Gridded LAMP Update

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Outline

- LAMP background
- LAMP probabilities and thresholds
- Verification
- Current status and products
- Gridded LAMP
- Consistency issues
- Future work

Localized Aviation MOS Program (LAMP) Background

- 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

Current Status: LAMP Guidance Details

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

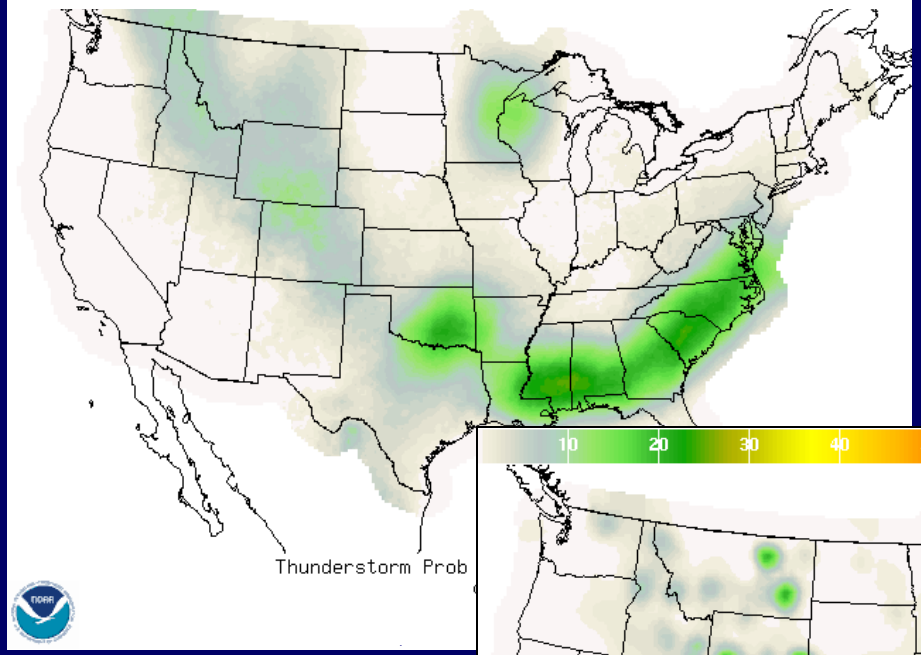
- LAMP provides station-oriented guidance for:
  - all LAMP forecast elements
  - ~1600 stations
  - CONUS, Alaska, Hawaii, Puerto Rico
- LAMP provides grid-oriented guidance for:
  - Thunderstorms:
    - Probability of thunderstorm occurrence in a 2 hour period in a 20-km grid box
    - Best Category Yes/No of thunderstorm occurrence in a 2 hour period in a 20-km grid box
  - CONUS only
- Runs 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

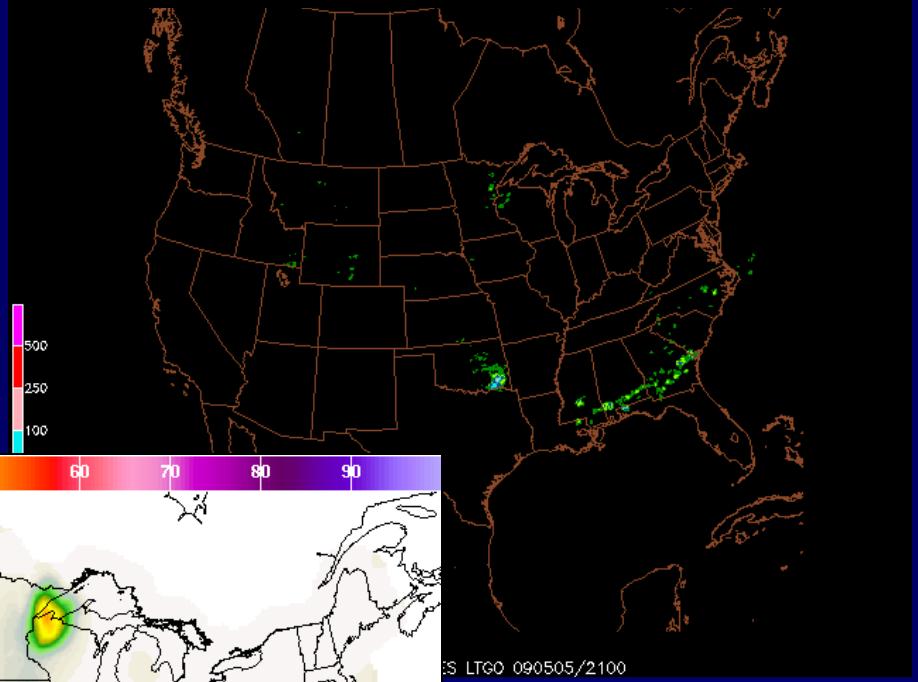
Example of blending Observations and MOS

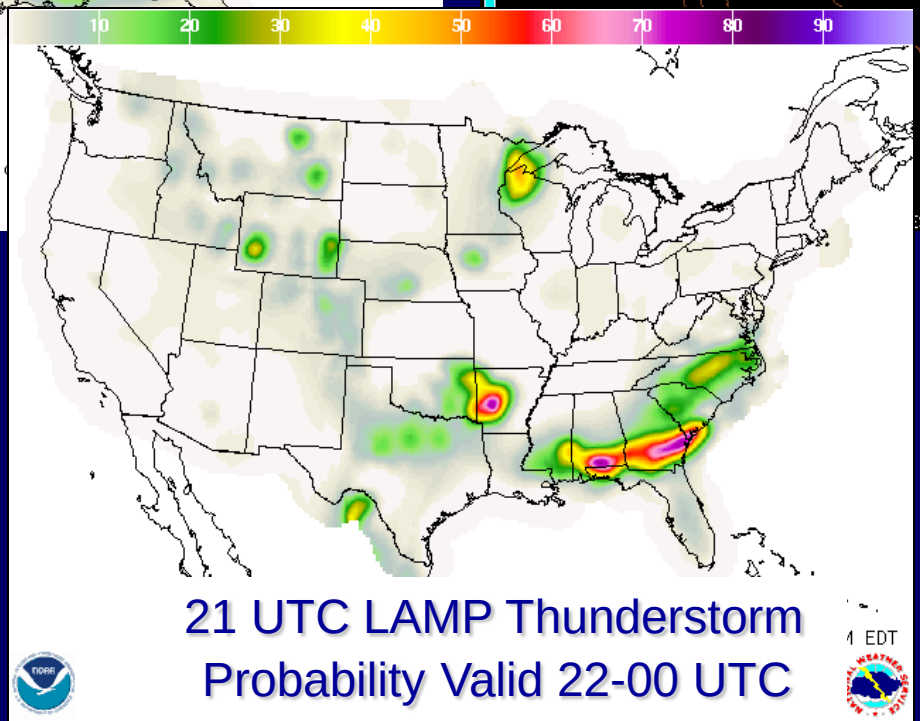
1-3 hr LAMP Thunderstorm forecast

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



Predictor: 21 UTC lightning strike data

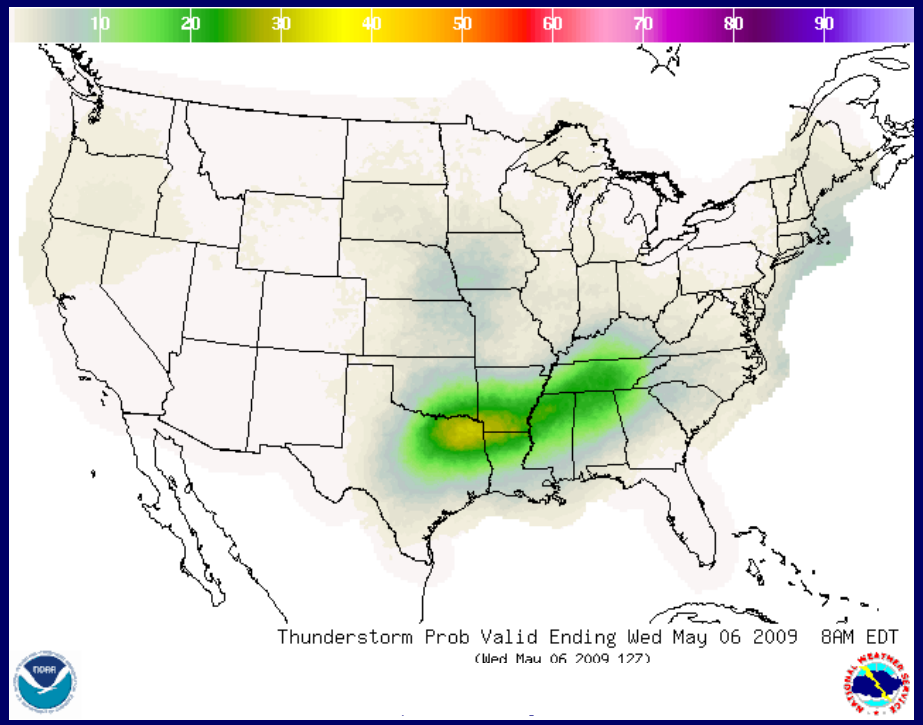




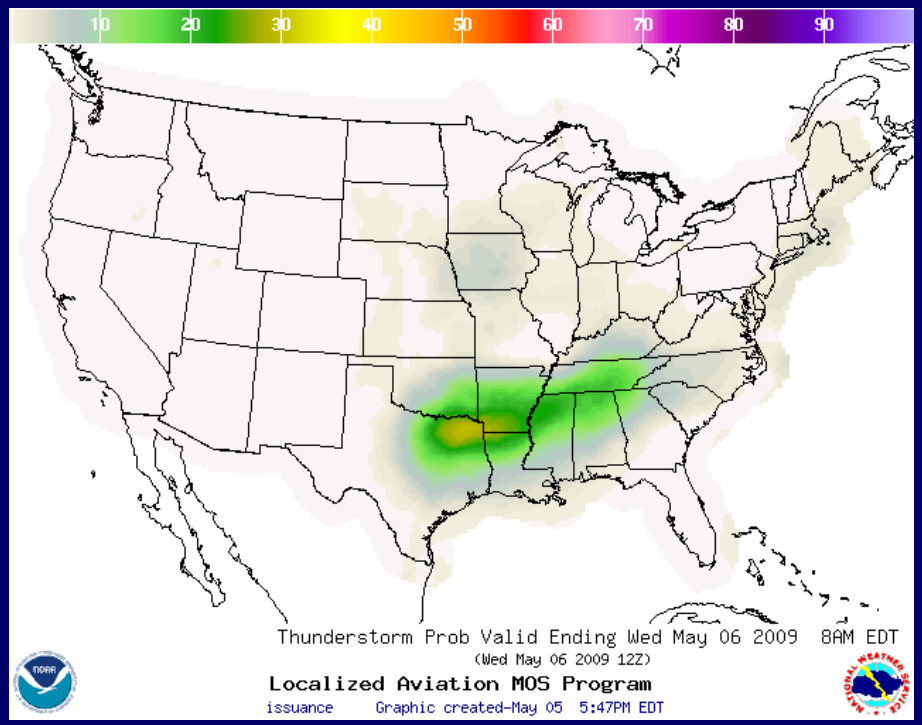
21 UTC LAMP Thunderstorm Probability Valid 22-00 UTC

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)



LAMP Probabilities and Thresholds

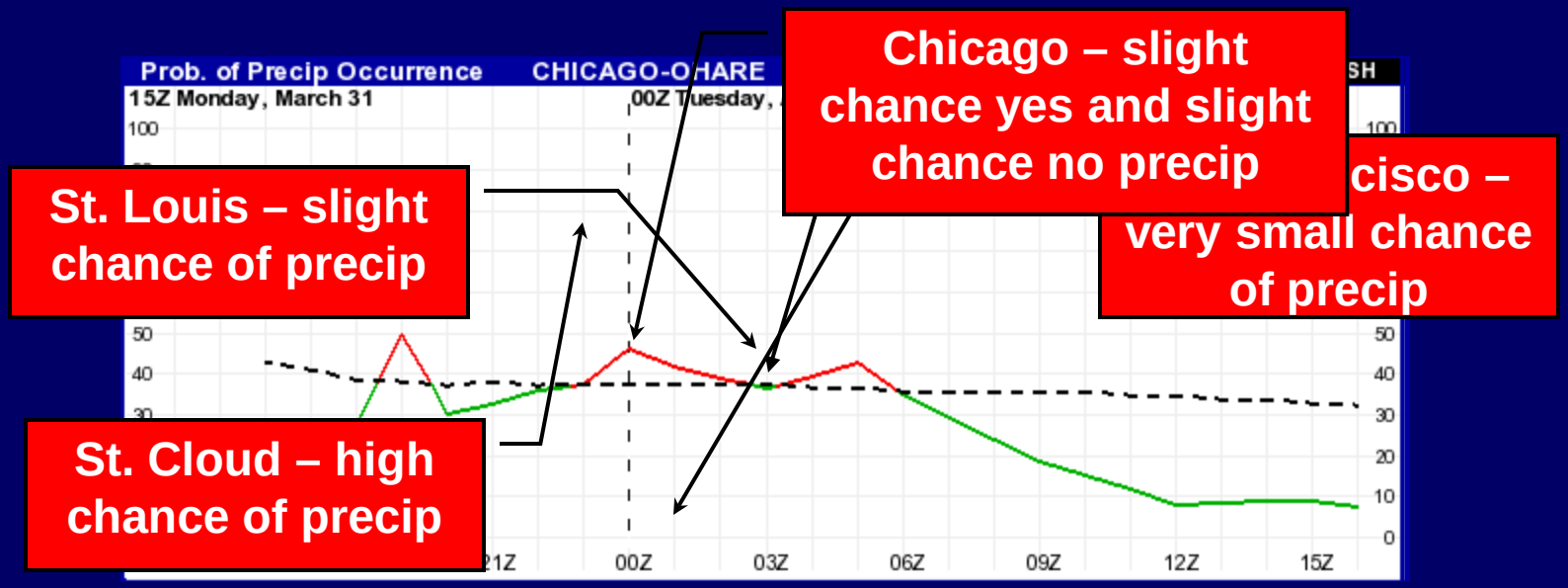
Depicting Probabilistic Information

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 ≥ thres = red line

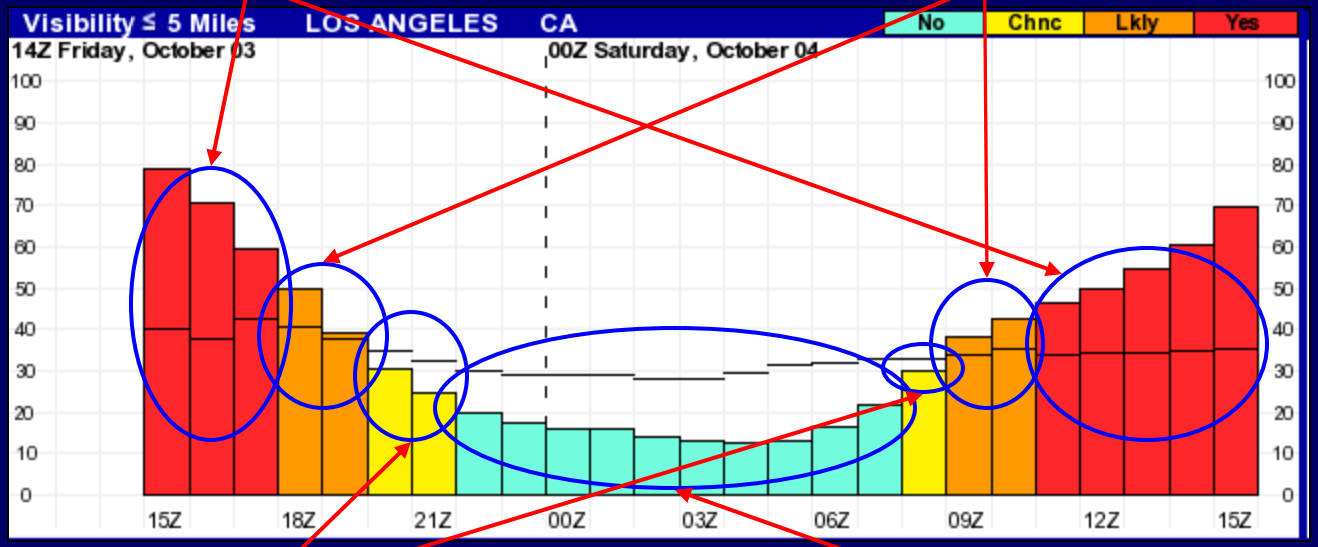


LAMP Probabilities and Thresholds for Flight Categories

Uncertainty Plot Tab – looking at vis ≤ 5 miles

Red=Yes
Probability exceeds threshold by more than 10%

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

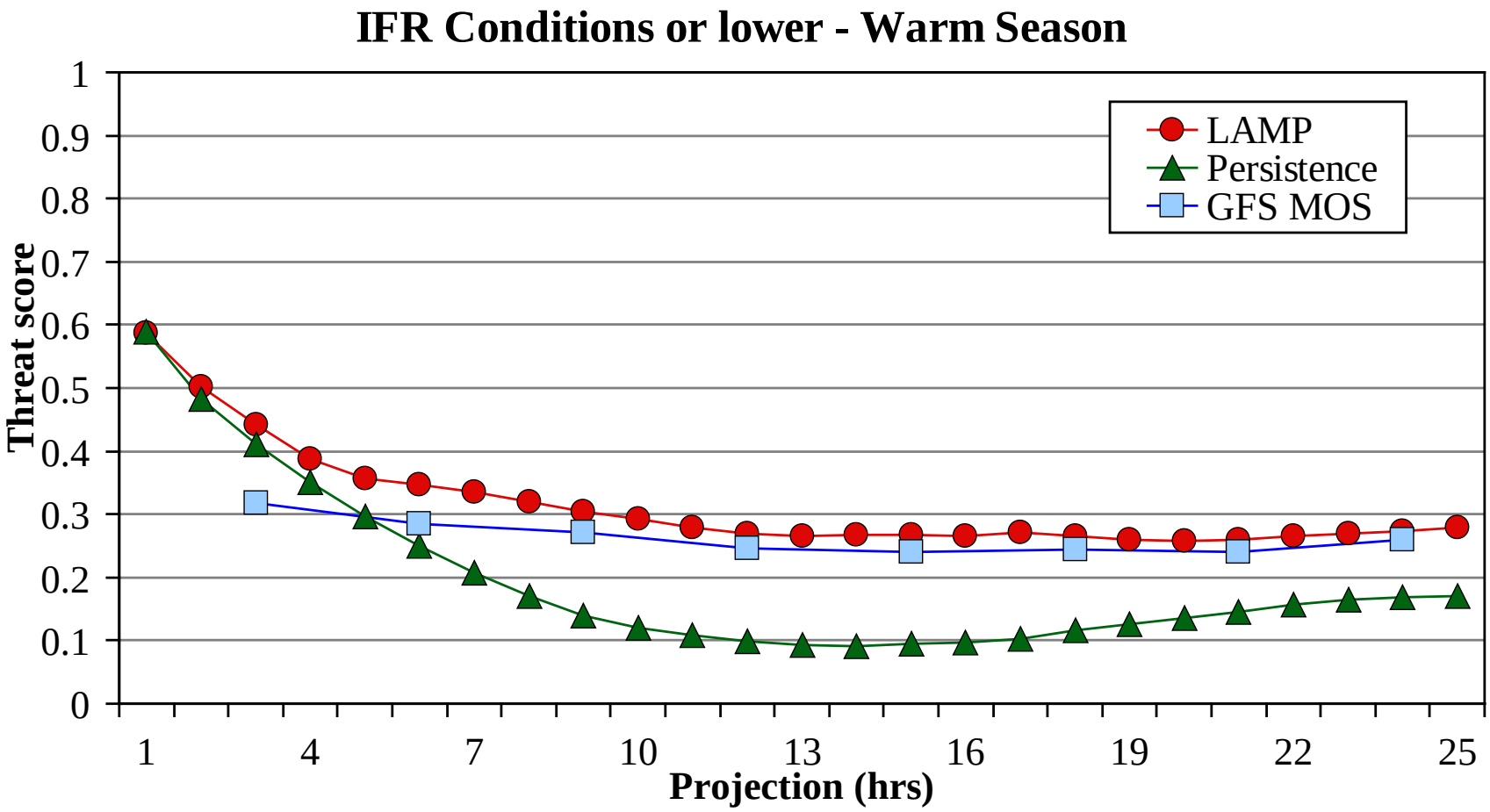


Yellow = Chance
Probability is less
than t
wi

Cyan = No
Probability is less

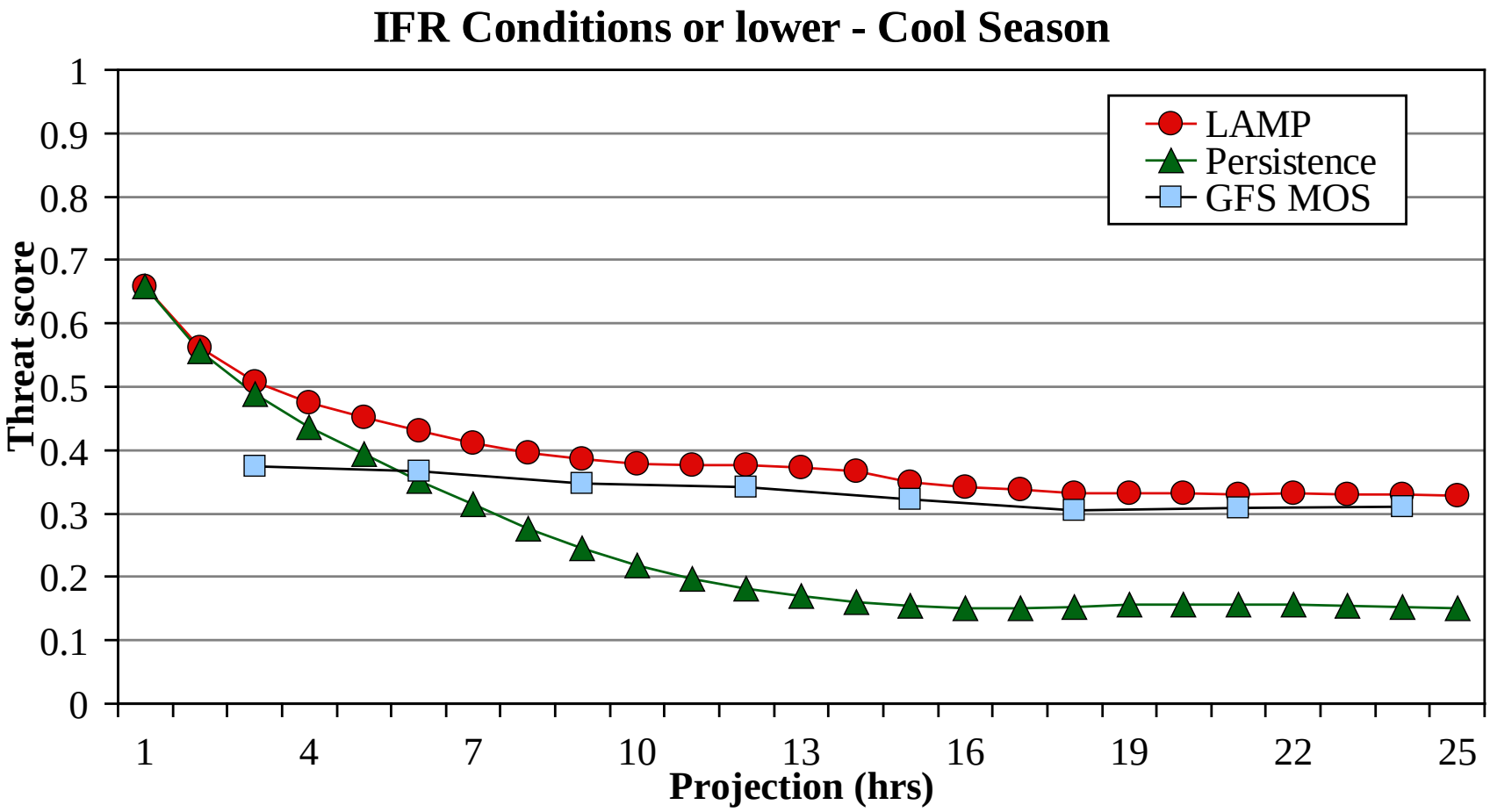
Note that this shows you one condition (e.g., vis ≤ 5 miles). To determine the most likely condition, you should consider rarer conditions first.

Verification



1522 stations, 0900 UTC LAMP, 0000 UTC GFS MOS

verification period: Apr – Sep 2007



1522 stations, 0900 UTC LAMP, 0000 UTC GFS MOS

verification period: Oct 2007 – Mar 2008

Current Status and Products

Current Status and Products

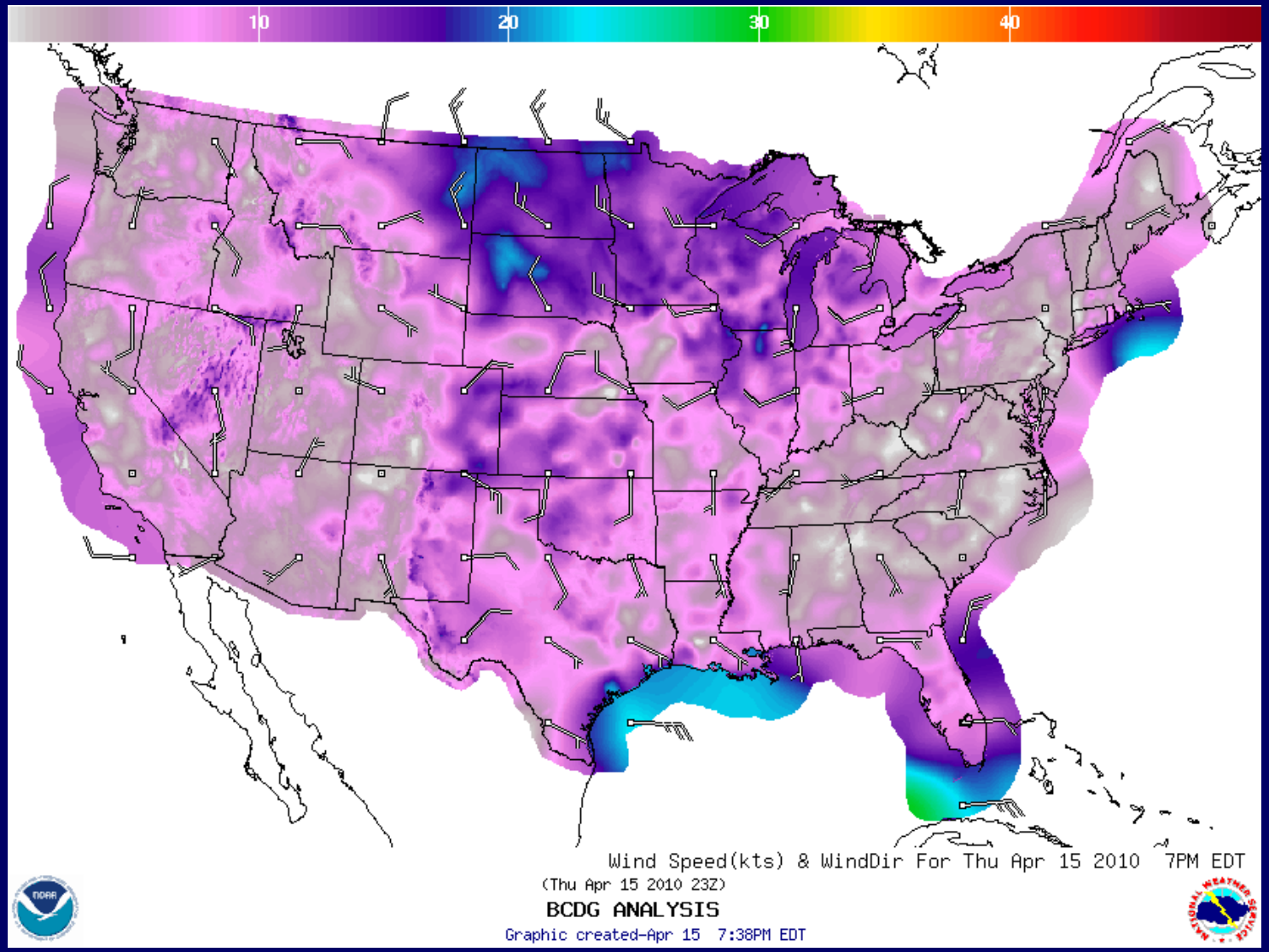
- Guidance sent out from NCEP on SBN/NOAAPort and NWS FTP Server
  - ASCII text bulletin
  - BUFR data
  - GRIB2 thunderstorm data
- Available Products:
  - At NWS WFOs:
    - Guidance viewable in AWIPS D2D and AvnFPS
    - Gridded thunderstorm data already available in GFE – “LAMP Probability of Thunder (PoT)”
  - Website products:
    - Text bulletins
    - Station plots
    - Meteograms
    - Probability/Threshold images
    - Gridded Thunderstorm images

Gridded LAMP

Gridded LAMP Work

- Gridded LAMP analyses of **observations** – for checkout and verification
  - Temperature and Dewpoint
  - Winds
  - Ceiling Height (100's of ft)
  - Visibility (miles)
  - Other elements later
- Temperature, Dewpoint, Winds:
  - Observations from METAR, Mesonet, synoptic stations, C-MAN, tide gauges, and moored buoys
  - Roughly 10,000 – 12,000 observations for analysis every hour for temperature, dewpoint, winds
- Ceiling and Visibility:
  - Observations from METAR

Wind Speed Gridded Obs example: 2300 UTC



Gridded LAMP Work

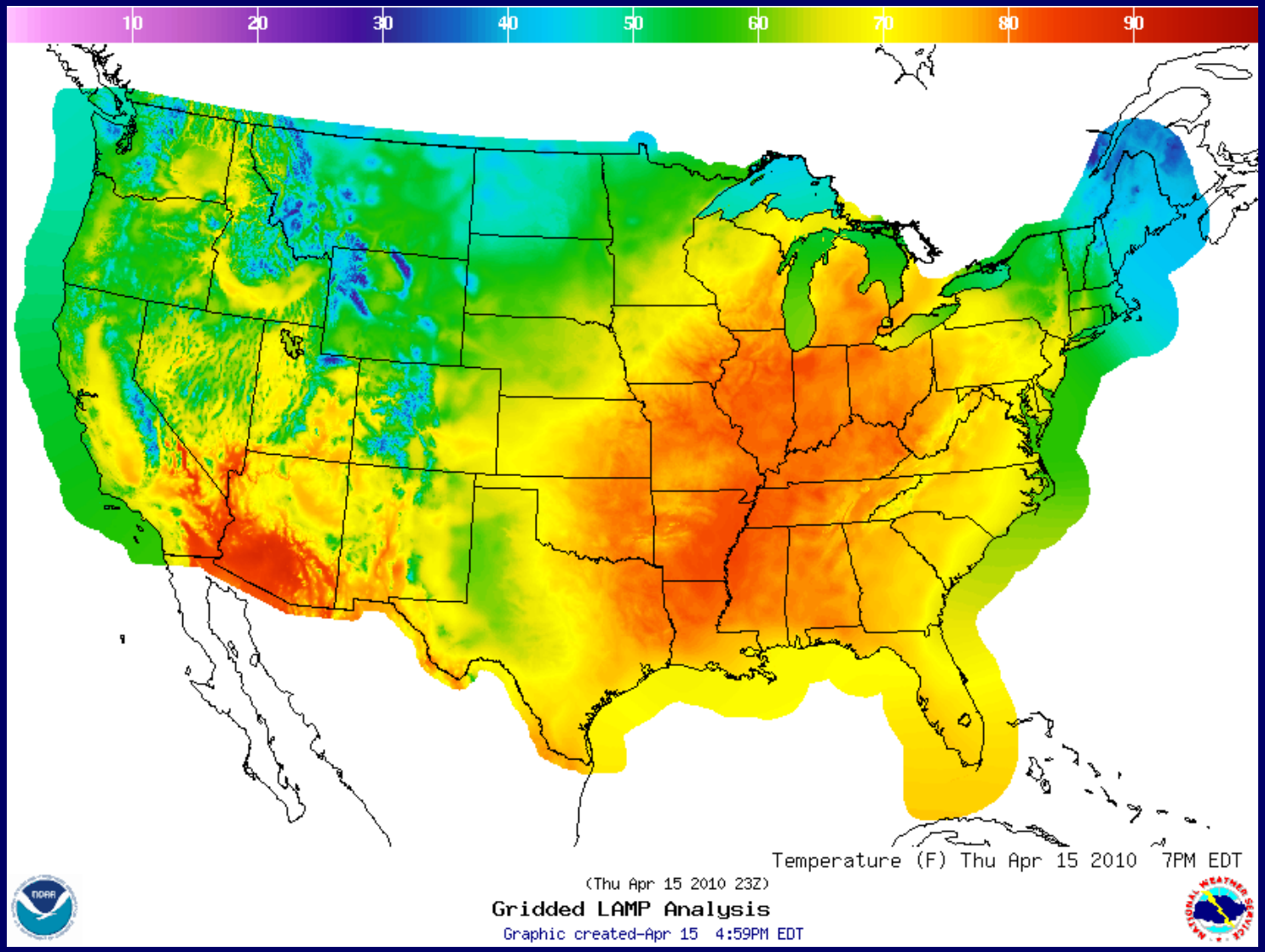
- Gridded LAMP **forecasts** of:
  - Temperature and Dewpoint
  - Winds
  - Probabilities of Ceiling Height
  - Ceiling Height (100's of ft)
  - Probabilities of Visibility
  - Visibility (miles)
  - Other elements later
- Projections 1-25 hours
- Status:
  - Temperature and dewpoint running for testing
  - Ceiling and Visibility being developed/tested

Gridded LAMP Work

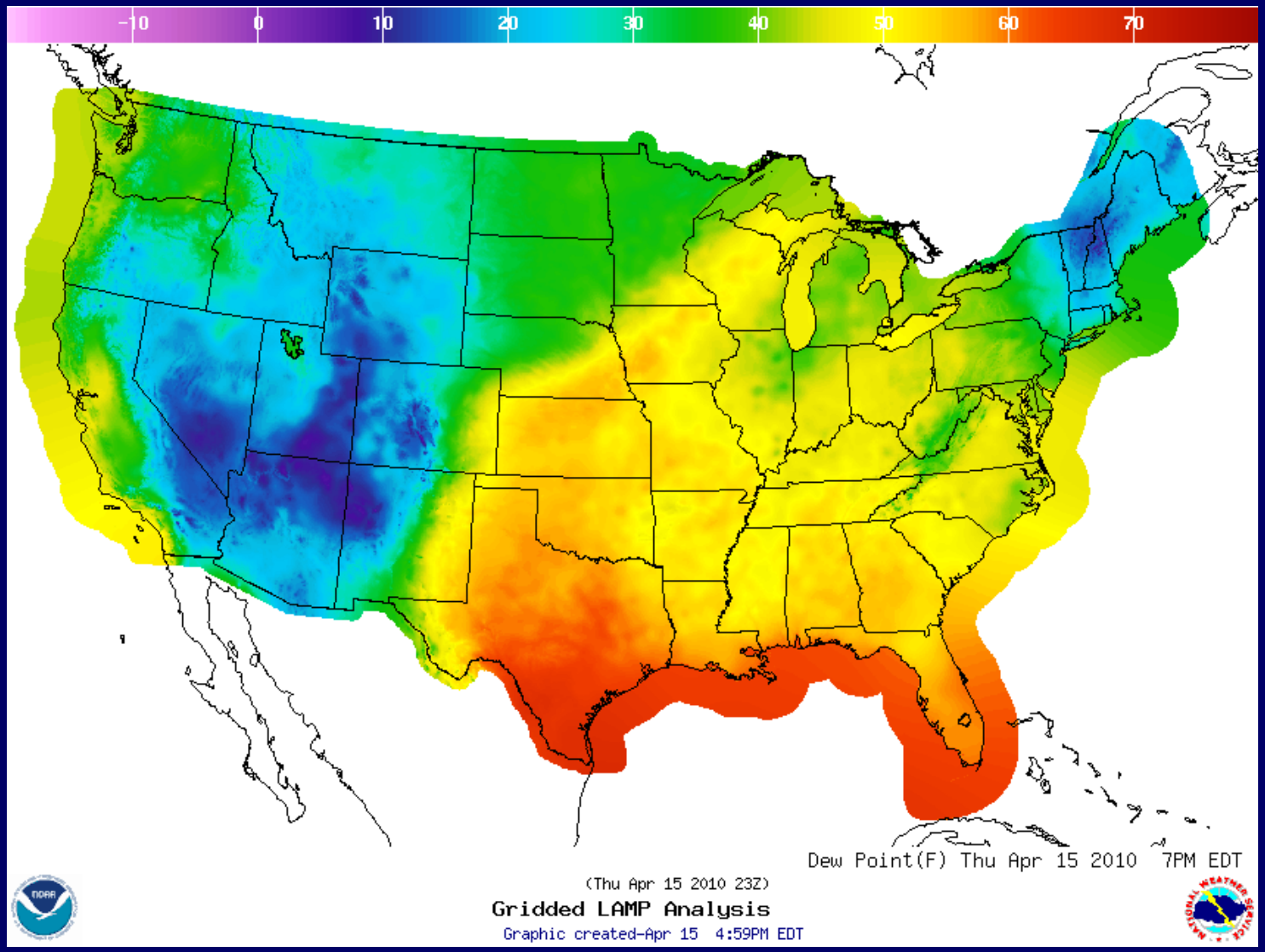
- Analysis of LAMP **forecasts**
  - Temperature, dewpoint, winds: continuous values are analyzed
  - Ceiling Ht and Vis: categorical values are converted to continuous values
    - Input: LAMP station categorical forecasts
    - Process:
      - Scale the categorical forecasts to continuous forecasts using the corresponding probabilities
      - Analyze the resulting continuous values
    - Output: gridded output of continuous values (ceiling height in 100's of feet, visibility in miles) instead of categorical values (1-8, 1-7 respectively)

- Technique: MDL Gridding Technique used in Gridded MOS, with modifications

Temperature GLMP example: 2000 UTC, 3-hr forecast



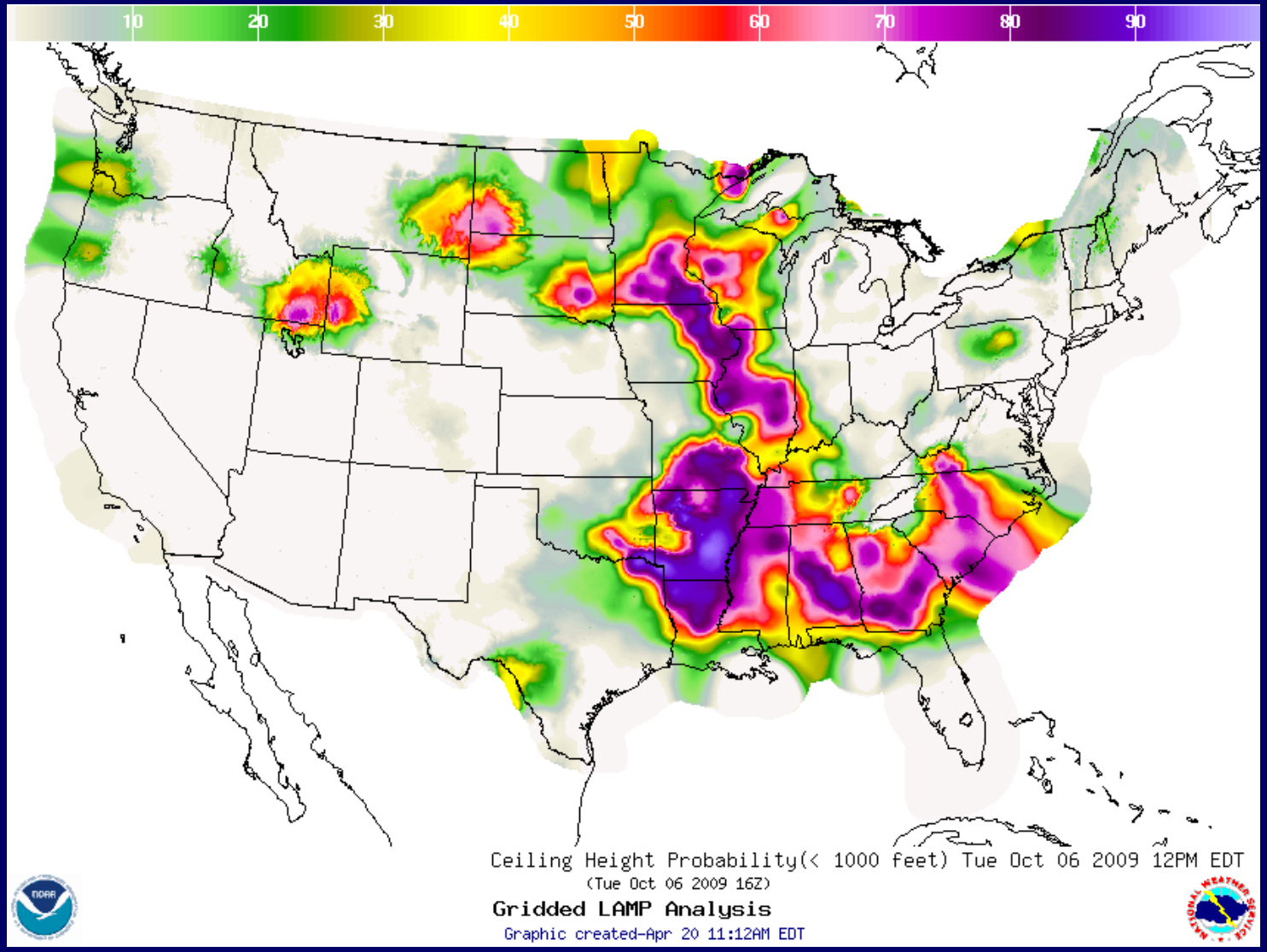
Dewpoint GLMP example: 2000 UTC, 3-hr forecast



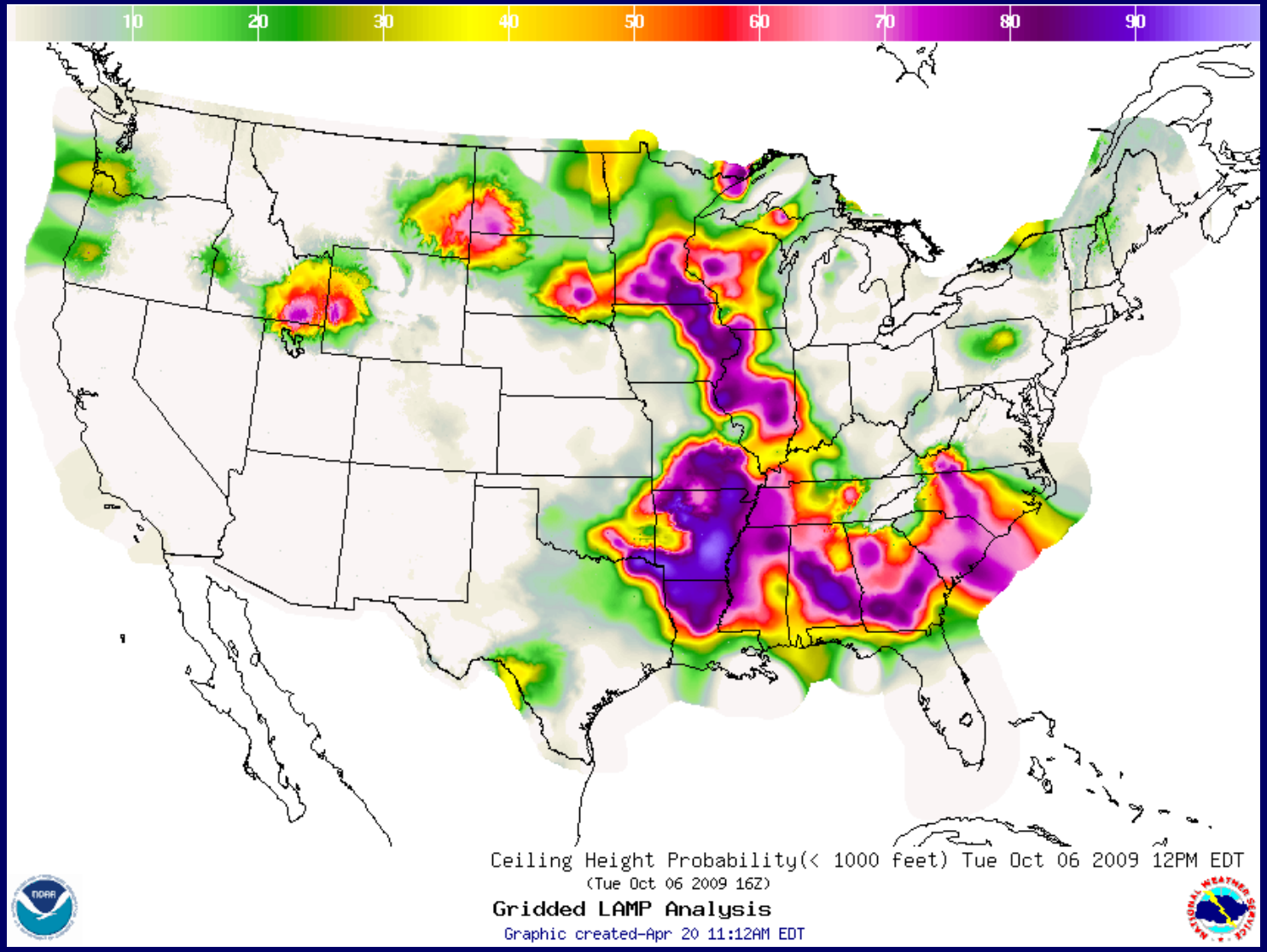
Now, what to do for ceiling height and visibility?

- Ceiling/Vis more discontinuous than temperature and dewpoint
- Ceiling/Vis observations available for METAR stations but not Mesonet stations
- → Far less observations for ceiling height/visibility compared to temperature & dewpoint
→ Poorer analysis of observations

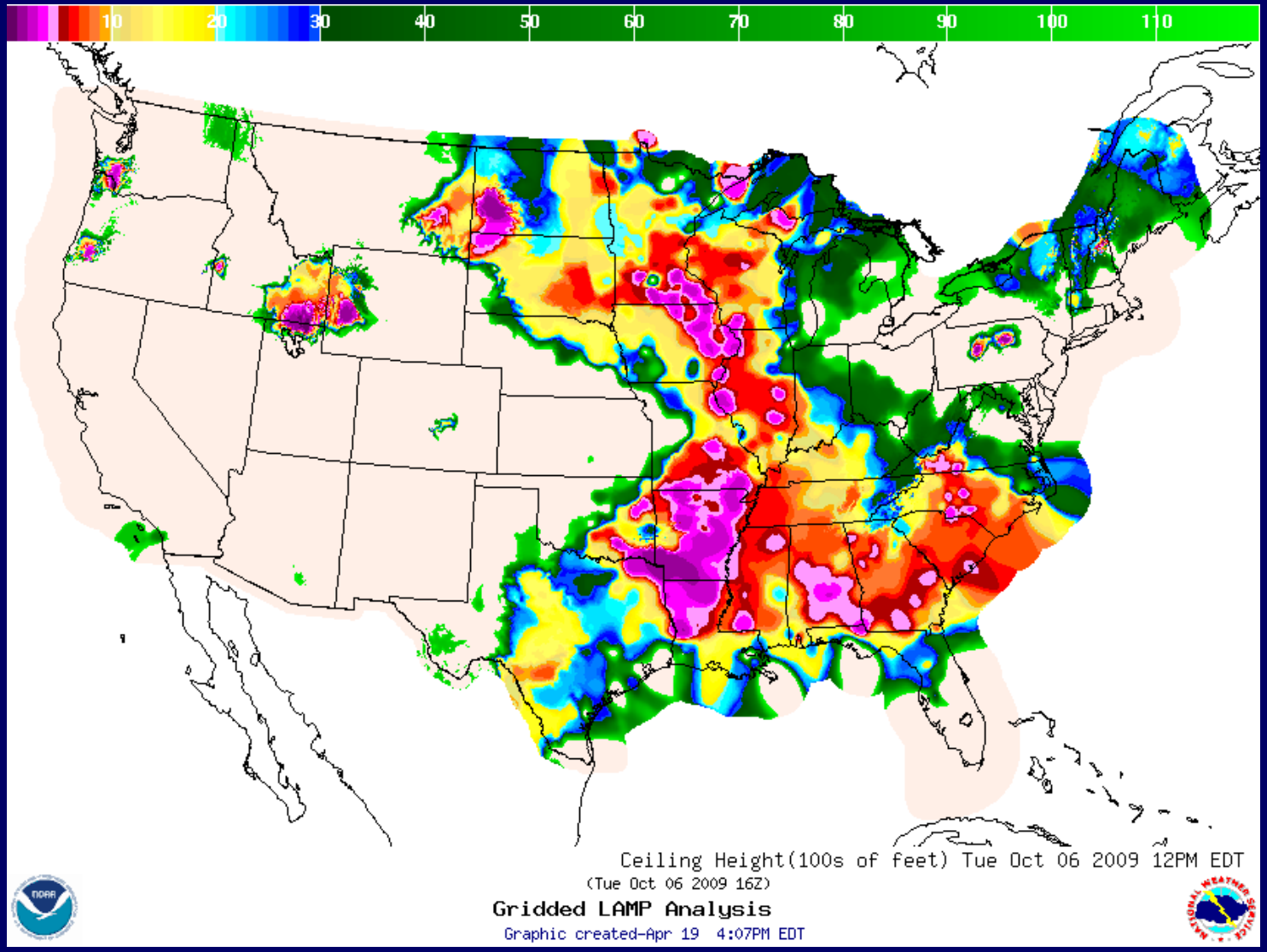
GLMP Ceiling Height Probability < 1000 ft example: 1500 UTC, 1-hr forecast



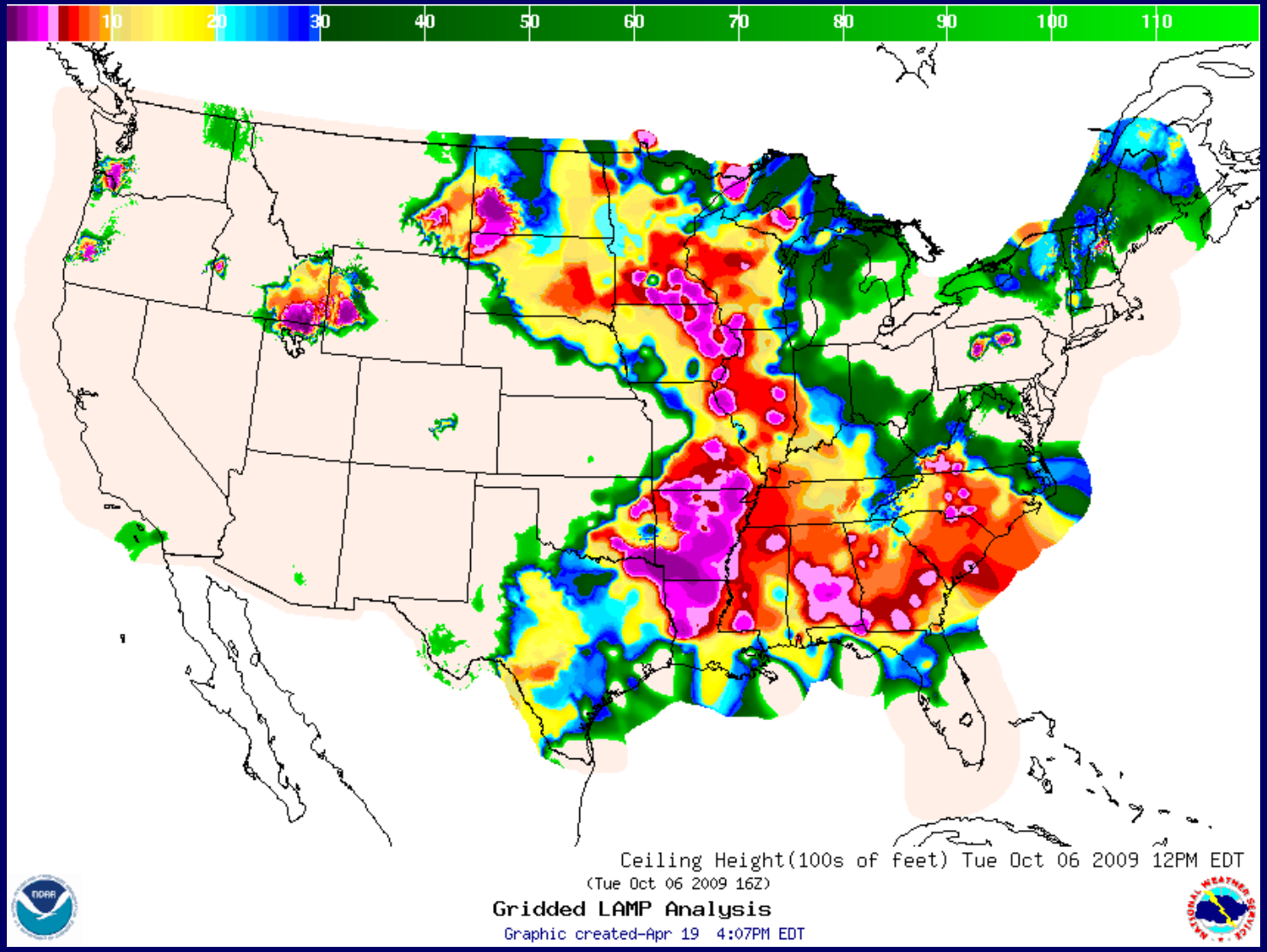
GLMP Ceiling Height Probability < 1000 ft example: 1500 UTC, 1-25 hr forecasts



GLMP Ceiling Height Forecast (100's of ft) example: 1500 UTC, 1-hr forecast

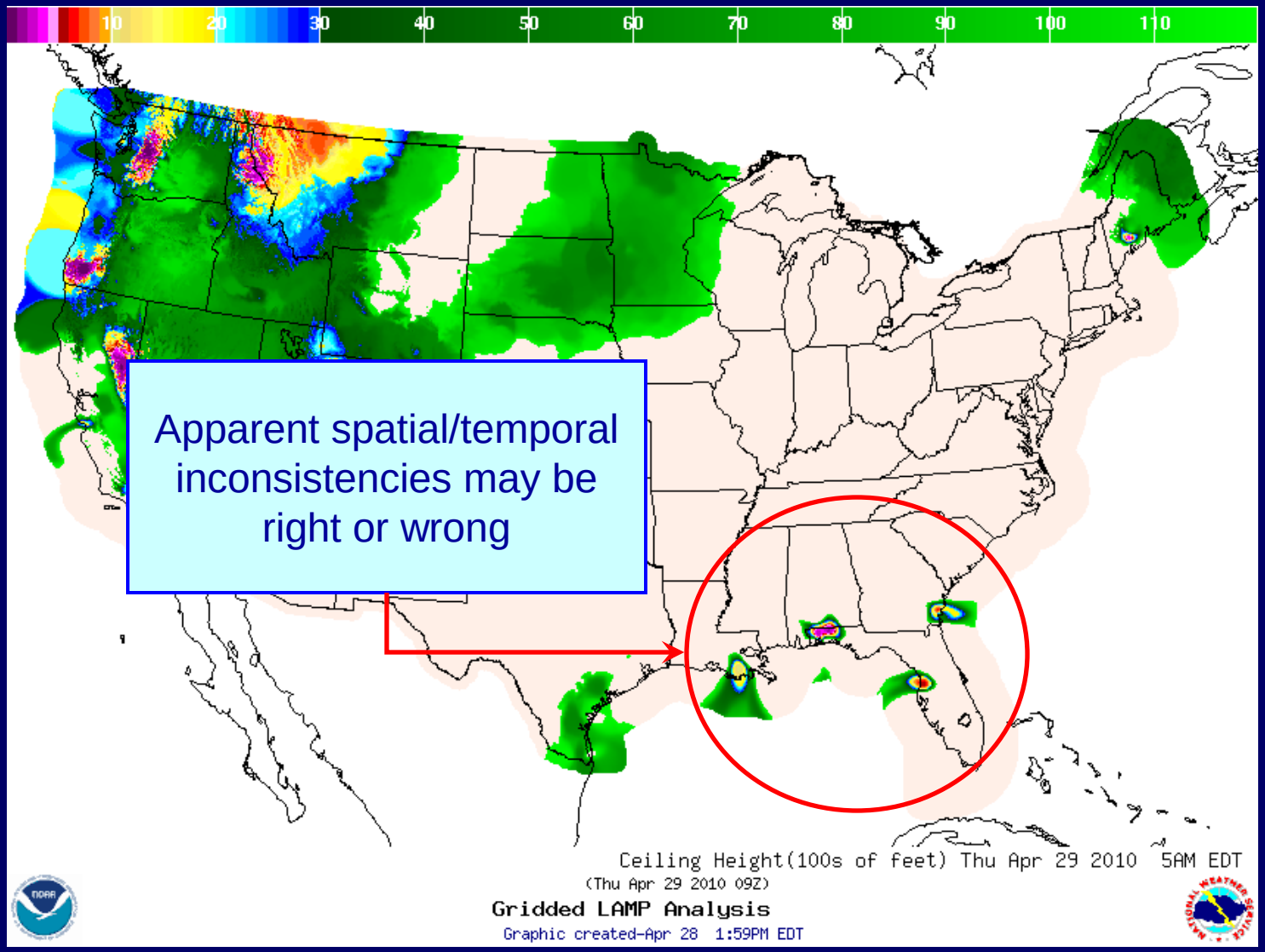


GLMP Ceiling Height Forecast (100's of ft) example: 1500 UTC, 1-25 hr forecasts

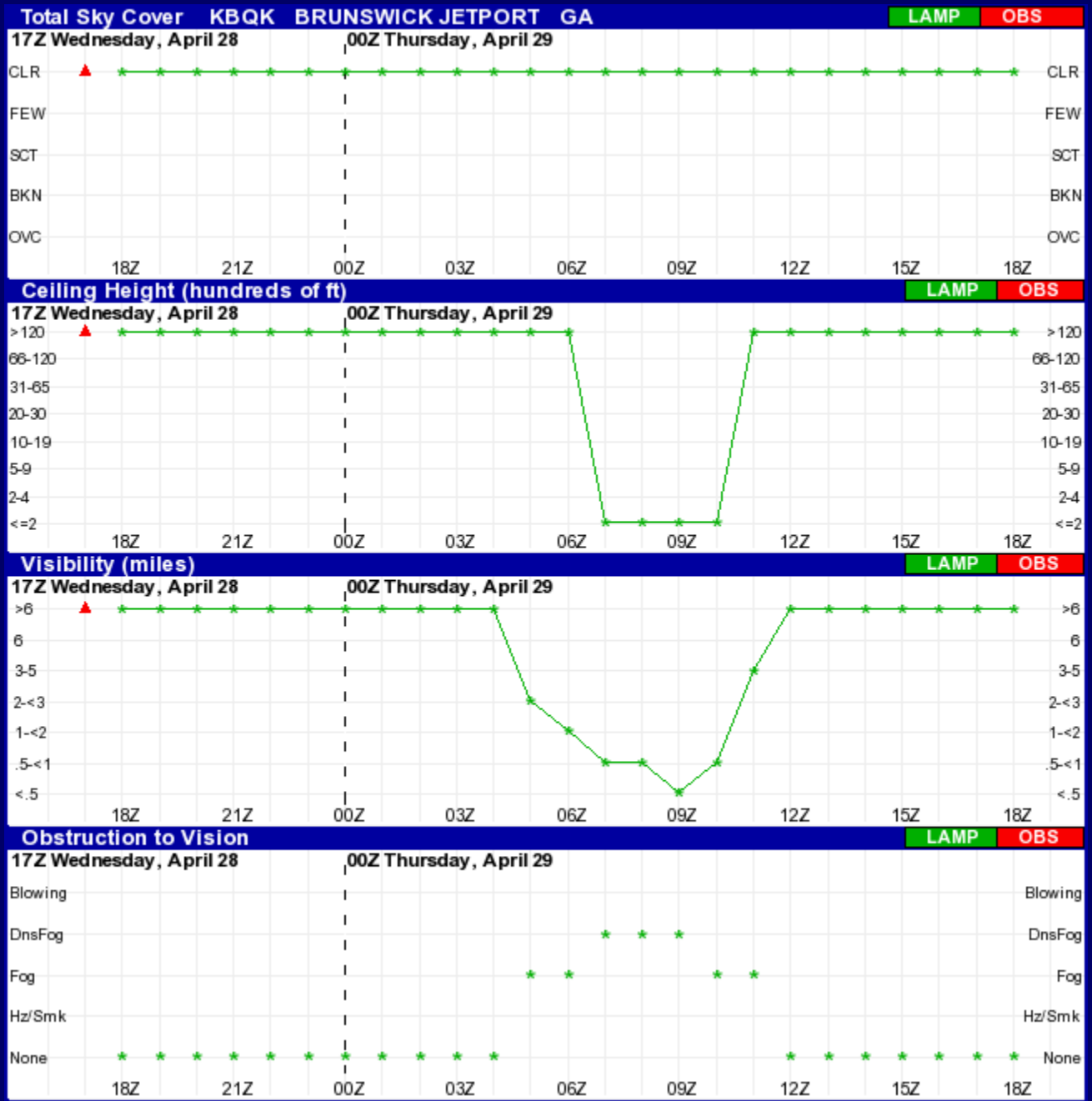


Consistency issues

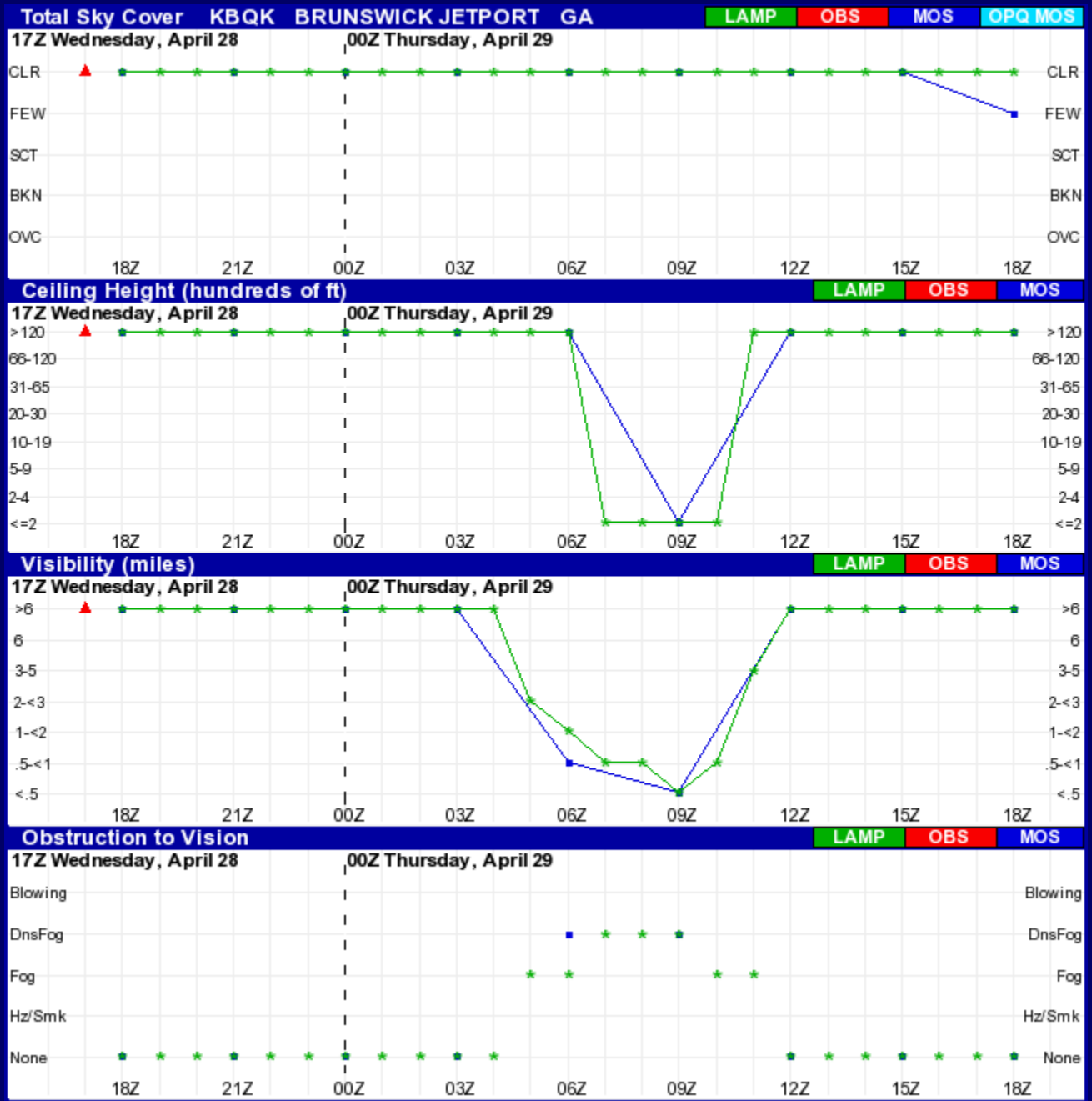
Spatial/Temporal Consistency Issues



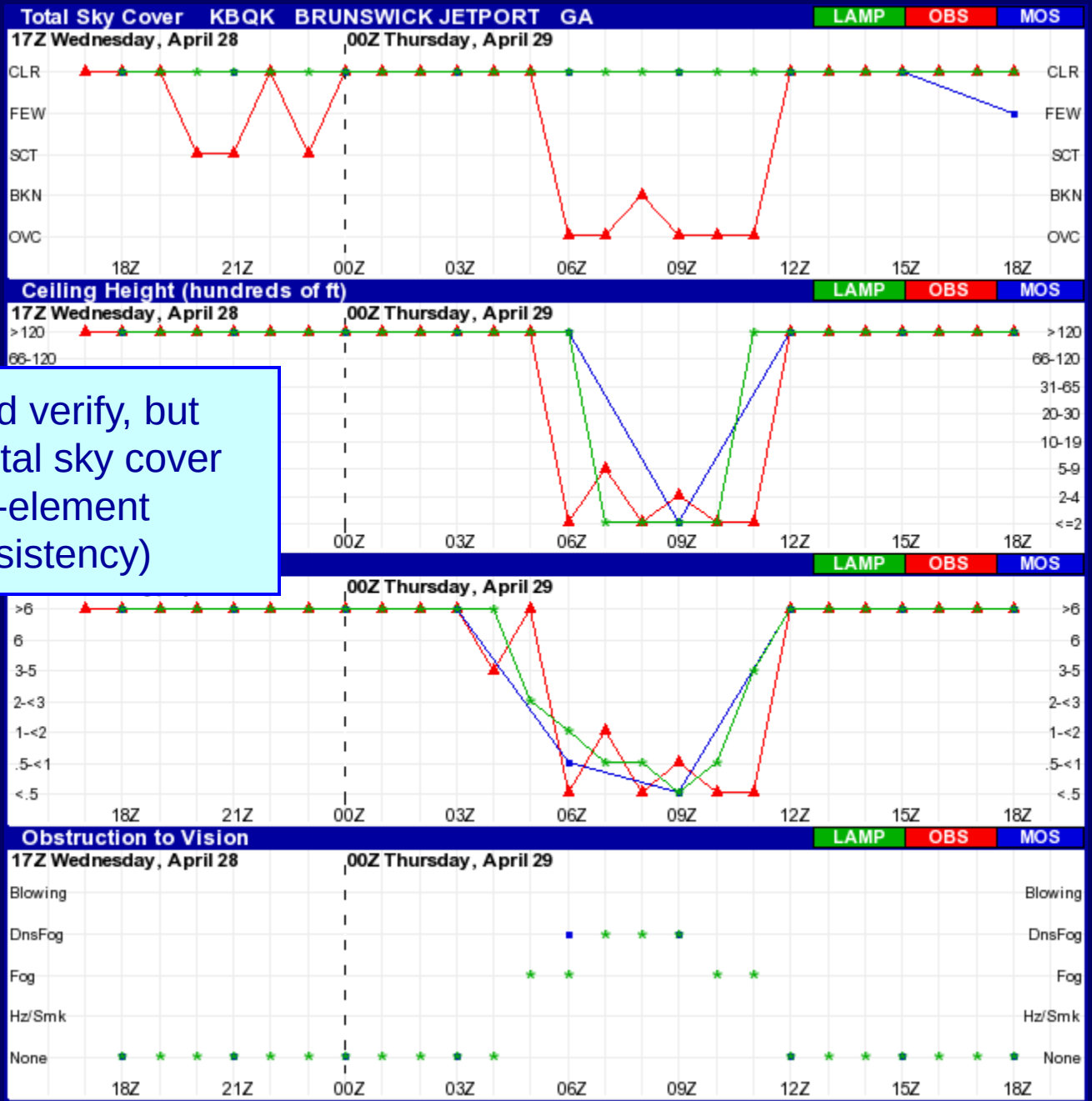
Inter-element consistency: Brunswick Jetport, GA: LAMP



Inter-element consistency: Brunswick Jetport, GA: LAMP and MOS

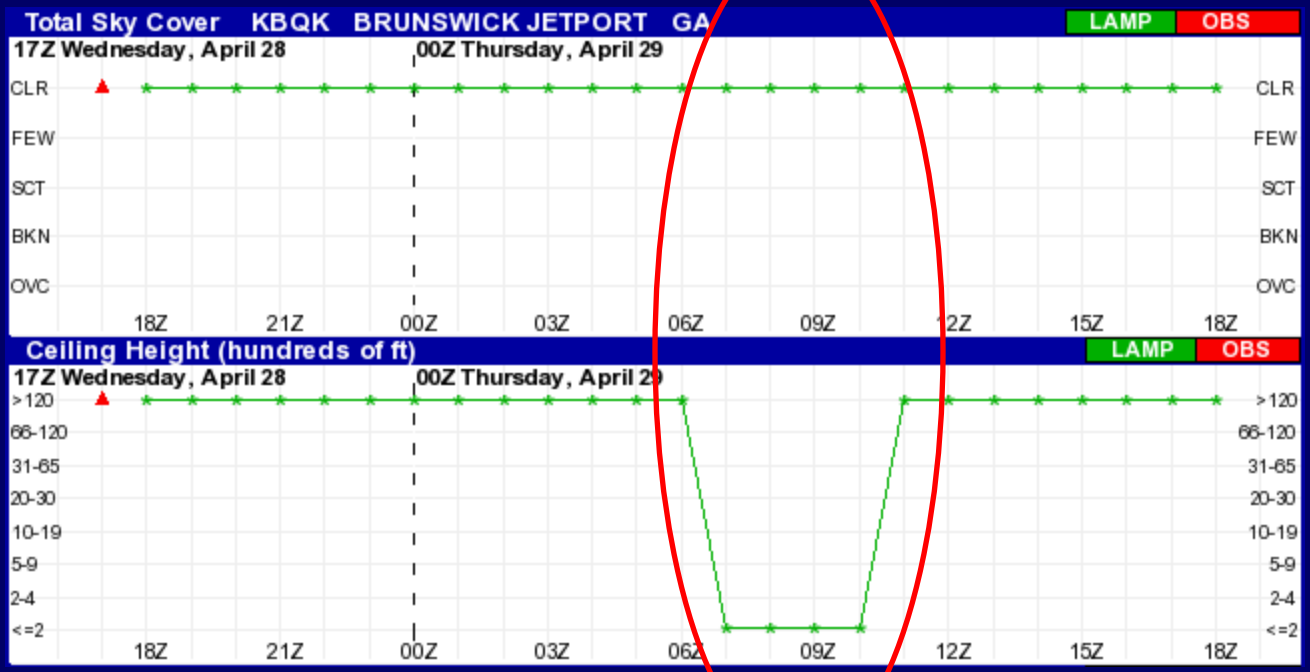


Inter-element consistency: Brunswick Jetport, GA: LAMP and MOS and Observations



Event did verify, but missed total sky cover (Inter-element inconsistency)

Summary of Inter-element Consistency Issue



Some inter-element inconsistencies are known to be wrong

MDL can use the probabilities to determine which element is more likely to be correct, and make the other element consistent

Future Plans

Future Plans

- Add 119 stations to match the stations which were added to GFS MOS 03/2010
- Redevelop LAMP station guidance of ceiling height and opaque sky cover
- GLMP Work:
  - Minimize inconsistencies
  - Verify grids
- GLMP Plans: GLMP available in experimental NDGD:
  - GRIB2 format
  - Temperature and dewpoint: Summer 2010
  - Ceiling height and visibility: Fall 2010
- Convective cloud tops
- New thunderstorm product

Questions?

- LAMP Website:
  - http://www.nws.noaa.gov/mdl/gfslamp/gfslamp.shtml
- LAMP Mailing List for notification/announcements:
  - http://www.nws.noaa.gov/mdl/lamp/joinlist.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