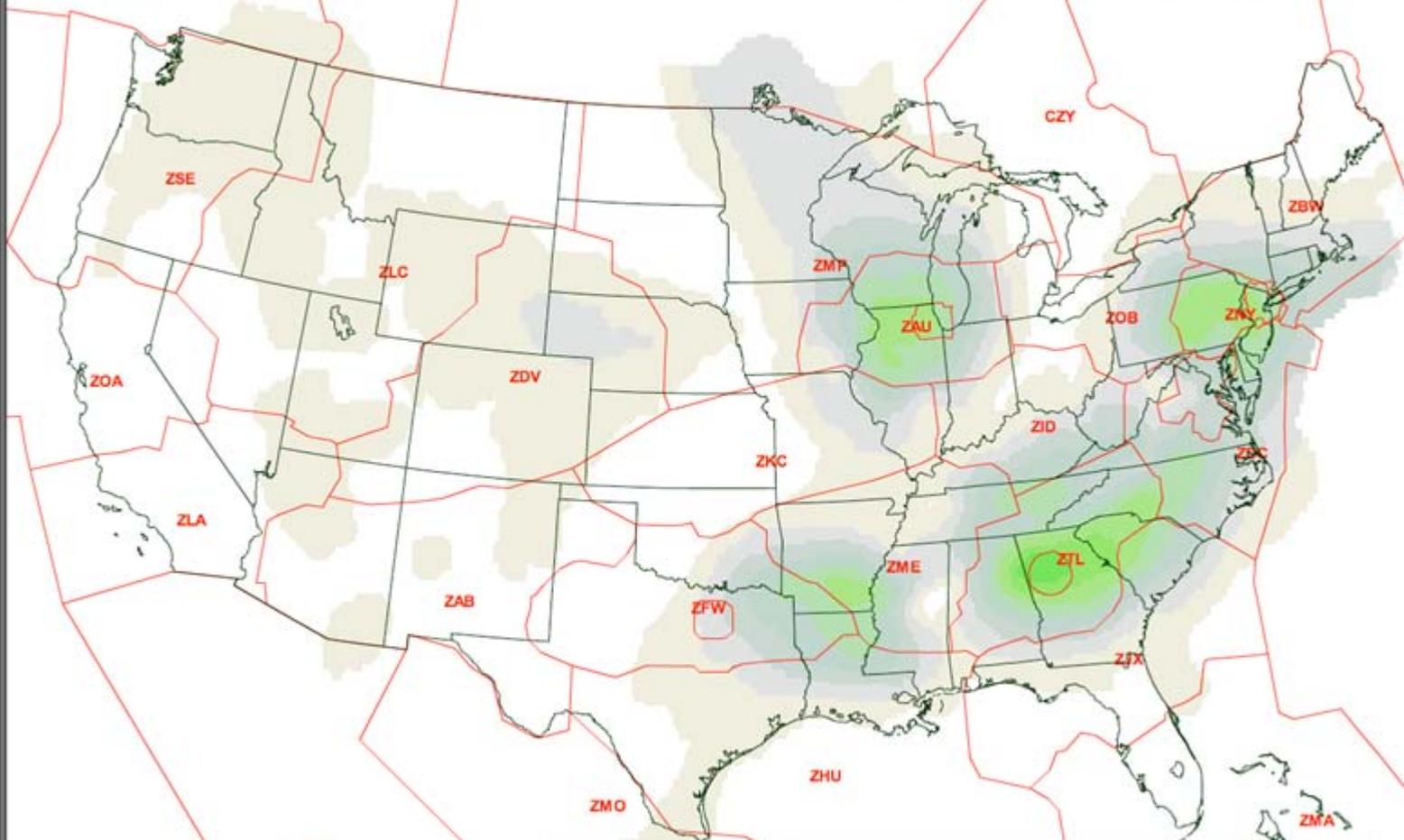
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LAMP	+13 - +15	1100	0000 - 0200	1238 / 05-06-09
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LAMP/CCFP Hybrid

# LAMP-CCFP Hybrid



No Canadian or Gulf LAMP data 50 miles outside of the US Border.



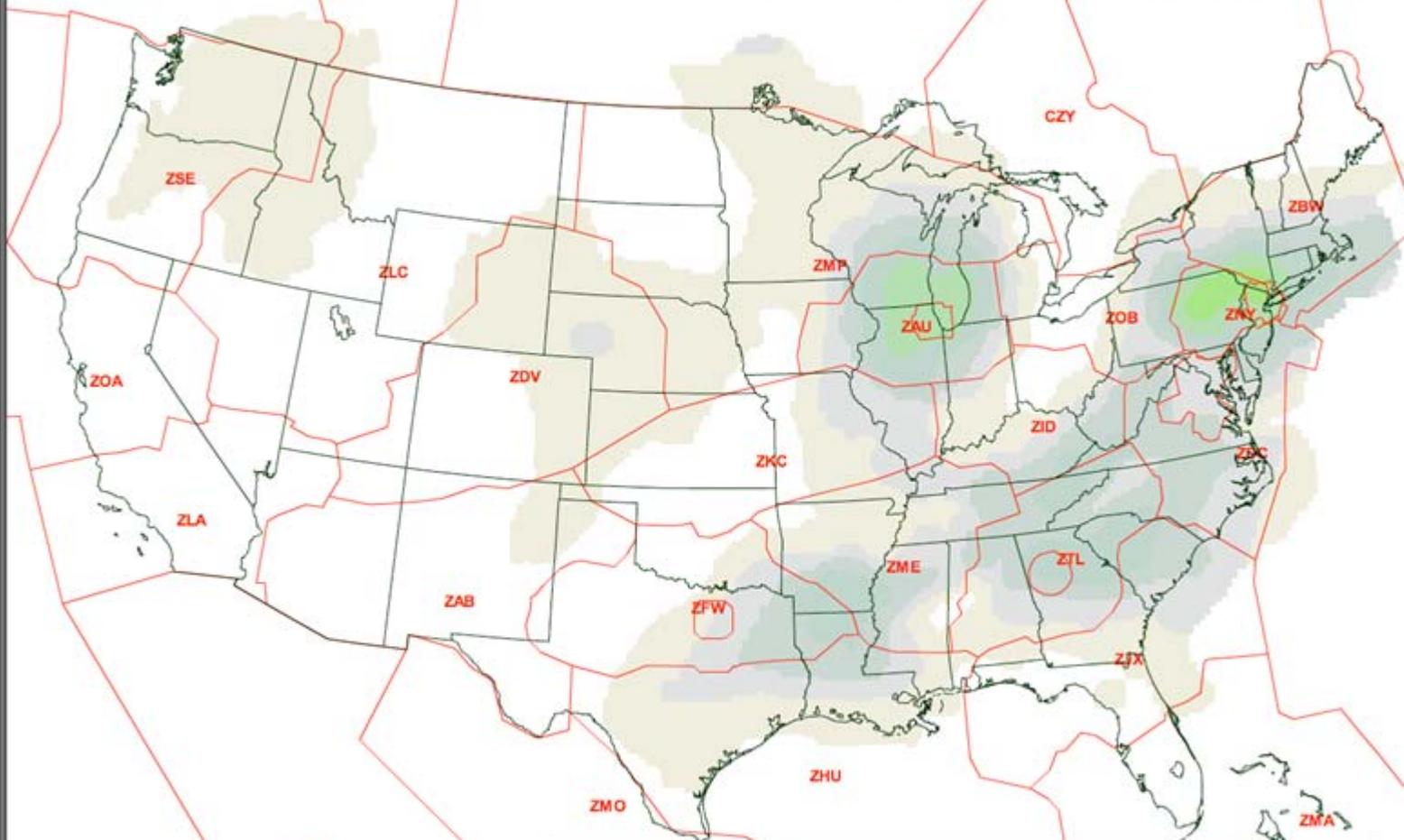
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LAMP	+15 - +17	1100	0200 - 0400	1238 / 05-06-09
CCFP	NA	NA	NA	Version: 1.06

LAMP/CCFP Hybrid

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No Canadian or Gulf LAMP data 50 miles outside of the US Border.

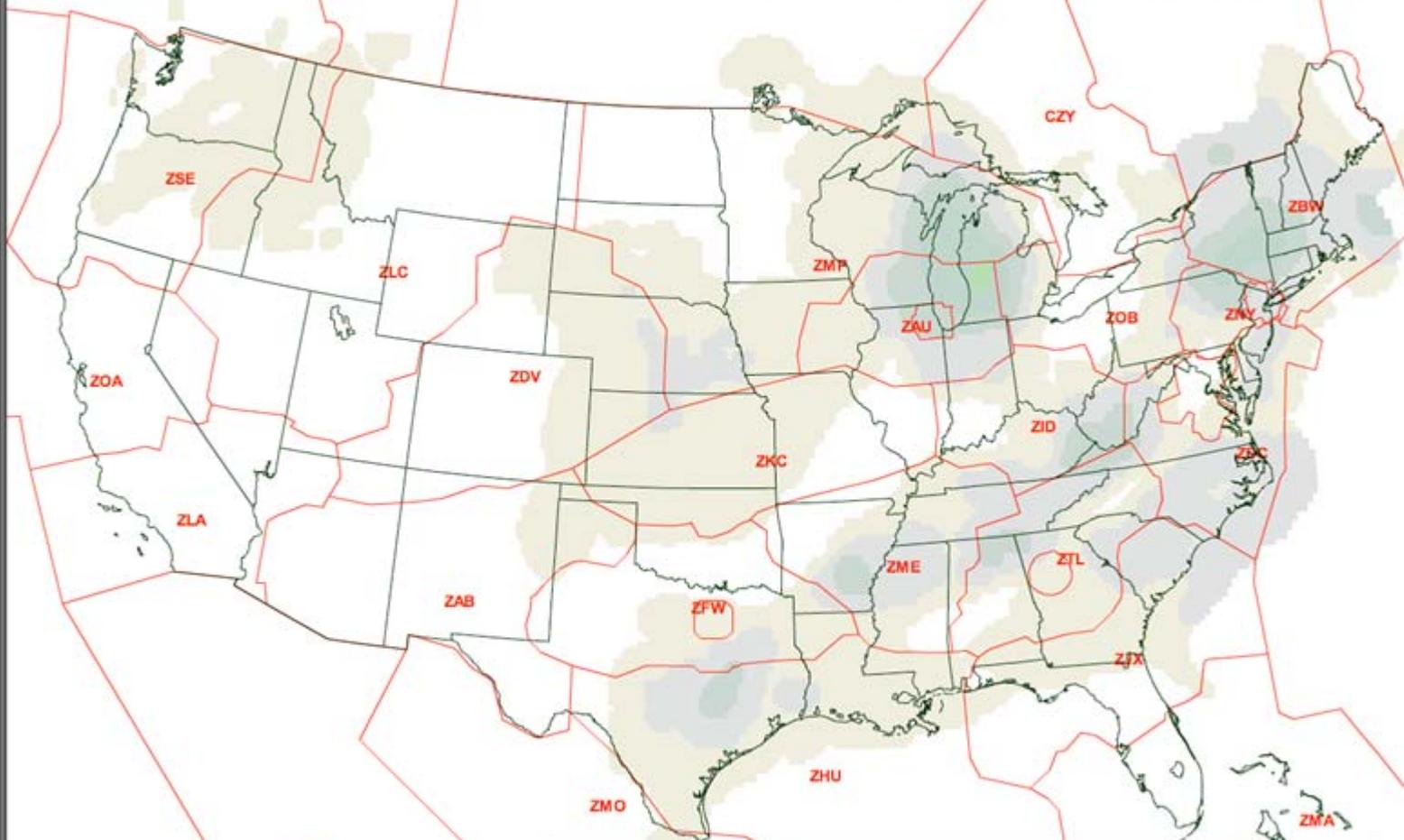


Forecast	Hours +	Issued	Valid	Current Time:
LAMP	+17 - +19	1100	0400 - 0600	1238 / 05-06-09
CCFP	NA	NA	NA	Version: 1.06

# LAMP-CCFP Hybrid



No Canadian or Gulf LAMP data 50 miles outside of the US Border.



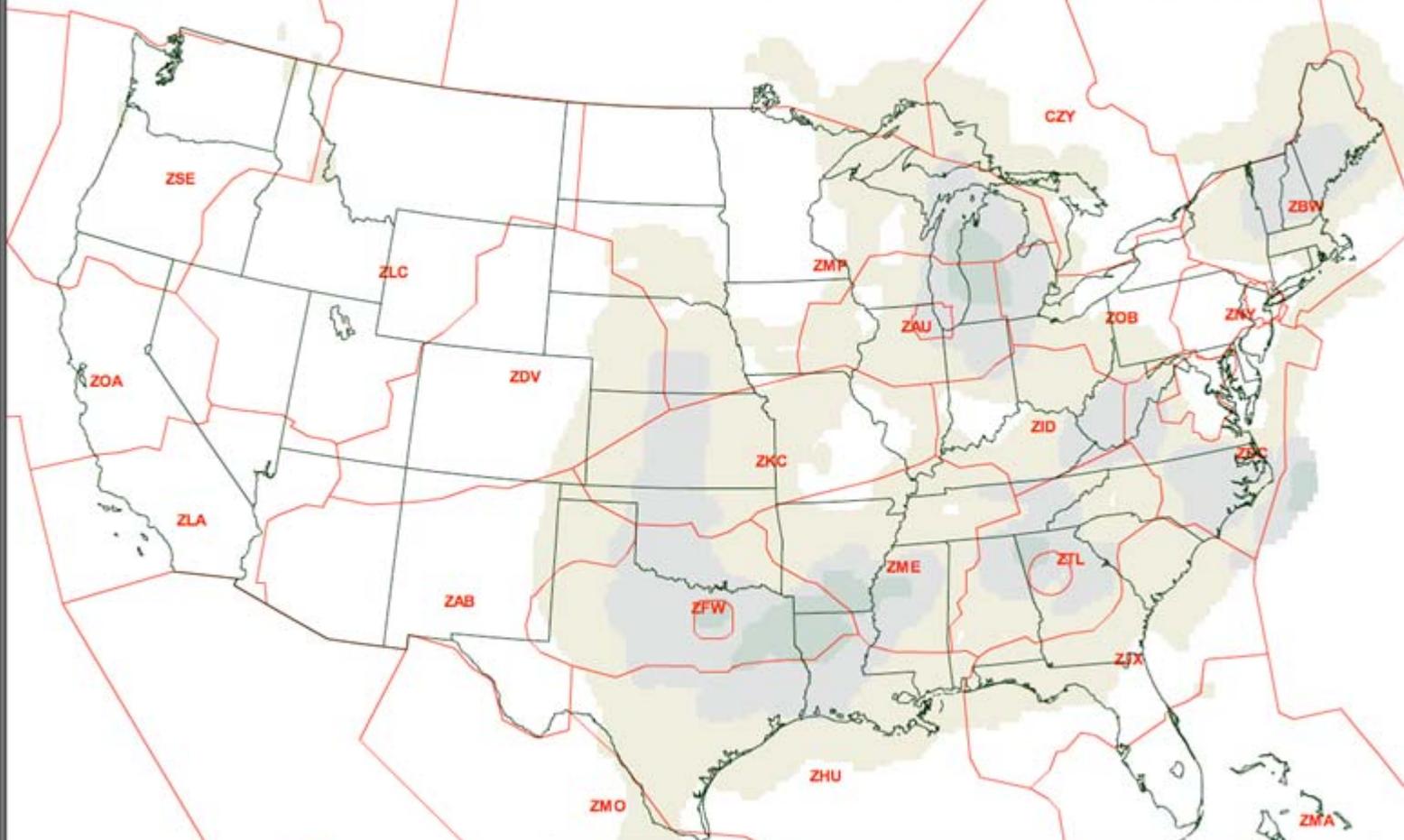
Forecast	Hours +	Issued	Valid	Current Time:
LAMP	+19 - +21	1100	0600 - 0800	1238 / 05-06-09
CCFP	NA	NA	NA	Version: 1.06



# LAMP-CCFP Hybrid



No Canadian or Gulf LAMP data 50 miles outside of the US Border.



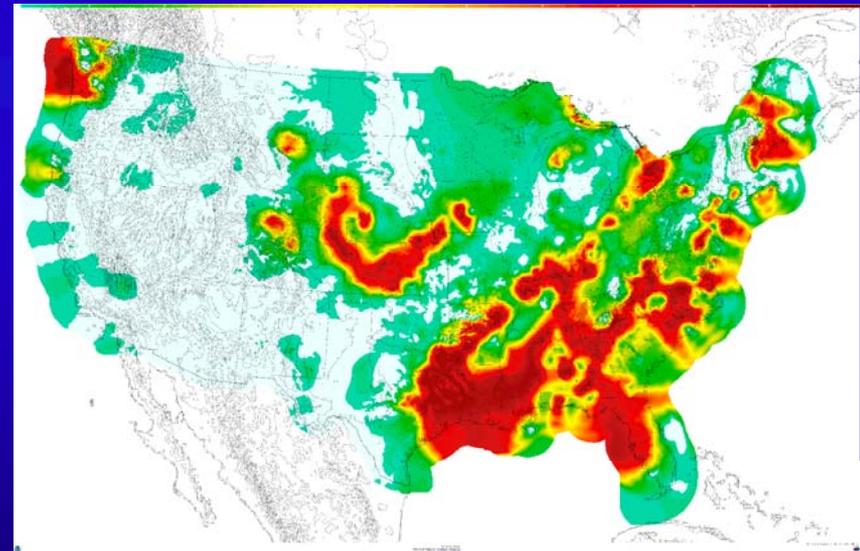
Forecast	Hours +	Issued	Valid	Current Time:
LAMP	+23 - +25	1100	1000 - 1200	1239 / 05-06-09
CCFP	NA	NA	NA	Version: 1.06

# Future Plans

# Future Plans

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- Minimize inter-element inconsistencies in anticipation of gridding forecasts
- Gridded LAMP forecasts of:
  - Temperature and dewpoint
  - Winds
  - Probabilities of Ceiling Height
  - Ceiling Height
  - Probabilities of Visibility
  - Visibility



# Future Plans

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- Redevelop LAMP station guidance of ceiling height and opaque sky cover
- Inter-hour station-based LAMP using SPECI observations
- Convective cloud tops?

# Questions?

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- LAMP Website:
  - <http://www.nws.noaa.gov/mdl/gfslamp/gfslamp.shtml>
- Training Materials:
  - Powerpoint Presentations, each one should take less than 1 hour to complete
  - <http://www.nws.noaa.gov/mdl/gfslamp/docs/presentations.shtml>
    - Training on LAMP Background: “An Introduction to The Localized Aviation MOS Program (LAMP)” by David Rudack.
    - Training on LAMP Products: “Accessing and Using GFS LAMP Products” by Scott Scallion.
- Contact:
  - [Judy.Ghirardelli@noaa.gov](mailto:Judy.Ghirardelli@noaa.gov)