Accessing and Using GFS LAMP Products

National Weather Service
Meteorological Development Laboratory
Mesoscale Prediction Branch

Scott D. Scallion, March 2008

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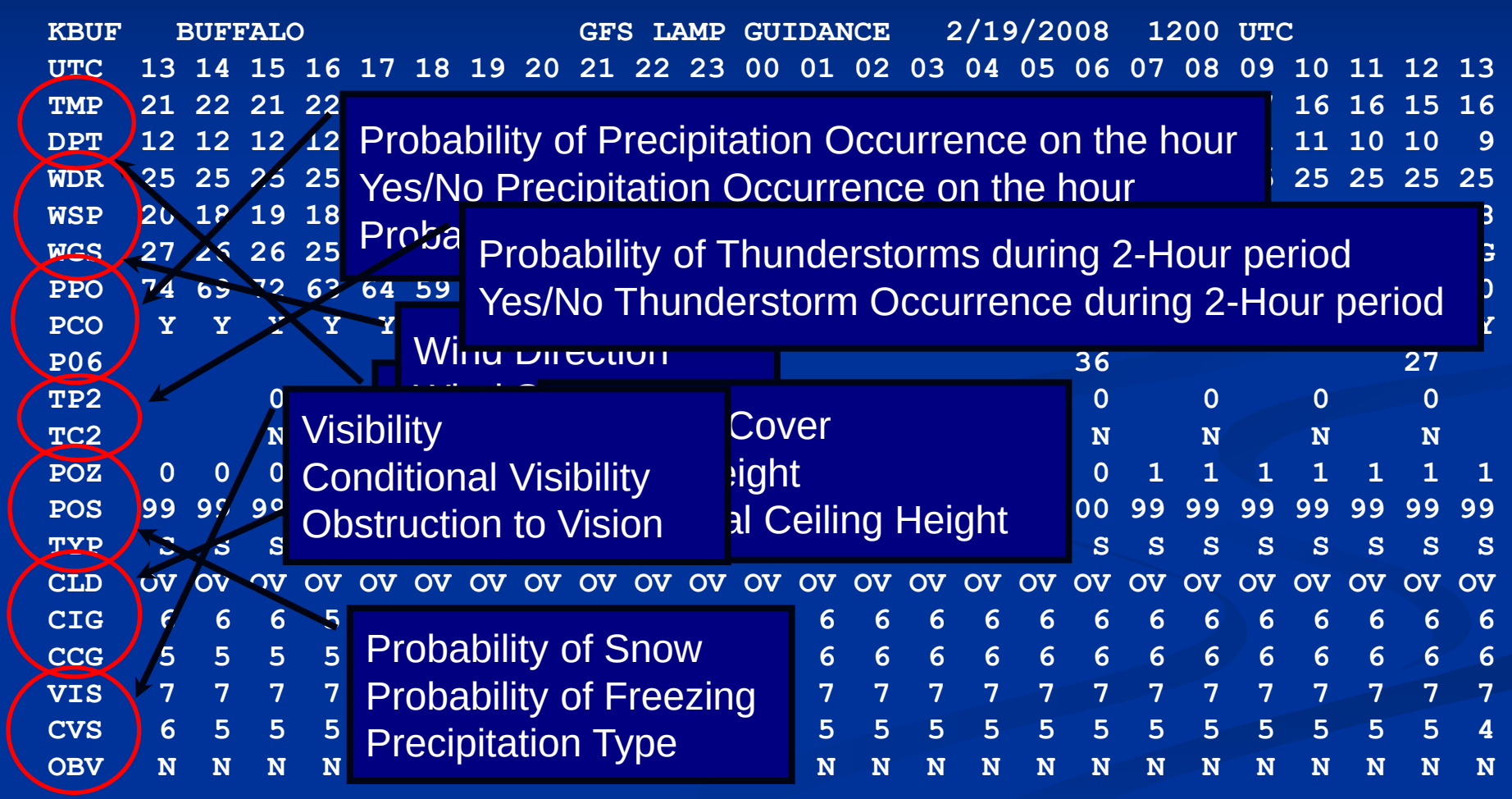
GFS LAMP Background

- The *Localized Aviation MOS Program* (LAMP) is a system of objective analyses, simple models, regression equations, and related thresholds which together provide guidance for sensible weather forecasts.
- LAMP provides hourly updates to GFS MOS by bridging the gap between the observations and the MOS forecast.
- LAMP provides probabilistic and non-probabilistic guidance for 17 weather elements.
- LAMP guidance focuses on aviation weather elements.

GFS LAMP Guidance Details

- LAMP guidance is in the range of 1- 25 hours in 1 hour projections
- LAMP provides station-oriented guidance for:
  - All 17 LAMP forecast elements
  - ~1600 stations
  - CONUS, Alaska, Hawaii, Puerto Rico
- LAMP provides gridded-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
- Eventually will run 24 times a day (every hour)
- Visit the website to check the latest availability of LAMP cycles:
  http://www.nws.noaa.gov/mdl/lamp/index.shtml

Example of a GFS LAMP Text Bulletin



GFS LAMP Weather Element Types

KBUF	BUFFALO						GFS LAMP GUIDANCE						2/19/2008				1200 UTC							
UTC	13	14	15	16	17	18	19	20	21	22	23	00	01	02	03	04	05	06	07	08	09	10	11	12	13
TMP	21	22	21	22	22	22	22	22	22	22	21	21	20	20	20	20	20	19	19	18	17	16	16	15	16
DPT	12	12	12	12	12	12	12	13	12	12	12	12	13	13	13	13	13	12	12	11	11	11	10	10	9
WDR	25	25	25	25	25	25	24	24	24	25	25	25	25	25	25	25	24	24	25	25	25	25	25	25	25
WSP	20	18	19	18	19	18	19	19	20	19	18	17	15	13	12	12	11	10	09	09	09	08	08	08	08
WGS	27	26	26	25	26	26	26	27	27	26	25	24	21	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG
PPO	74	69	72	63	64	59	68	74	74	67	60	55	50	51	48	49	49	49	48	47	46	48	48	48	50
PCO	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
P06						40						35						36						27	
TP2			0	0	0	0	0	0		0		0		0		0		0		0		0		0	
TC2			N	N	N	N	N	N		N		N		N		N		N		N		N		N	
POZ	0	0	0	0	0	0	0	0	0	1	1	0	0	1	0	0	0	0	1	1	1	1	1	1	1
POS	99	99	99	100	100	100	100	100	100	100	100	100	100	99	100	100	100	100	99	99	99	99	99	99	99
TYP	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
CLD	OV	OV	OV	OV	OV	OV	OV	OV	OV	OV	OV	OV	OV	OV	OV	OV	OV	OV	OV	OV	OV	OV	OV	OV	OV
CIG	6	6	6	5	5	5	5	5	5	5	5	6	6	6	6	6	6	6	6	6	6	6	6	6	6
CCG	5	5	5	5	5	4	4	4	4	4	5	6	6	6	6	6	6	6	6	6	6	6	6	6	6
VIS	7	7	7	7	7	7	6	5	5	6	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
CVS	6	5	5	5	5	5	5	5	3	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	4
OBV	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N

13 -- Continuous Elements

Overview of Available Products

- Sent out on SBN/NOAAPort and NWS FTP Server
  - ASCII text bulletin
  - BUFR data
  - GRIB2 thunderstorm data
- AWIPS
  - Displayable in D2D
    - Local menu
    - Volume Browser
  - Guidance available for display and Terminal Aerodrome Forecast (TAF) preparation via the Aviation Forecast Preparation System (AvnFPS)
- GFS LAMP Website

  http://www.nws.noaa.gov/mdl/gfslamp/gfslamp.shtml

Retrieving Data From NWS Server

1) ftp to *tgftp.nws.noaa.gov*

2) username is *anonymous*

3) Supply email address for the password
   - For text data, set type to ascii
   - For BUFR and GRIB2, set type to binary

4) Data and locations (HH= cycle hour):
   - ASCII Text Bulletin
     - SL.us008001/DF.anf/DC.lampgfs/cy.HH.txt
   - BUFR Data
     - SL.us008001/DF.bf/DC.lampgfs/cy.HH.bin
   - GRIB2 Thunderstorm Probabilities
     - SL.us008001/ST.opnl/DF.gr2/DC.ndgd/GT.lampgfs/AR.conus/ds.pts02.bin
   - GRIB2 Thunderstorm Occurrence (Yes/No)
     - SL.us008001/ST.opnl/DF.gr2/DC.ndgd/GT.lampgfs/AR.conus/ds.ots02.bin

GFS LAMP BUFR Data

- Includes all text bulletin weather elements
- Also contains additional LAMP forecast data types and elements not in the text bulletin
  - Ex: complete suite of probabilities, POP12, precipitation characteristics
- Stored in netcdf in AWIPS
- For more information, visit the LAMP BUFR Guidance page:

http://www.nws.noaa.gov/mdl/gfslamp/docs/BufrLAMPintro05.shtml

GFS LAMP GRIB2 Data

- Includes gridded thunderstorm guidance for probabilistic (%) and categorical (Yes/No) forecasts
- Thunderstorm guidance is provided on the 5-km NDFD grid
- Each thunderstorm product has its unique WMO heading
- For more information, visit the LAMP GRIB2 Encoding Details Website:

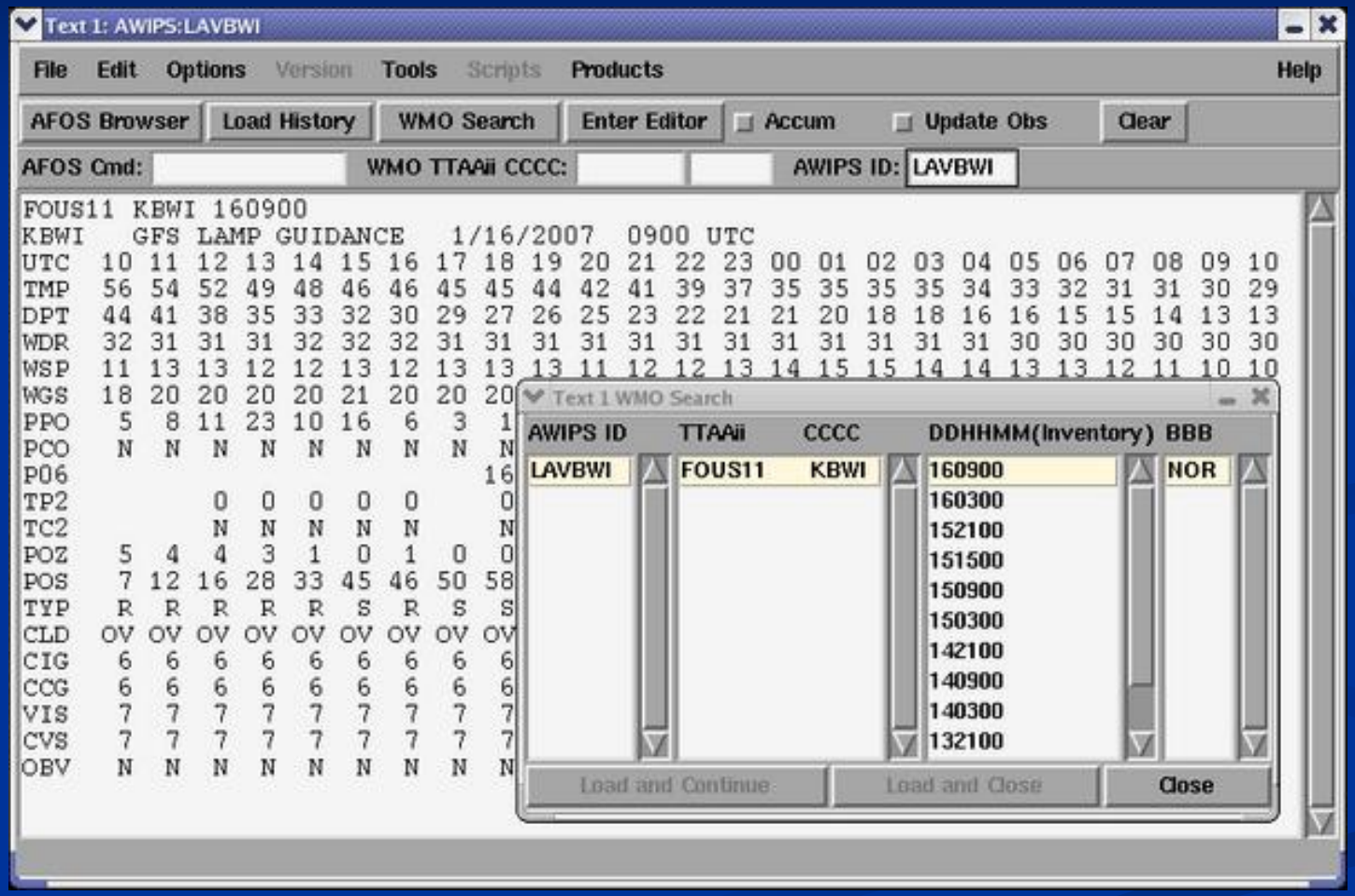
http://www.nws.noaa.gov/mdl/gfslamp/docs/lampgrib2.shtml

GFS LAMP IN AWIPS D2D

To view the step-by-step processes for accessing these products, consult the GFS LAMP jobsheets at:

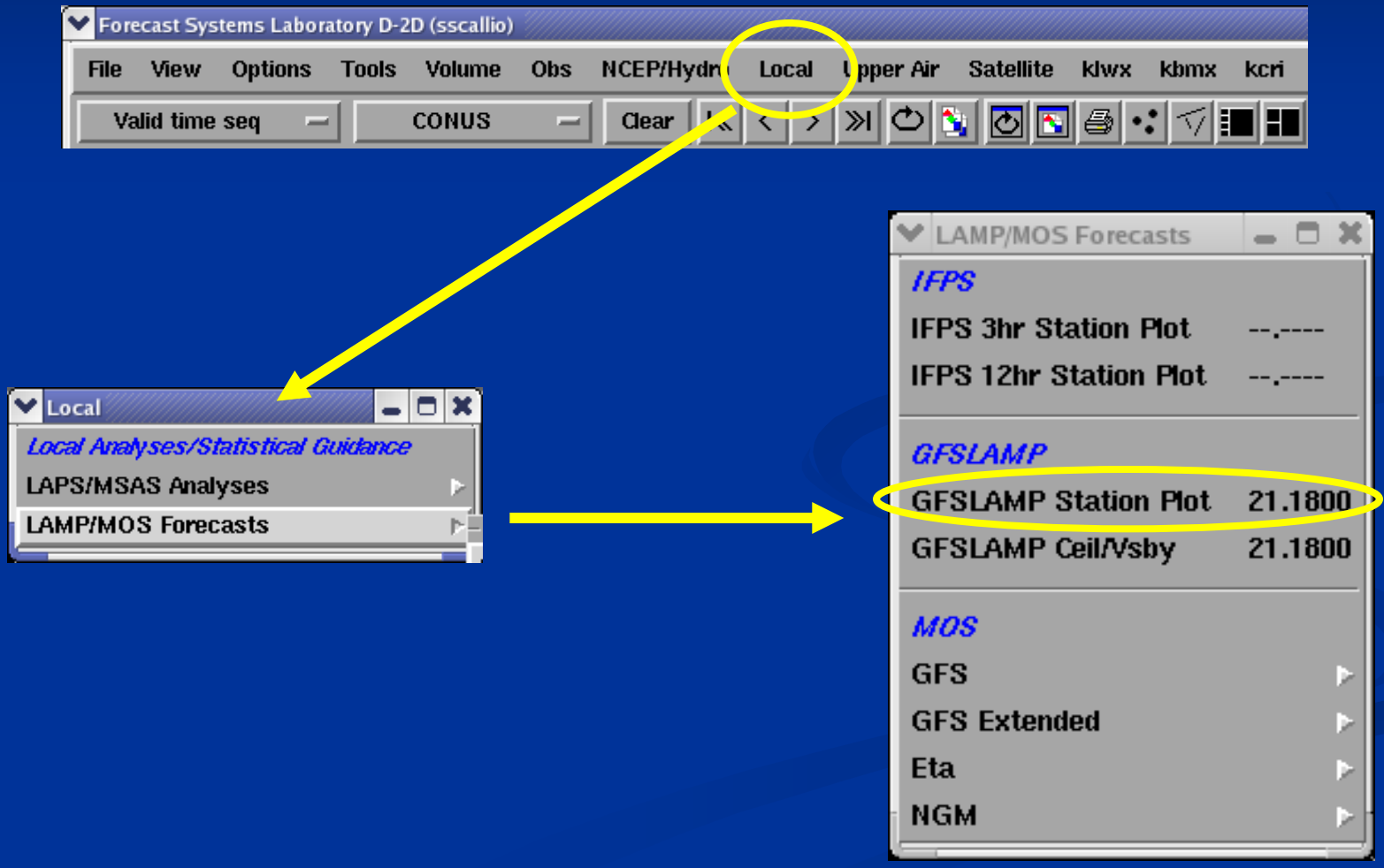
http://www.nws.noaa.gov/mdl/gfslamp/docs/jobsheets.shtml

Text Bulletin in D2D

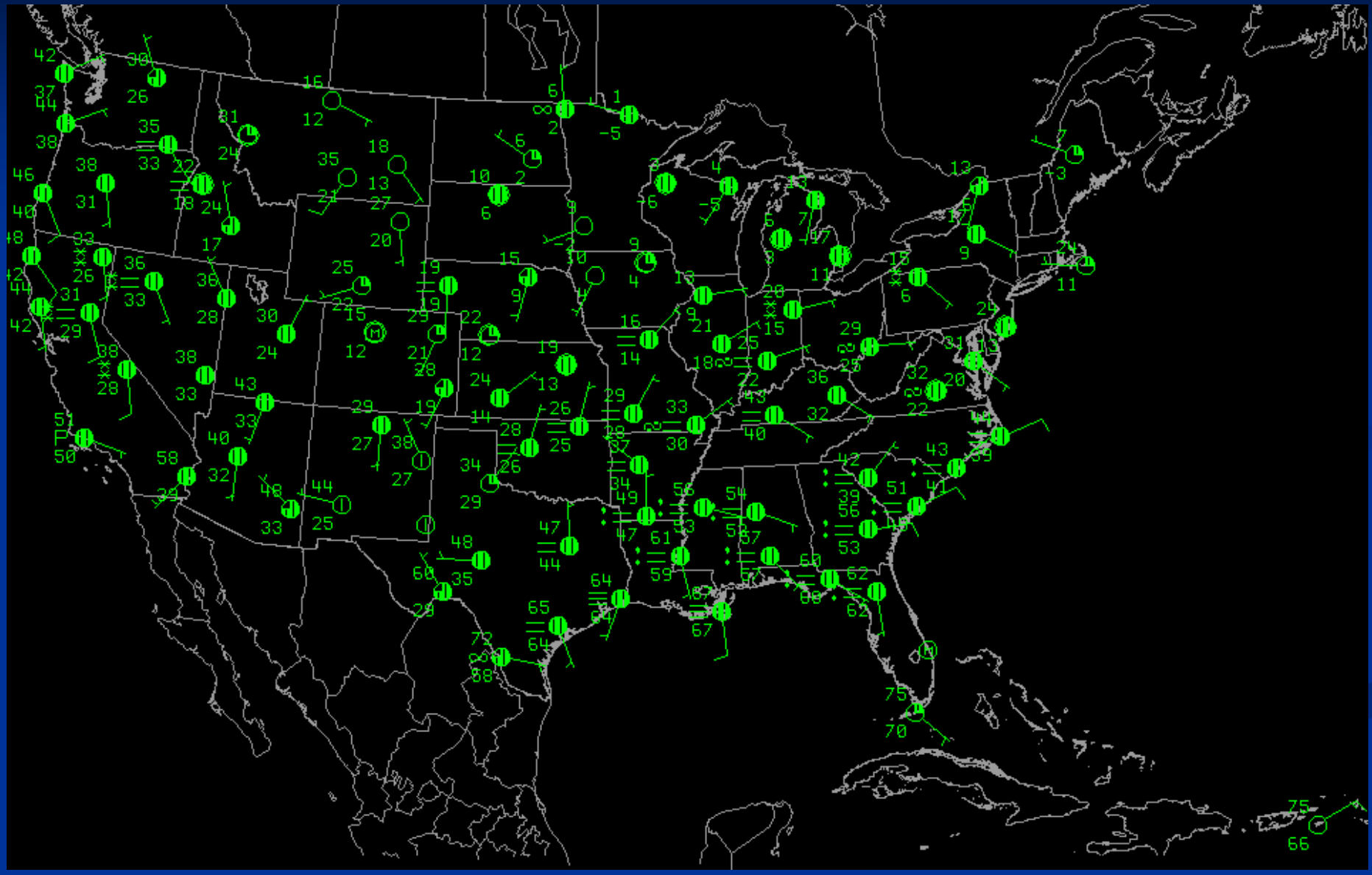


*Use AWIPS PIL - *LAV*

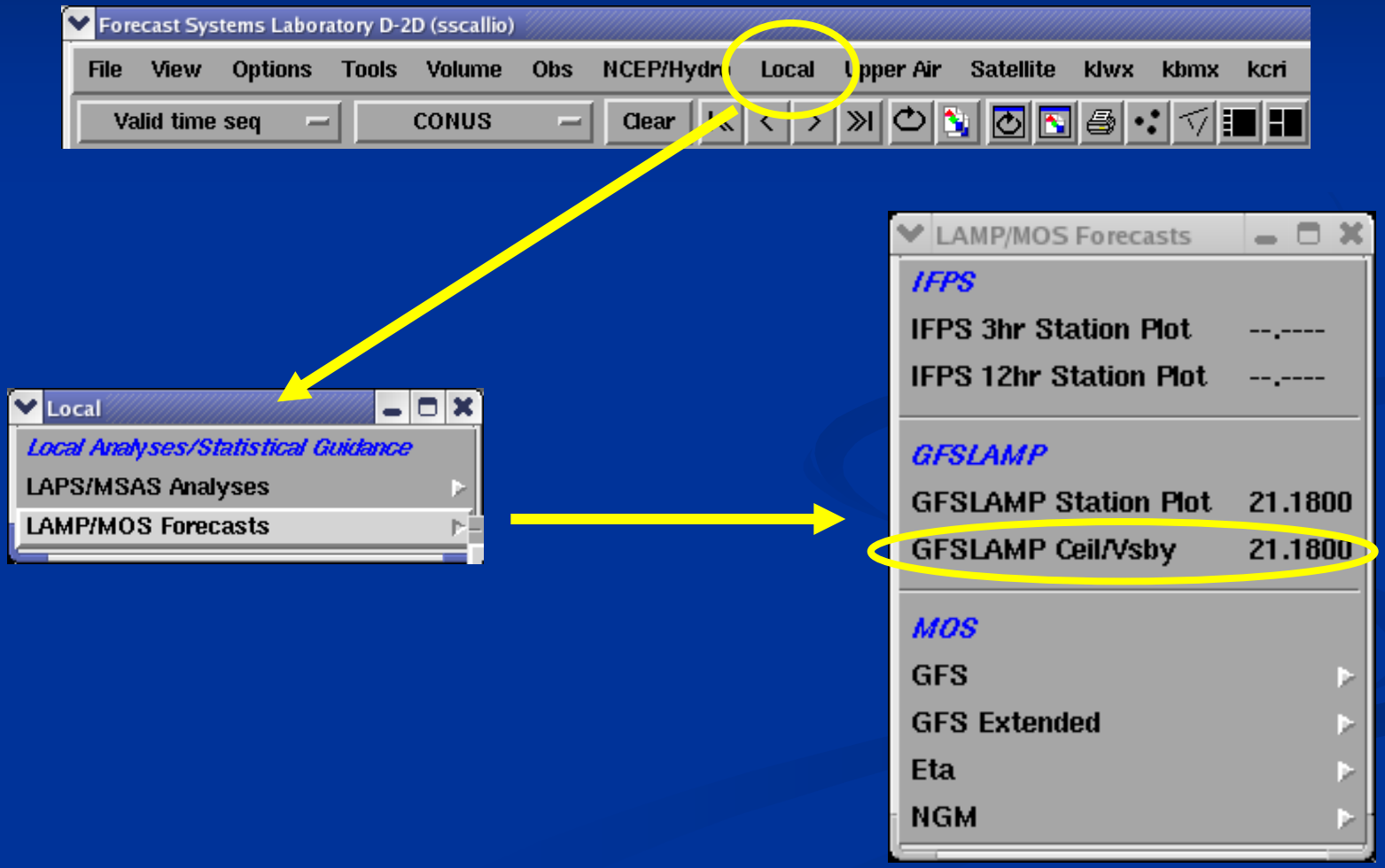
Station Plots Under the Local Menu



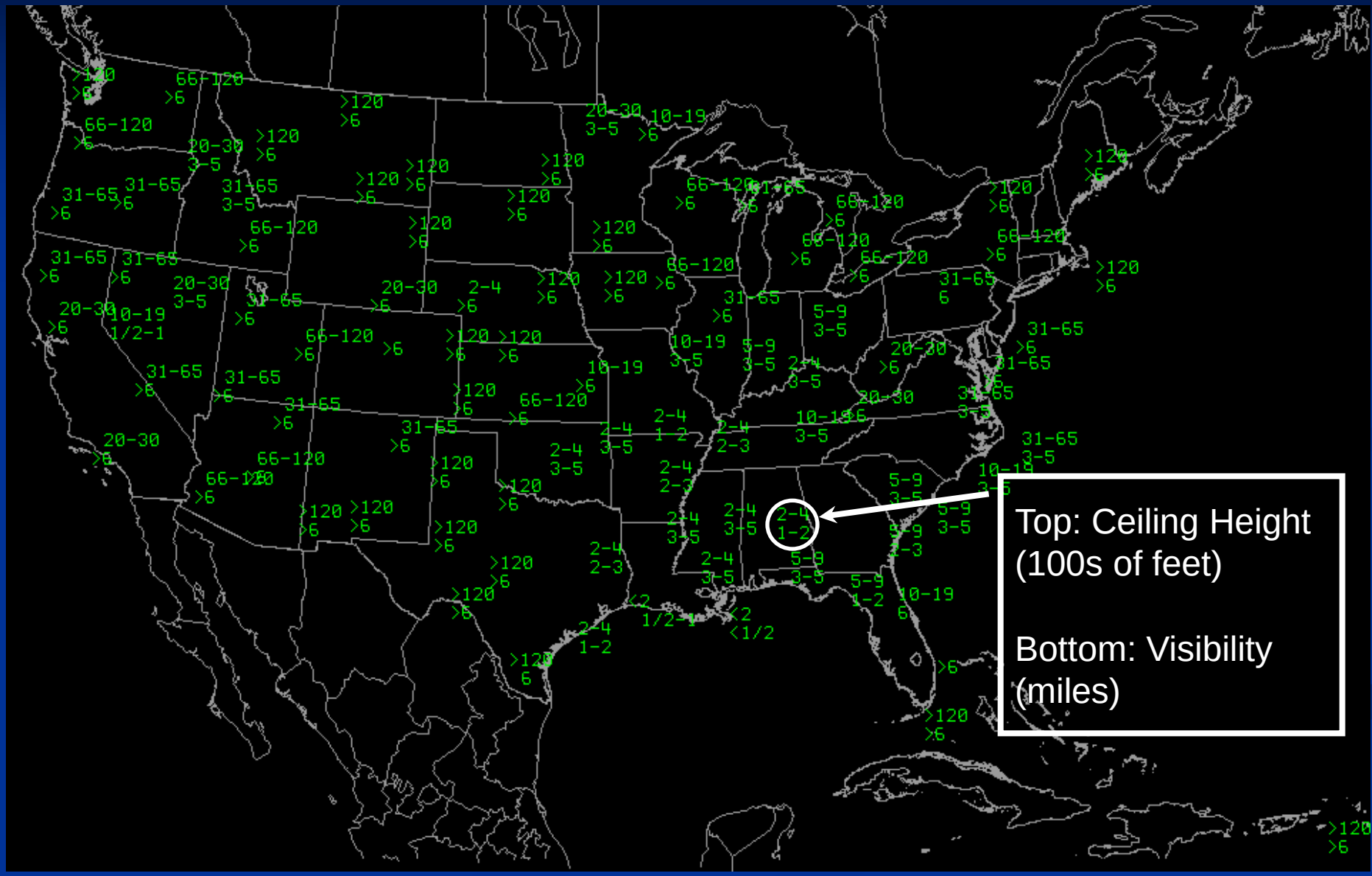
GFS LAMP Station Plots



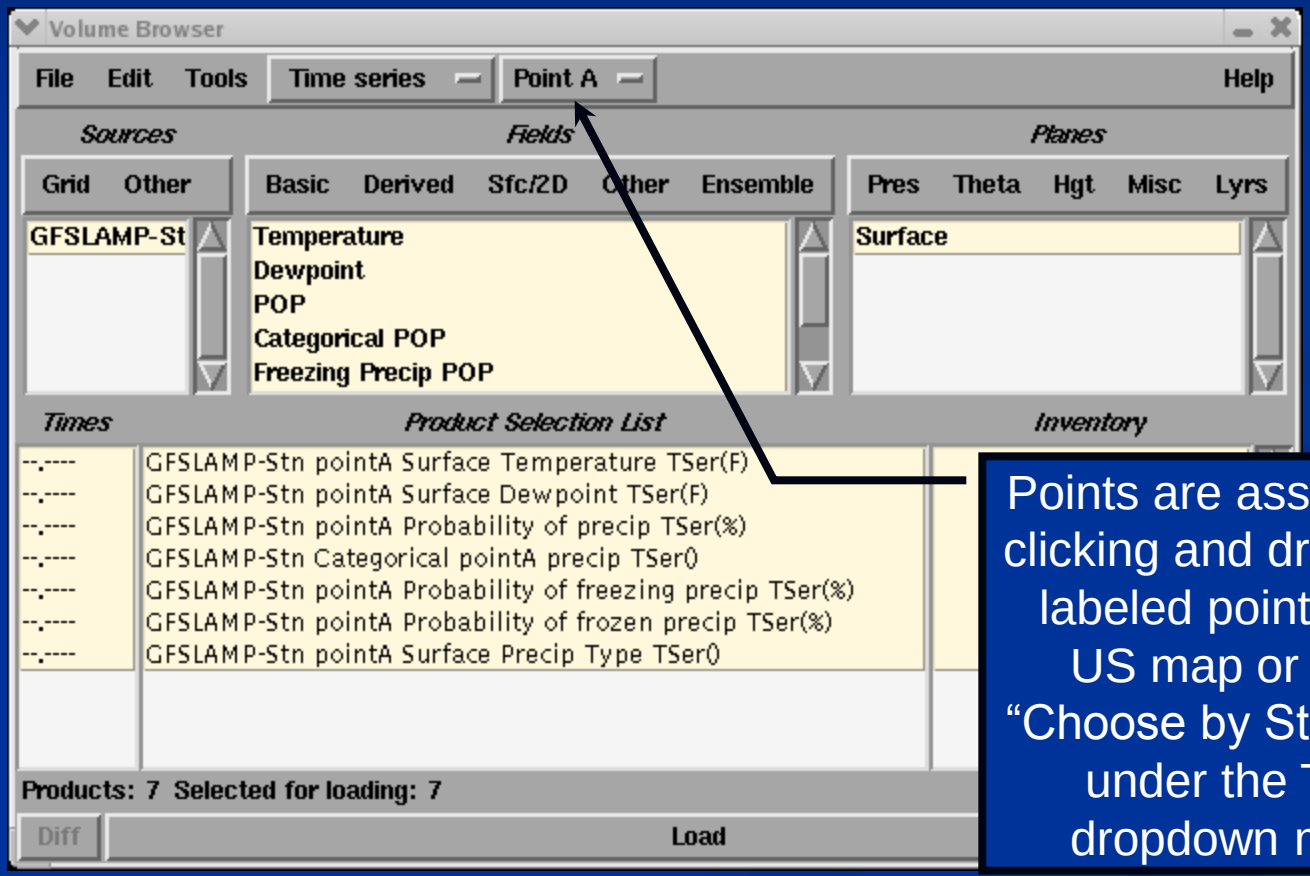
Ceiling Height/Visibility Plots Under the Local Menu



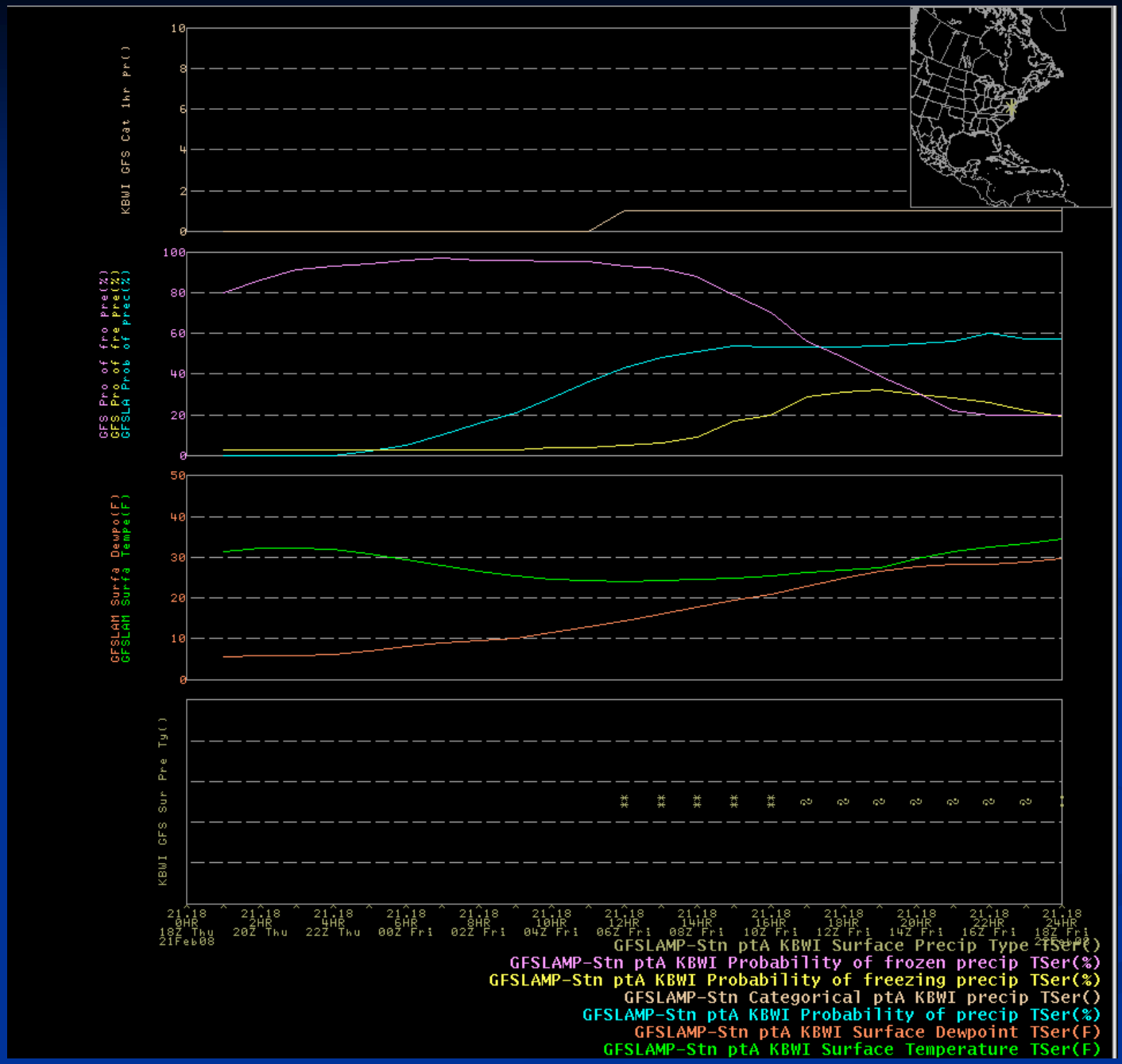
GFS LAMP Ceiling/Visibility Plots



Time Series of LAMP Forecasts in Volume Browser



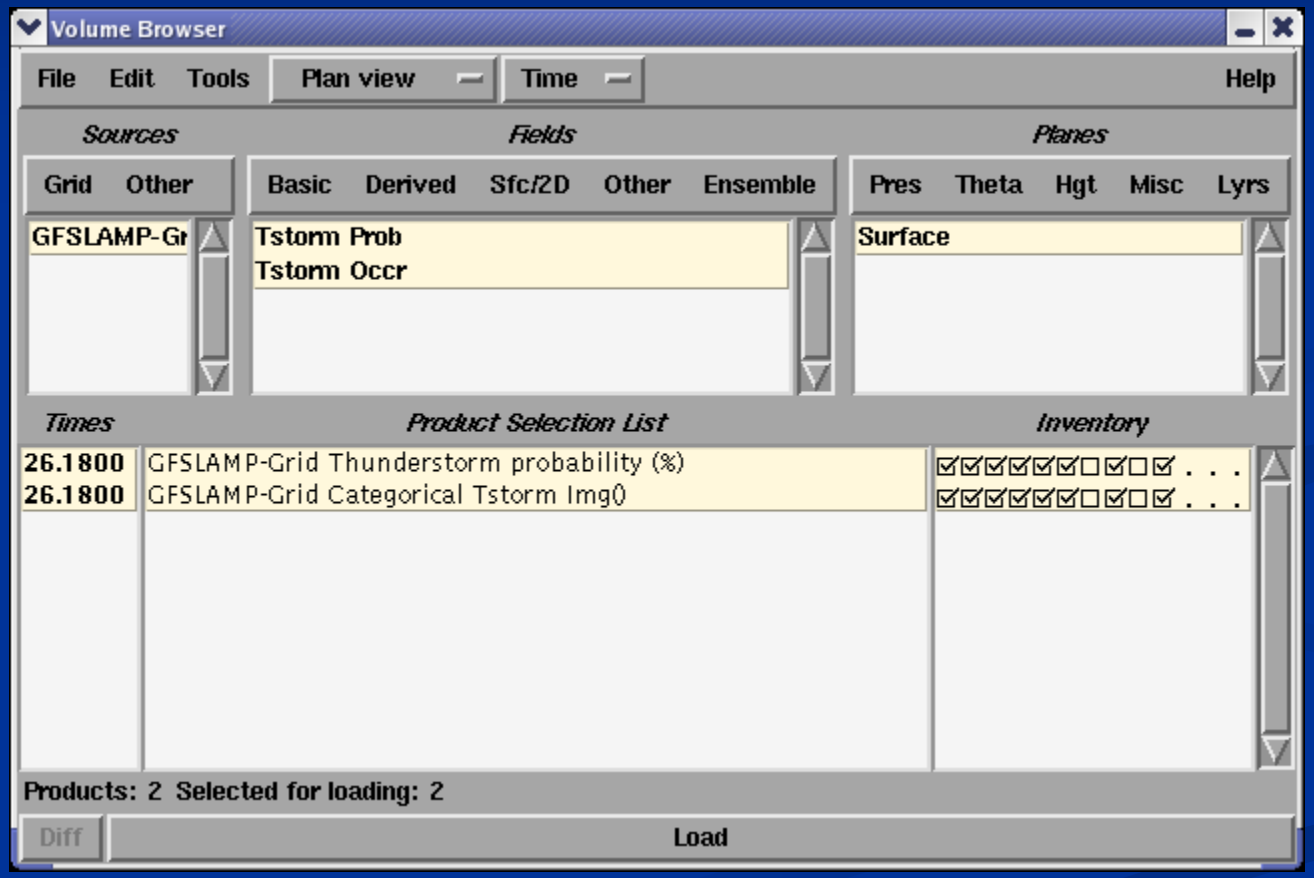
Points are assigned by clicking and dragging a labeled point on the US map or using "Choose by Station ID" under the Tools dropdown menu.



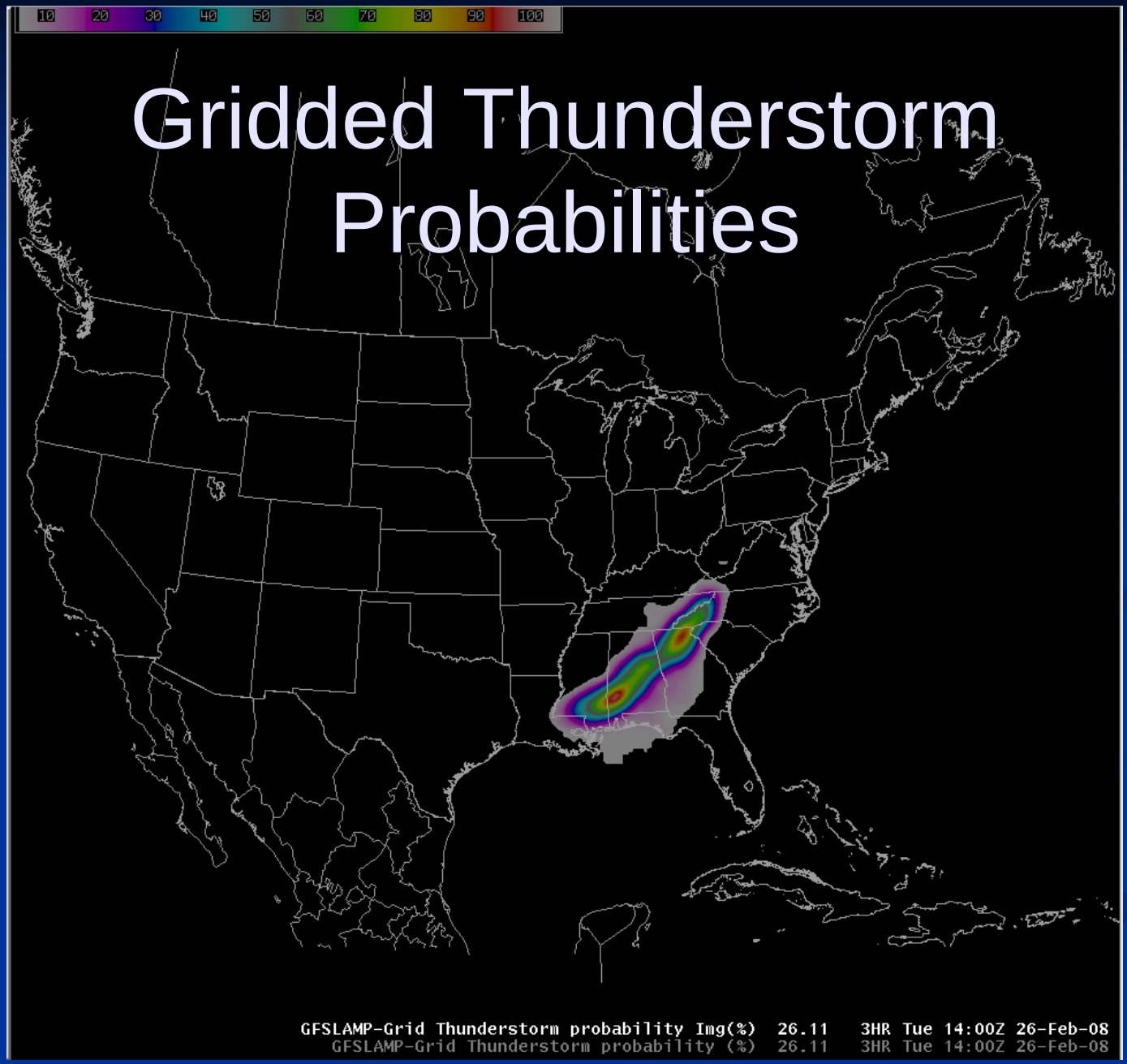
Time-Series Station Plot

The user can also plot the observations to see real-time verification of a LAMP forecast

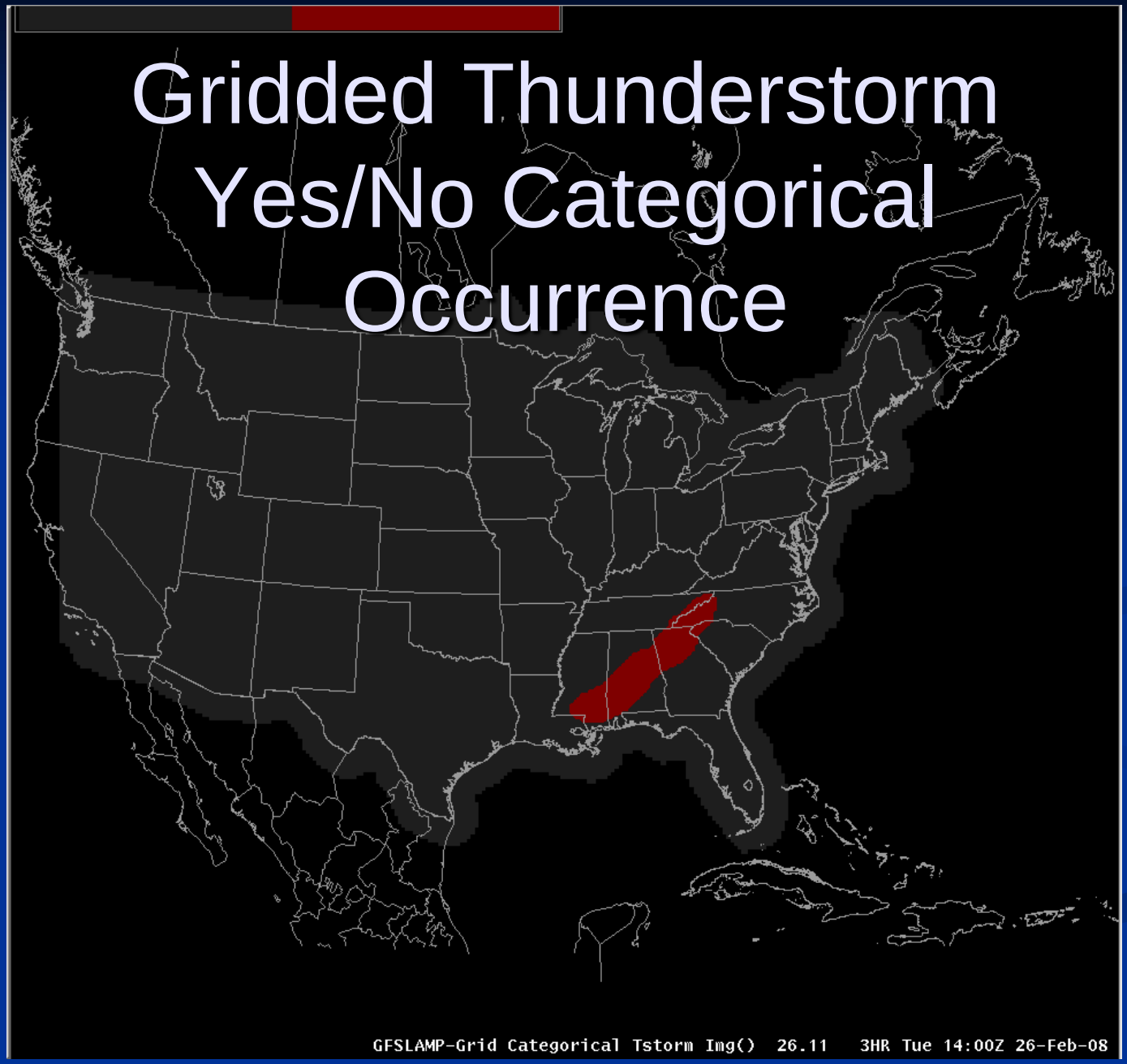
GFS LAMP Gridded Thunderstorms in the Volume Browser



Gridded Thunderstorm Probabilities

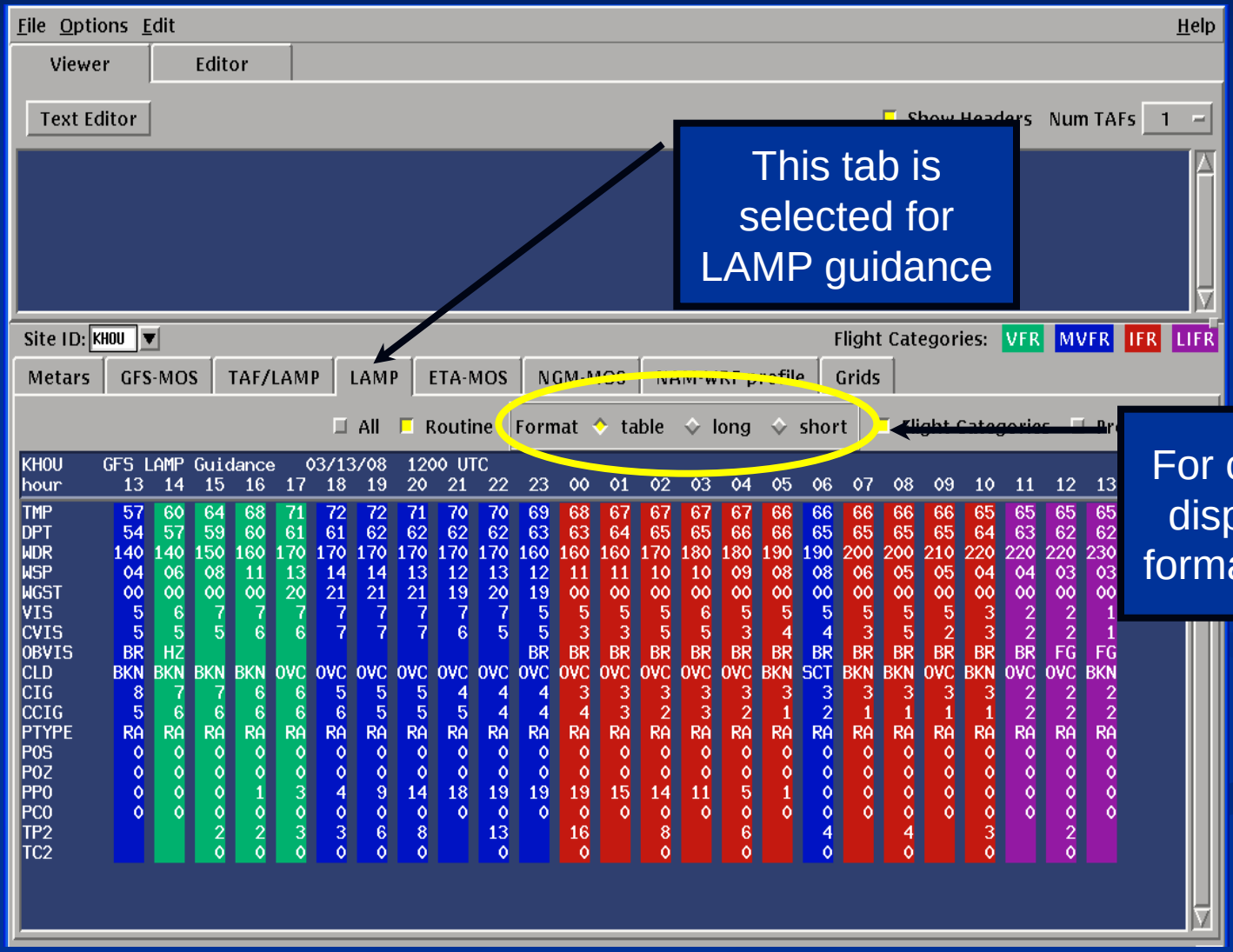


Gridded Thunderstorm Yes/No Categorical Occurrence



GFS LAMP IN AWIPS AVNFPS

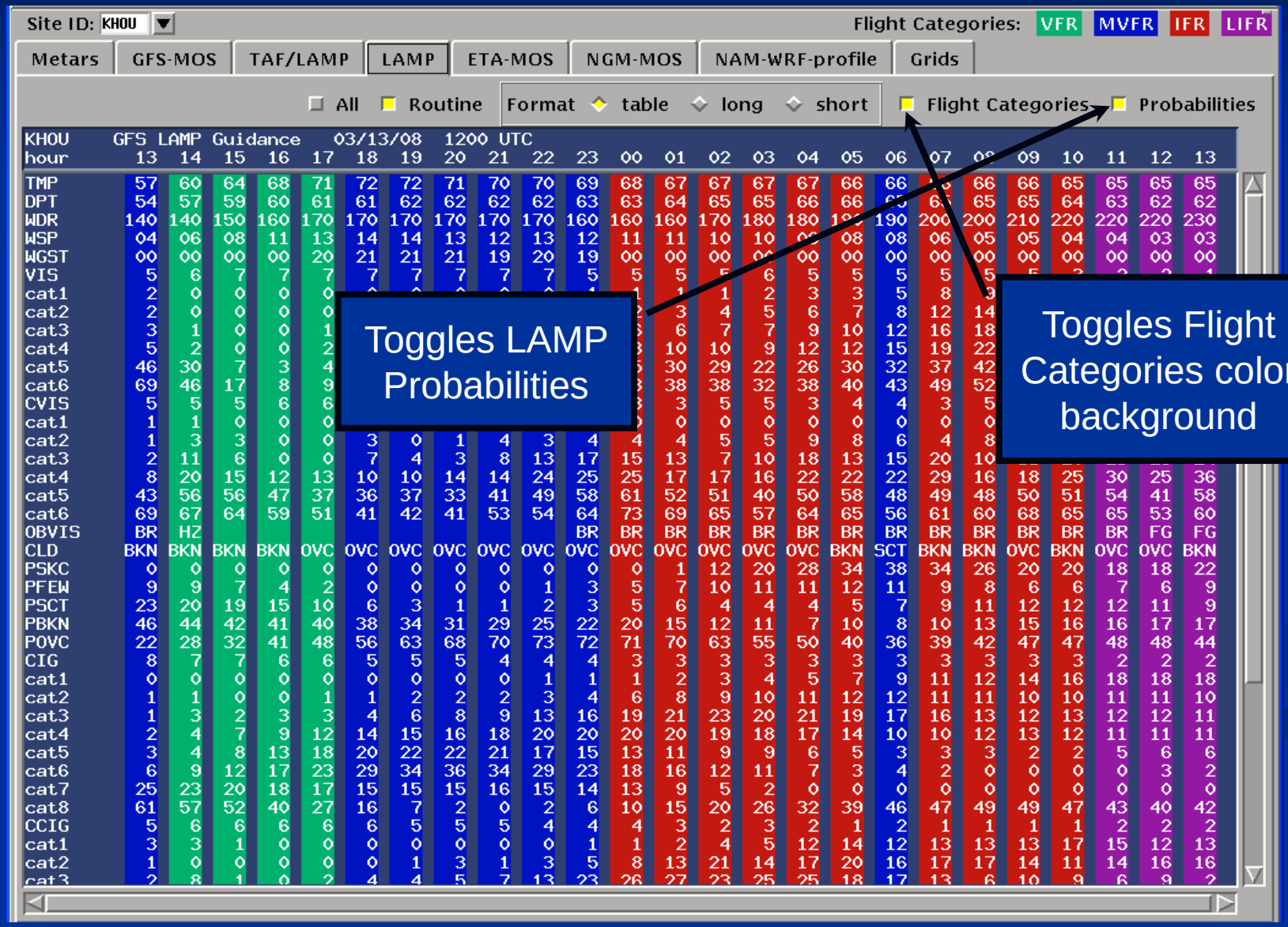
AvnFPS TAF Editor



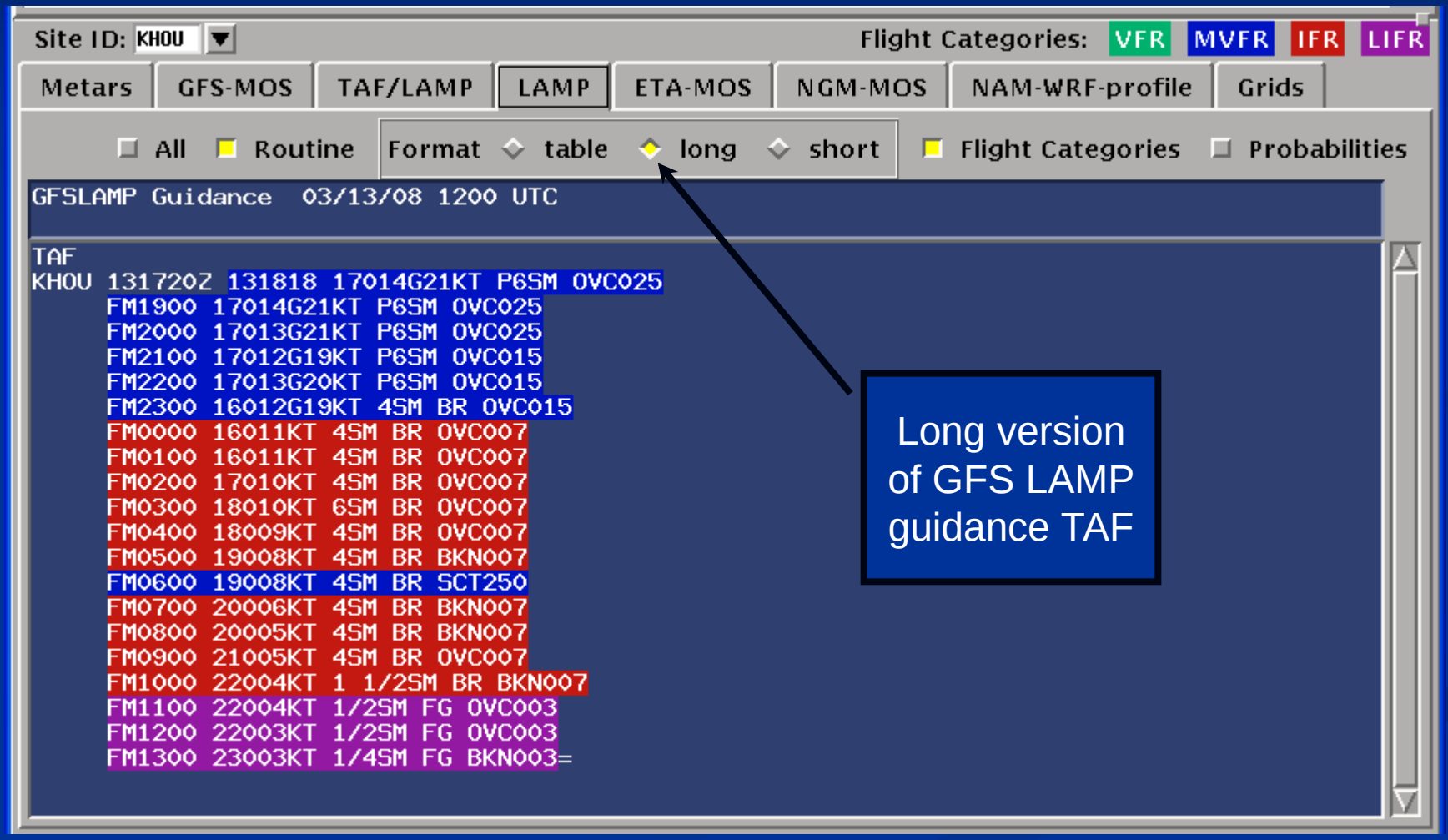
KHOU GFS LAMP Guidance 03/13/08 1200 UTC

hour	13	14	15	16	17	18	19	20	21	22	23	00	01	02	03	04	05	06	07	08	09	10	11	12	13
TMP	57	60	64	68	71	72	72	71	70	70	69	68	67	67	67	67	66	66	66	66	66	65	65	65	65
DPT	54	57	59	60	61	61	62	62	62	62	63	63	64	65	65	66	66	65	65	65	65	64	63	62	62
WDR	140	140	150	160	170	170	170	170	170	170	160	160	160	170	180	180	190	190	200	200	210	220	220	220	230
WSP	04	06	08	11	13	14	14	13	12	13	12	11	11	10	10	09	08	08	06	05	05	04	04	03	03
WGST	00	00	00	00	20	21	21	21	19	20	19	00	00	00	00	00	00	00	00	00	00	00	00	00	00
VIS	5	6	7	7	7	7	7	7	7	7	5	5	5	5	6	5	5	5	5	5	5	3	2	2	1
CVIS	5	5	5	6	6	7	7	7	6	5	5	3	3	5	5	3	4	4	3	5	2	3	2	2	1
OBVIS	BR	HZ									BR	BR	BR	BR	BR	BR	BR	BR	BR	BR	BR	BR	BR	FG	FG
CLD	BKN	BKN	BKN	BKN	OVC	OVC	OVC	OVC	OVC	OVC	OVC	OVC	OVC	OVC	OVC	OVC	OVC	BKN	SCT	BKN	BKN	OVC	BKN	OVC	OVC	BKN
CIG	8	7	7	6	6	5	5	5	4	4	4	3	3	3	3	3	3	3	3	3	3	3	2	2	2
CCIG	5	6	6	6	6	6	5	5	5	4	4	4	3	2	3	2	1	2	1	1	1	1	2	2	2
PTYPE	RA	RA	RA	RA	RA	RA	RA	RA	RA	RA	RA	RA	RA	RA	RA	RA	RA	RA	RA	RA	RA	RA	RA	RA	RA
POS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
POZ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PPO	0	0	0	1	3	4	9	14	18	19	19	19	15	14	11	5	1	0	0	0	0	0	0	0	0
PCO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TP2			2	2	3	3	6	8		13		16		8		6		4		4		3		2	
TC2			0	0	0	0	0	0		0		0		0		0		0		0		0		0	

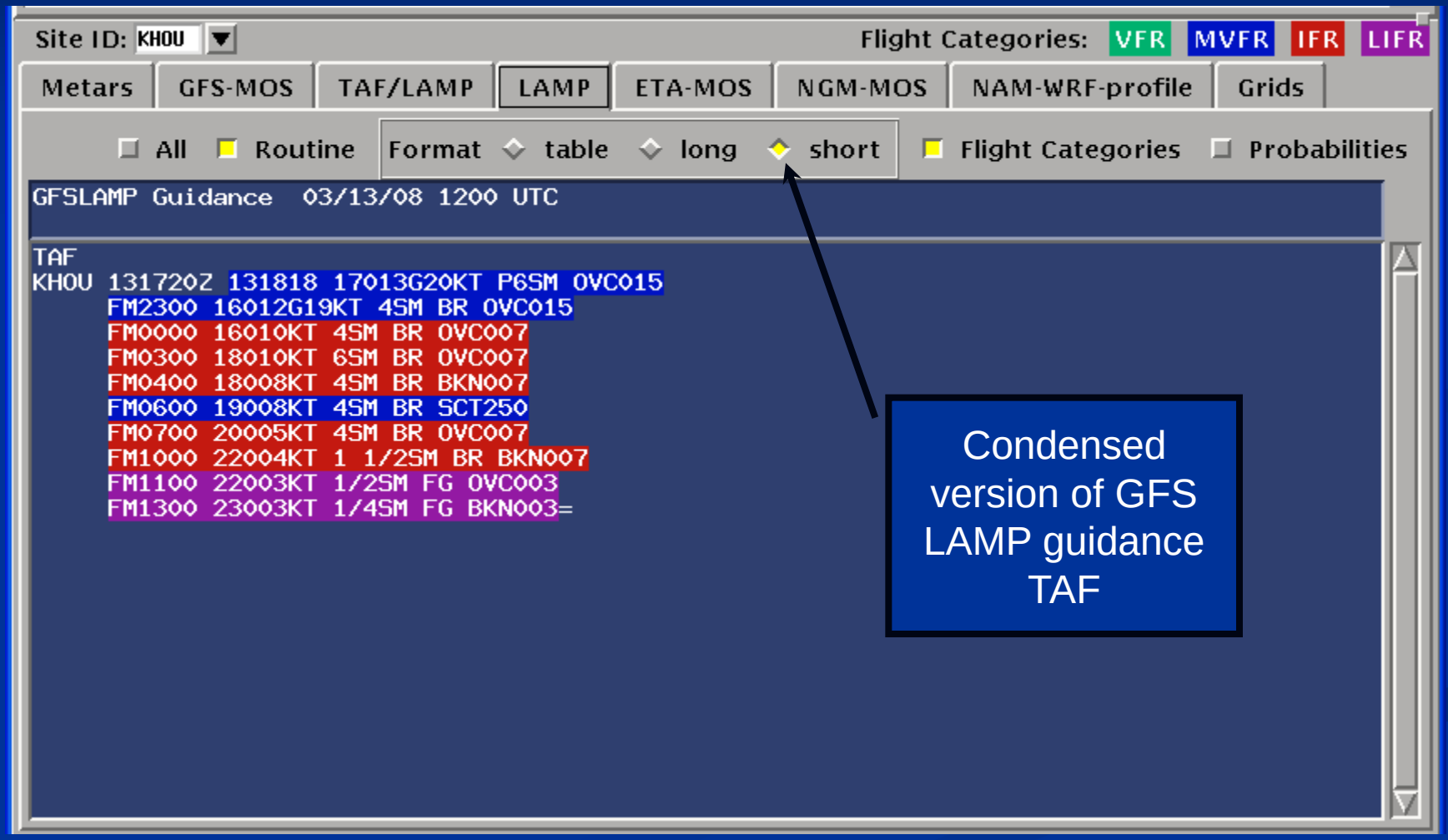
LAMP Guidance in Table Format



GFS LAMP Guidance in TAF Format (long)



GFS LAMP Guidance in TAF Format (short)

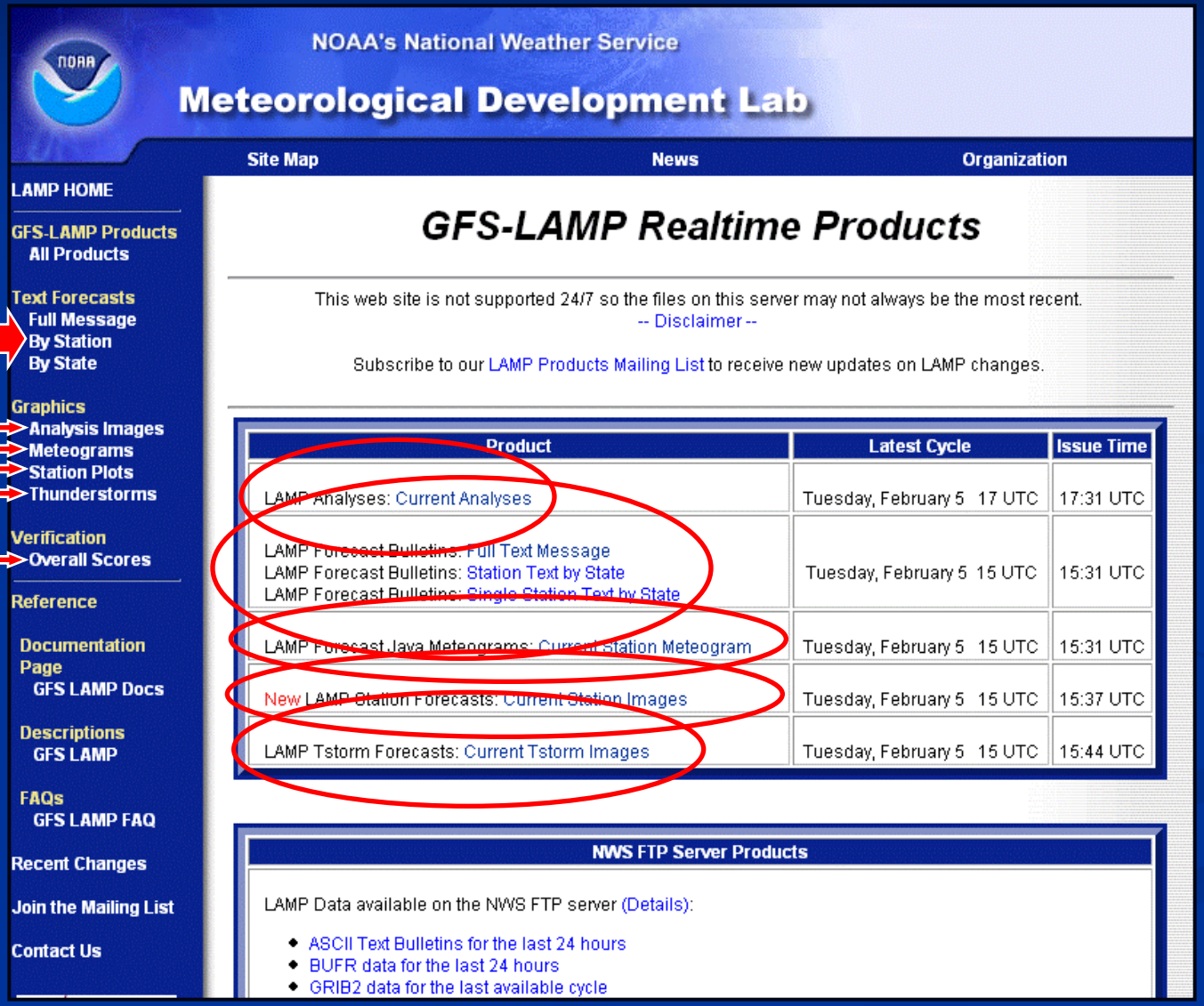


GFS LAMP Products on the Web

To view these products online, visit:

http://www.nws.noaa.gov/mdl/gfslamp/gfslamp.shtml

GFS LAMP Website



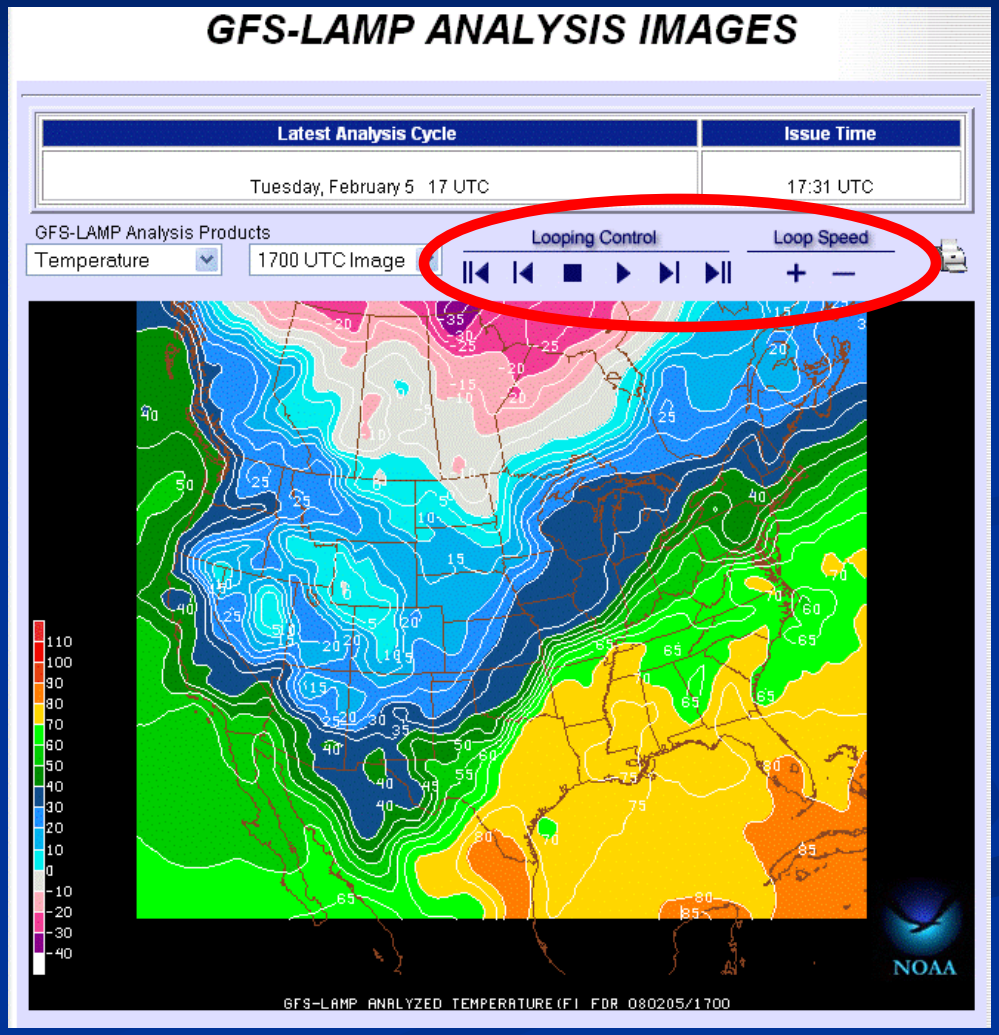
- Analysis Images
- Text Bulletins
- Station Meteograms
- Station Plots
- Thunderstorm Images
- Verification Images

GFS LAMP Analysis Page

Analyzed elements are:

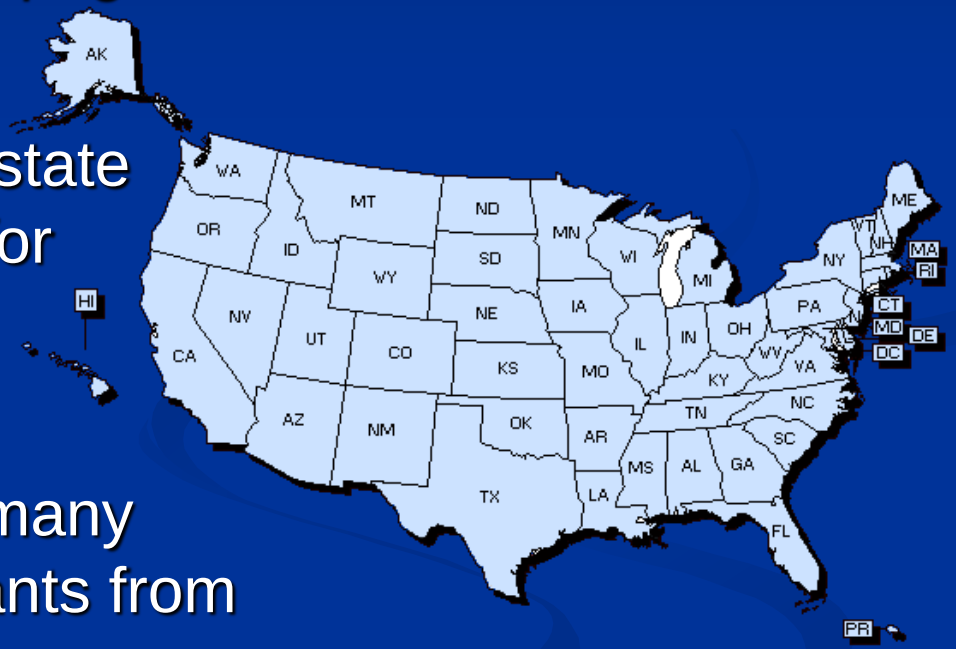
- Temperature
- Dewpoint
- Theta-E
- Mixing Ratio
- Saturation Deficit
- Radar
- Sea Level Pressure & Winds

*The looping control on the analysis page animates images for the previous 23 hours up to the current time



Options for Viewing Text Bulletins

- Full Text Message
  - Includes all sites on one page
- By State
  - The user can click on a state to display text bulletins for all of its stations
- Custom station list
  - The user can select as many stations as he or she wants from a list organized by state



GFS LAMP Station Meteograms

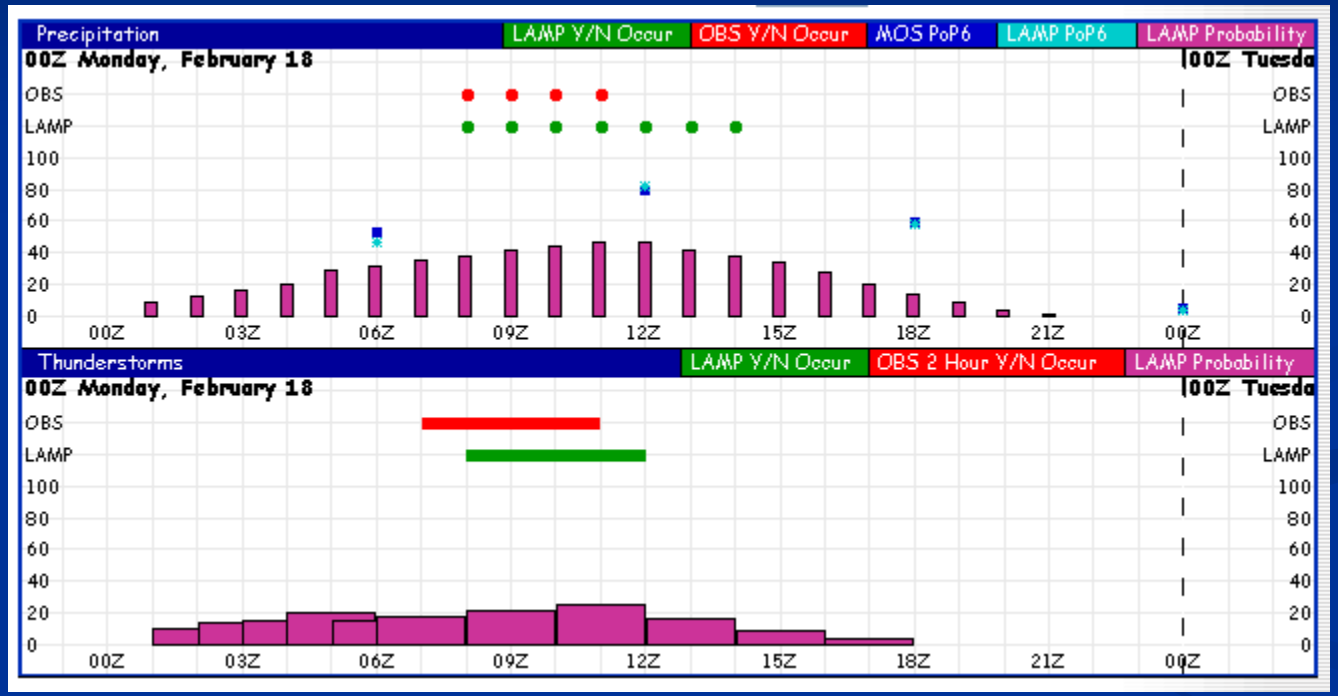
Features

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

Meteogram Case Studies

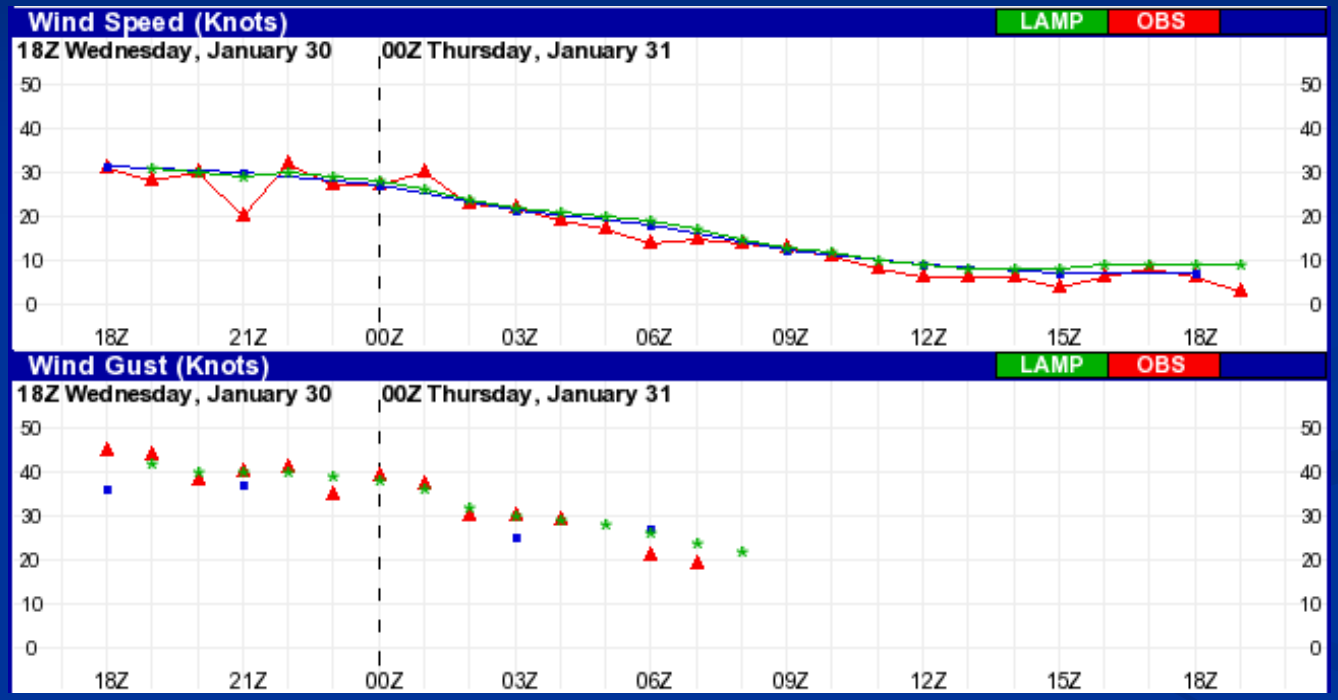
A closer look highlighting helpful ways to utilize this product…

Case Study #1: Timing of a Weather Event



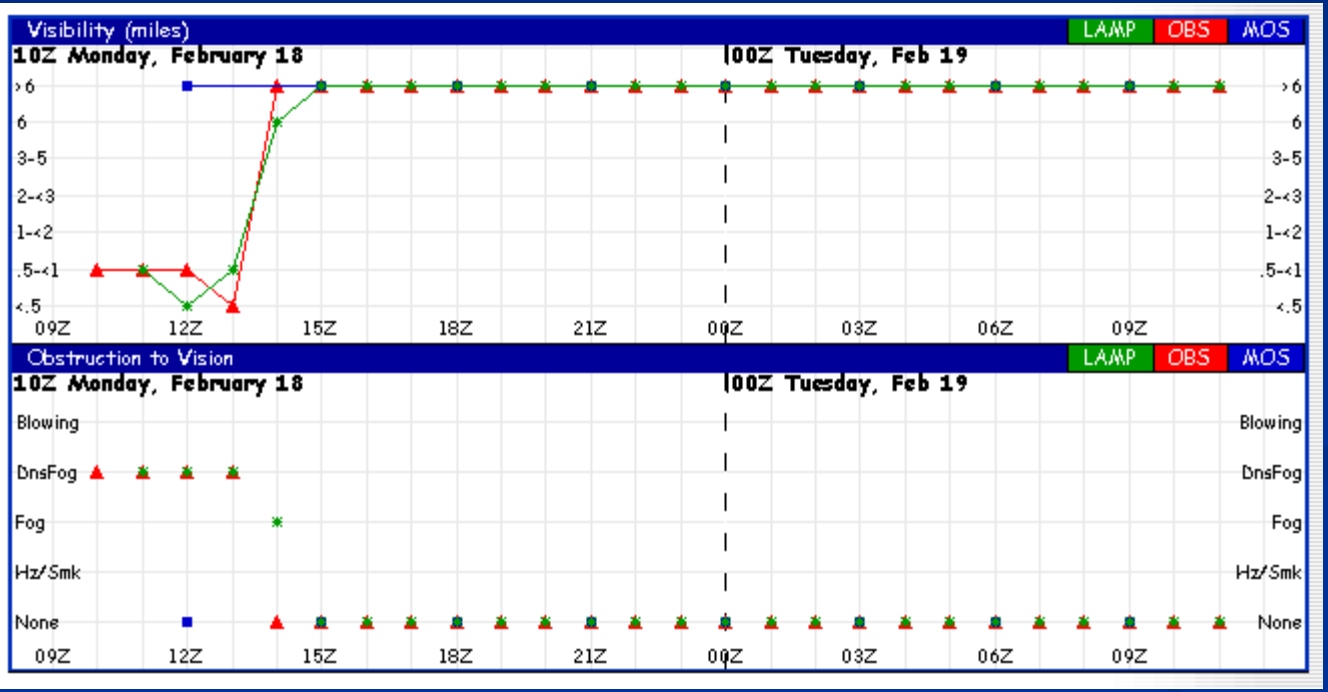
The meteograms can be helpful in determining the timing of a particular weather event. In the example above, LAMP correctly forecasted that precipitation would begin at 08Z Monday, which was eight hours before the event, but missed the onset of the thunderstorms by one hour.

Case Study #2: Another Timing of a Weather Event



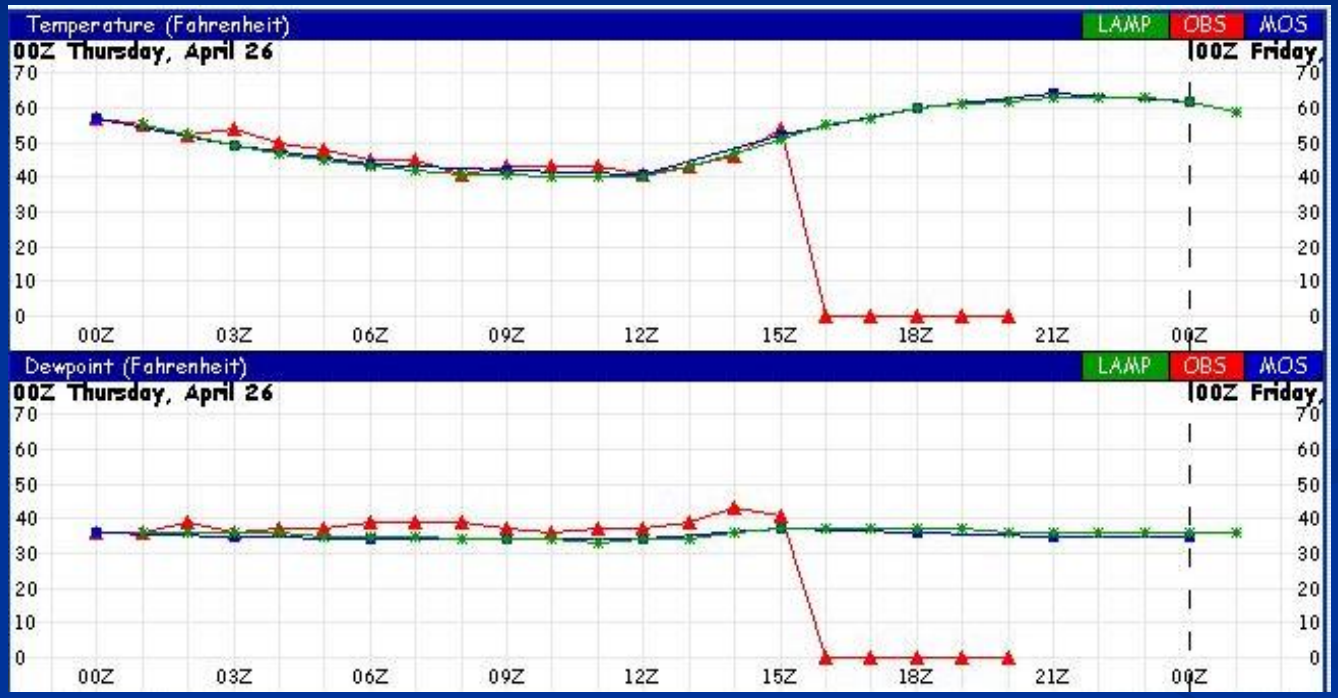
In another example, these meteograms show LAMP handling the timing of a high wind event by correctly forecasting 40 knot gusts and diminishing the high winds in the overnight hours.

Case Study #3: The Influence of the Observation (Improvement)



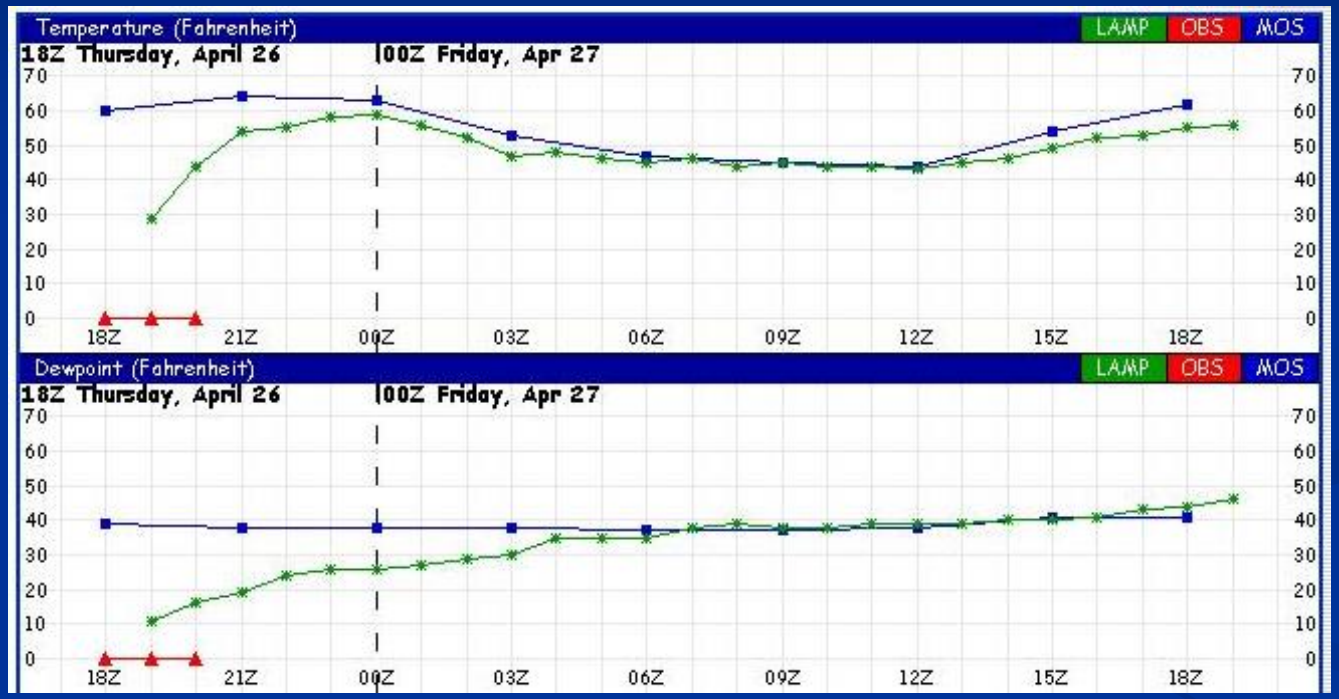
LAMP was able to catch this dense fog event on Monday morning, when the 06Z MOS had no reduced visibilities. The influence of the observed dense fog allowed the LAMP to “update” the MOS forecast and correctly depict this event.

Case Study #4: The Influence of the Observation (Degradation)



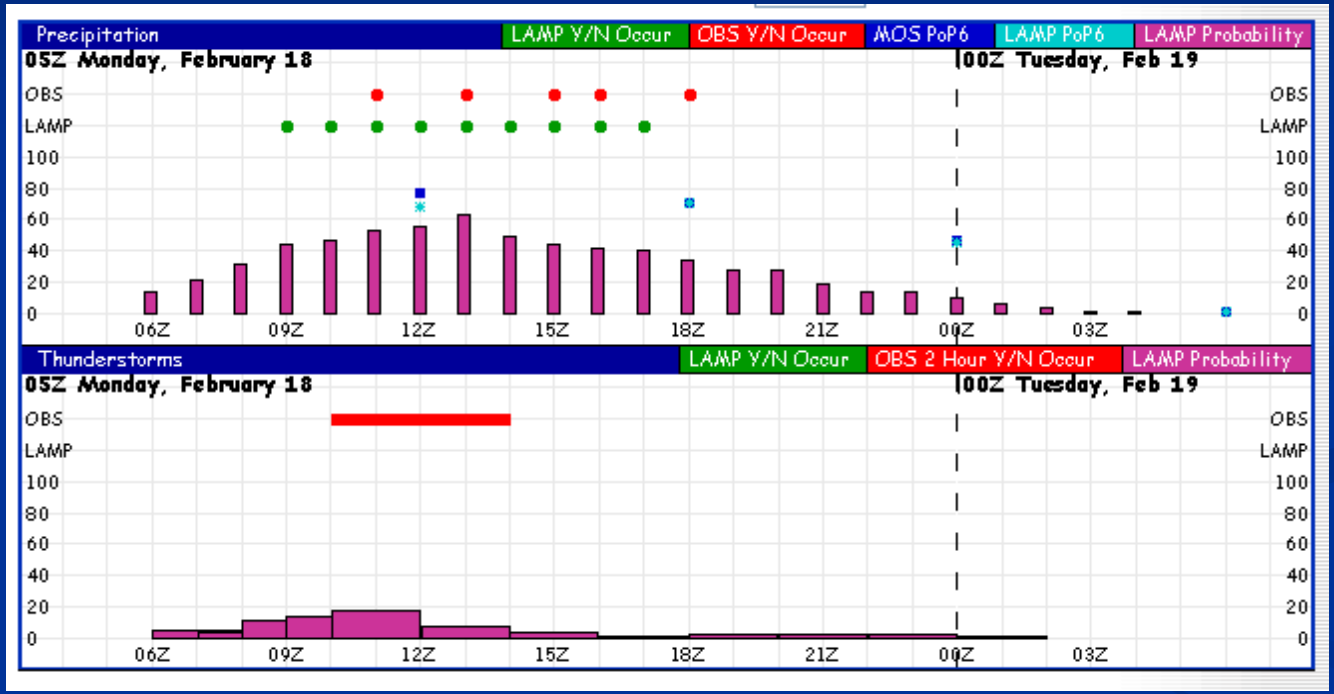
The above image shows the 00Z LAMP temperature and dewpoint meteograms with the corresponding GFS MOS forecast and the verifying observation. You'll notice that the observation becomes bad after 15Z. On the next slide, we will see how this impacts the temperature and dewpoint forecasts at the 18Z cycle.

Case Study #4 Continued



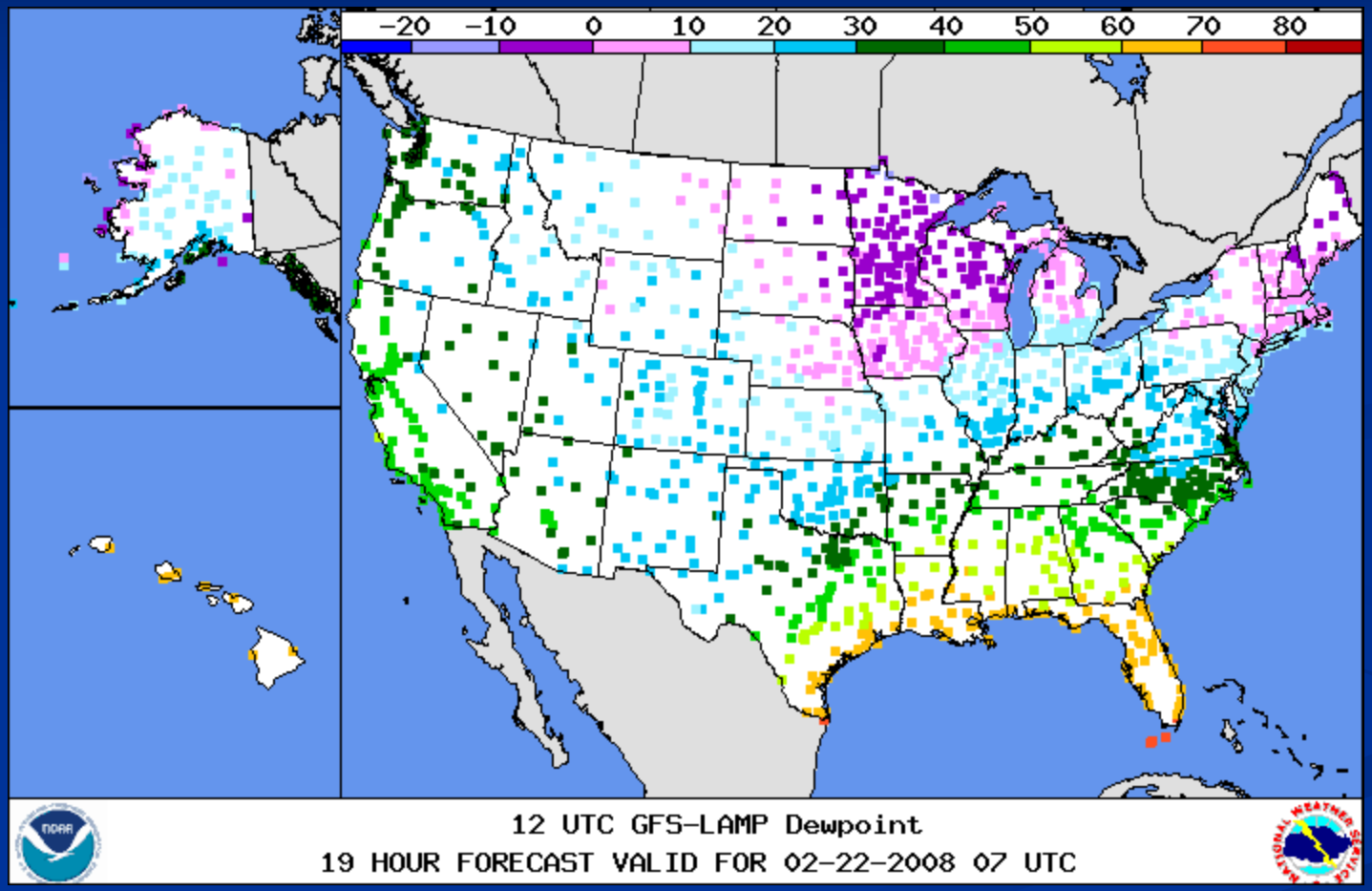
With bad observations still being reported at 18Z, we see a negative influence on the temperature and dewpoint forecasts. The influence of this observation causes the LAMP forecasts to be unreasonably lower than MOS at many of the forecast projections.

Case Study #5: Using POPO and Thunderstorm Probabilities



In this example, the LAMP categorical forecast missed observed thunderstorms during 10 - 14Z. However, the probabilistic thunderstorm forecast shows significant values (below the threshold) during 10Z – 12Z. Thus, forecasters can infer the chance of thunderstorms, even with a “no” categorical forecast.

GFS LAMP Station Plots



Elements

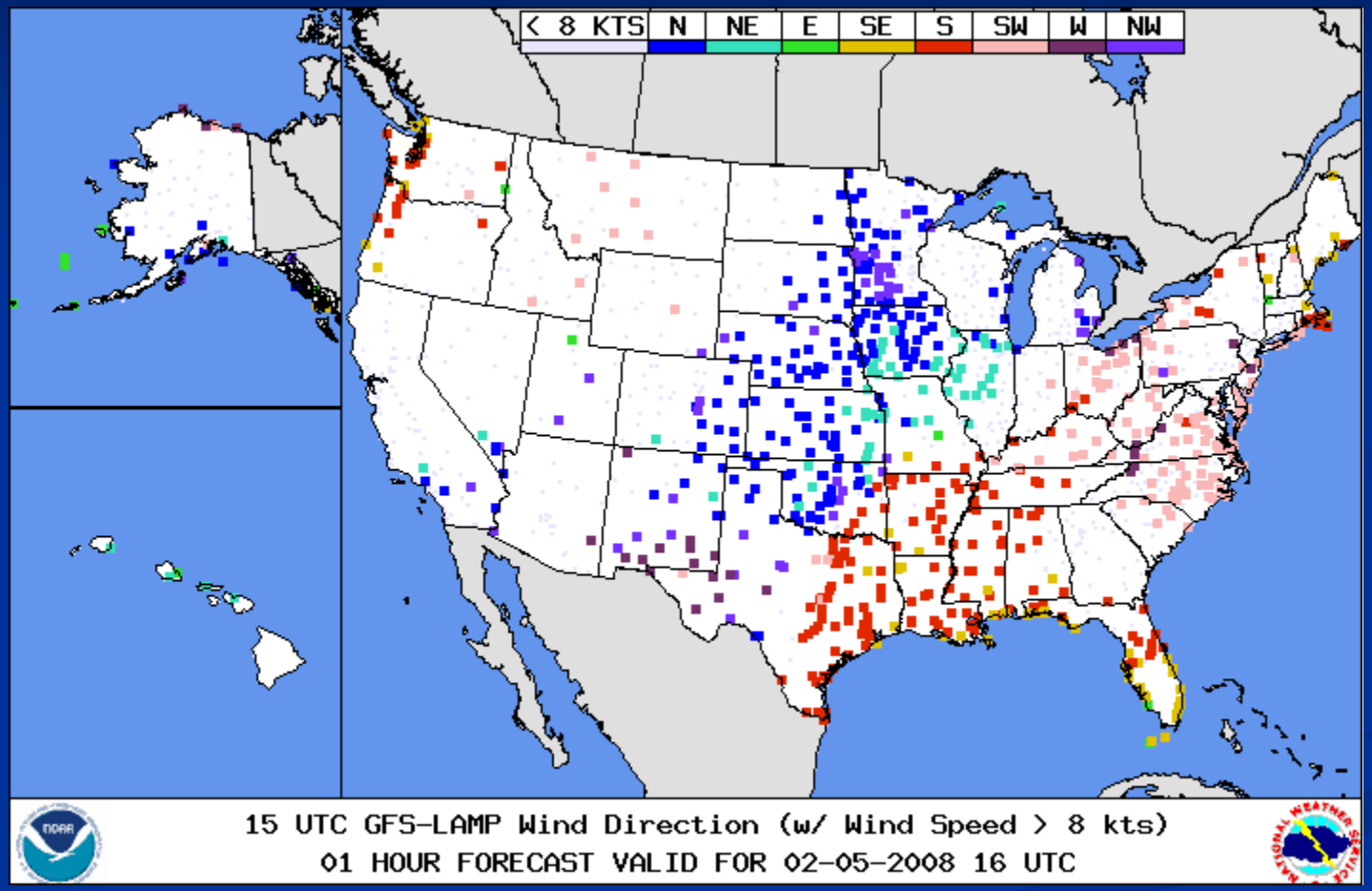
- Flight Category
- Ceiling Height
- Visibility
- Obstruction to Vision
- Total Sky Cover
- Precipitation Type
- Probability of Precipitation
- Wind Speed
- Wind Gust
- Wind Direction
- Temperature
- Dewpoint

Click an element name on this slide to see its plot

A closer look at the station plots…

Two examples of how to use the station plot images

Identifying a Frontal Boundary



Wind Direction

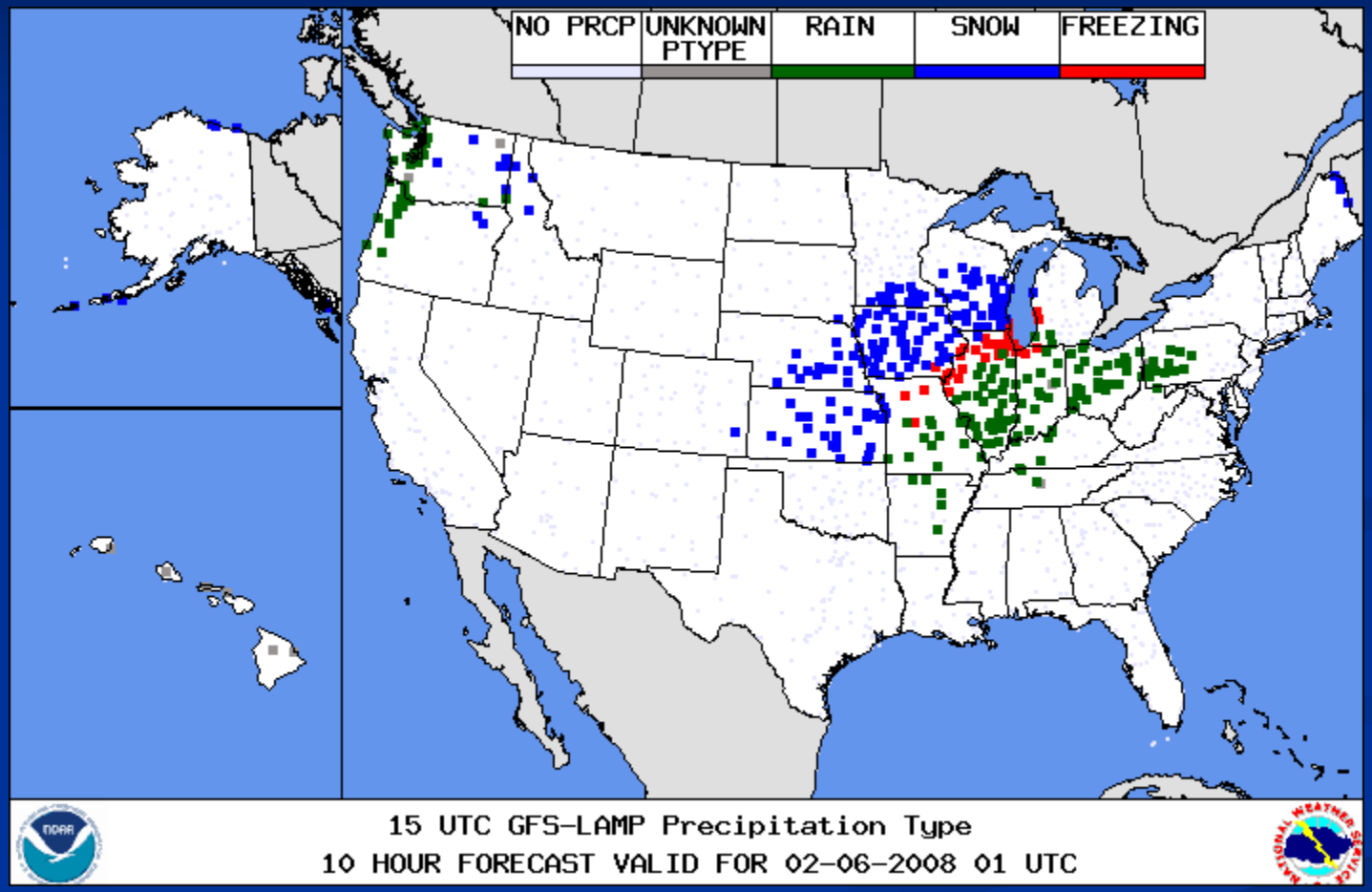
Dewpoint

12Z Surface Map

Click on one of the above choices to see its plot

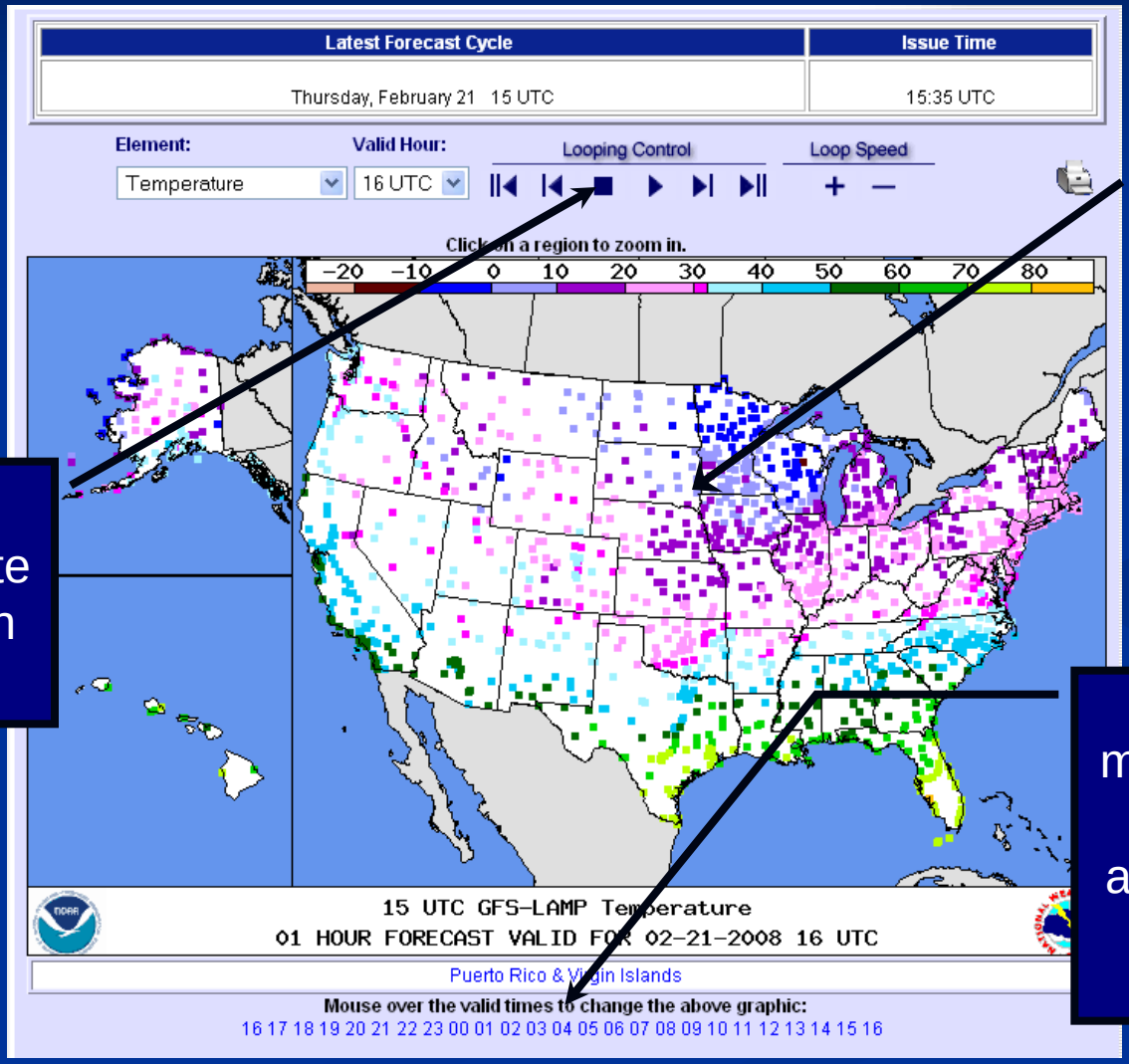
Notice the sharp dewpoint gradient and wind shift in the central United States, helping to identify the presence of a cold front.

Locating the Rain/Snow Line



The station plots allow the user to get a spatial understanding of the station-based forecasts. This could prove useful in precipitation type forecast.

Other Station Plots Features

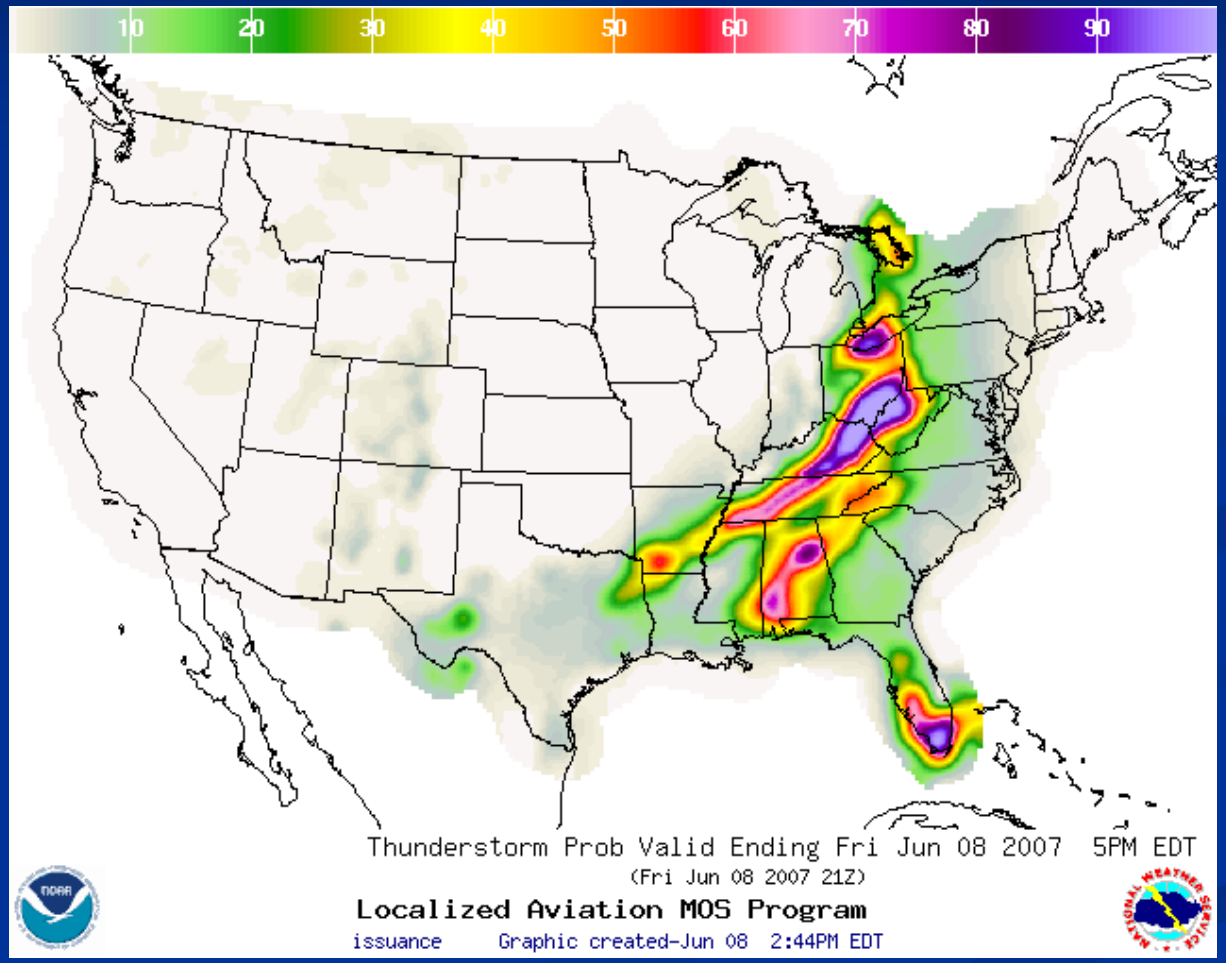


The looping controls animate plots in time on the webpage

On the webpage, click on the map to zoom into a region

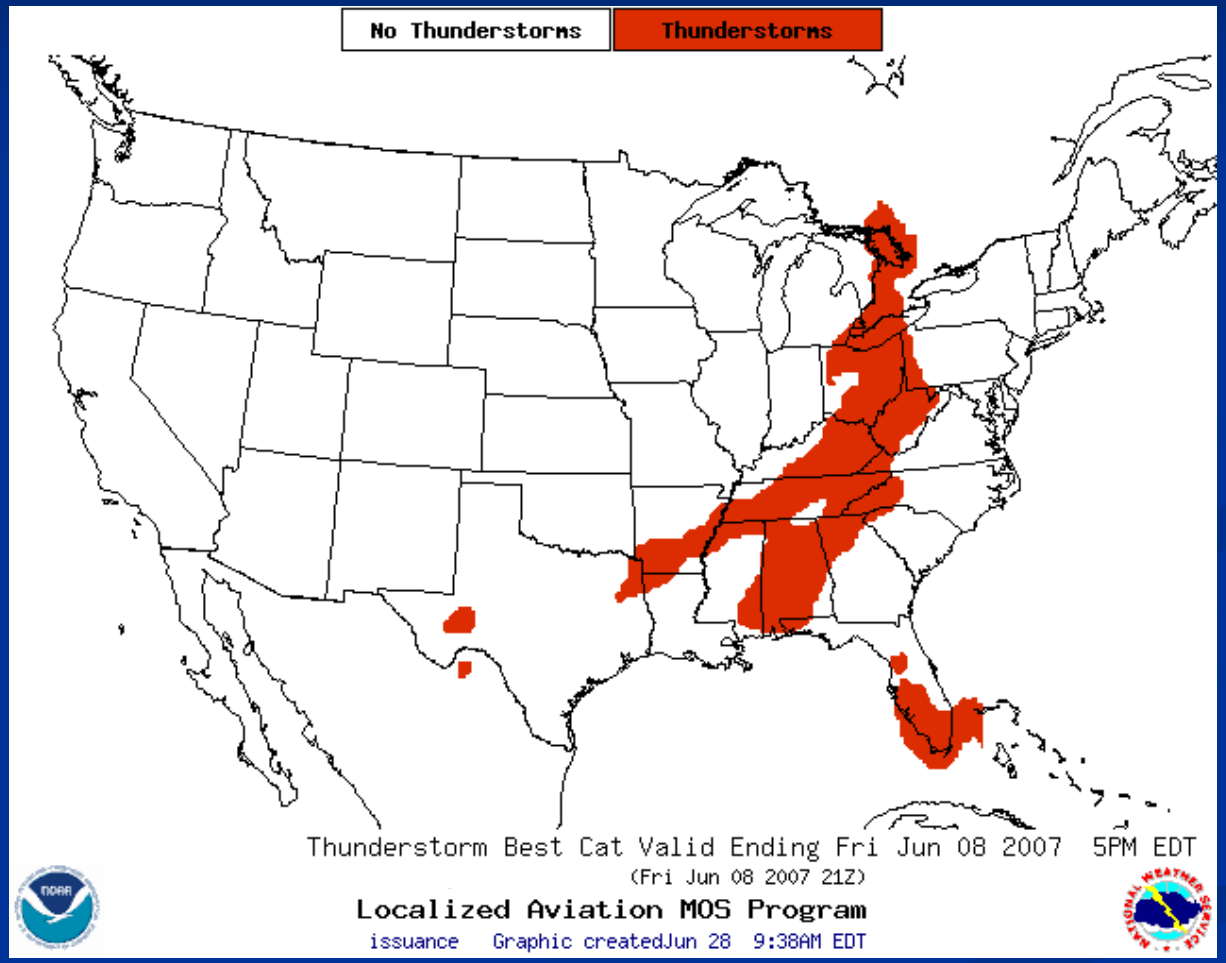
The user can mouseover valid times for an alternate way to display a new plot

GFS LAMP Thunderstorm Images



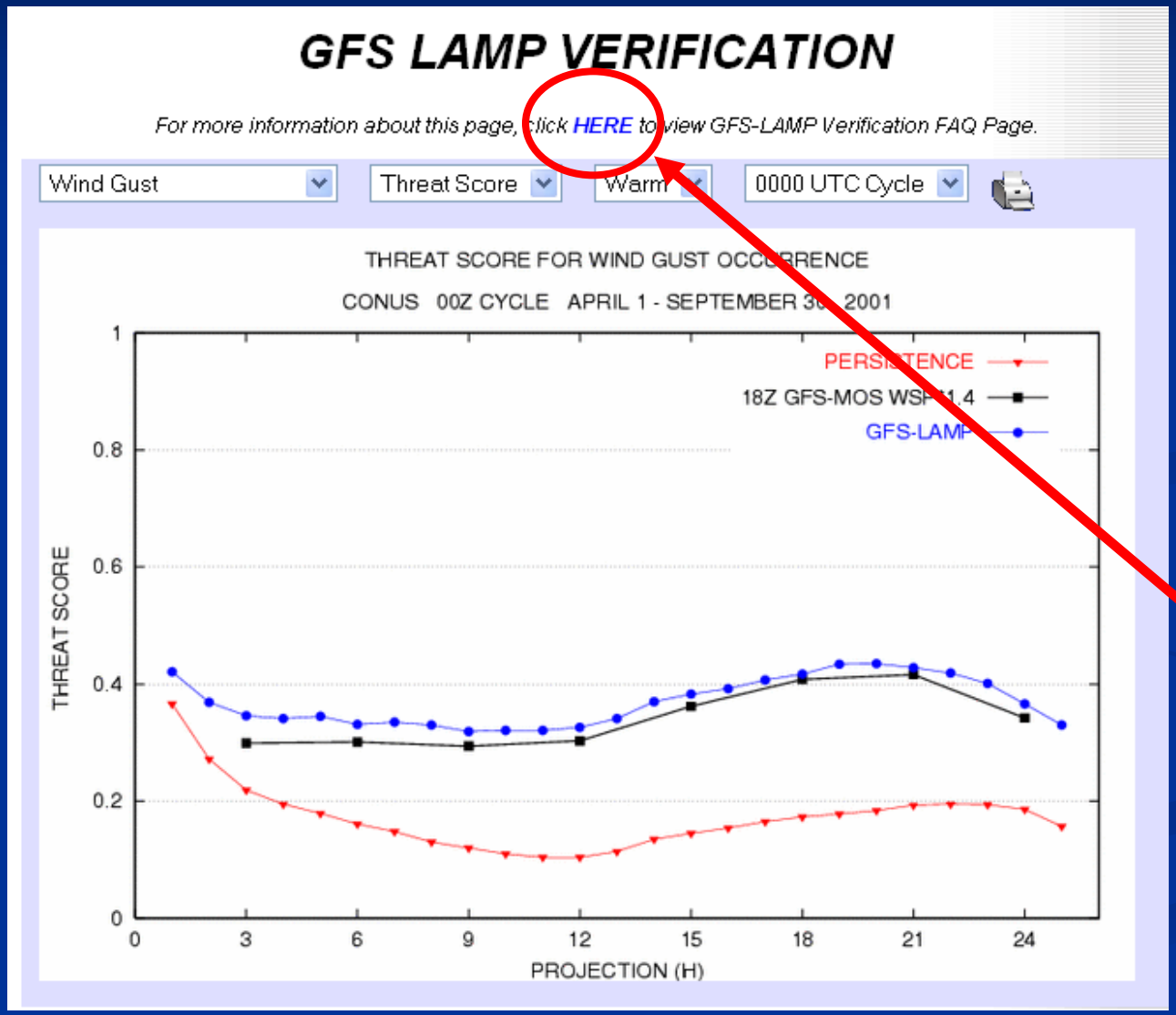
Probability of a Thunderstorm during a 2-Hour Period

GFS LAMP Thunderstorm Images



Categorical Yes/No Thunderstorm Forecast during a 2-Hour Period

Viewing GFS LAMP Verification



- The user can view the verification scores for GFS LAMP elements at each implemented cycle and season.
- On the website, clicking here will bring up the FAQ page for specific information on these plots.

Summary

- LAMP offers a diverse selection of graphical and textual depictions of its forecast elements.
- These products are available through the SBN/NOAAPort, the NWS FTP Server, D2D in AWIPS, AvnFPS in AWIPS, and the website.
- Although there is some overlap, each method of accessing LAMP guidance contains unique products and weather element information.
- Full use of these products can provide a more complete understanding of the GFS LAMP forecast in a synoptic and temporal context, as well as insights into the strengths and weaknesses of the guidance.
- For more information, visit the LAMP website:

  http://www.nws.noaa.gov/mdl/lamp/index.shtml