Localized Aviation Model Output Statistics (MOS) Program (LAMP) Upgrades for Improved Aviation Forecasts

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Southwest Aviation Weather Safety Workshop (SAWS VIII)

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Thanks to the LAMP team:

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[2]Ace Info Solutions

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[4]NOAA Rotational Assignment Program, National Marine Fisheries Service/Alaska Fisheries Science Center

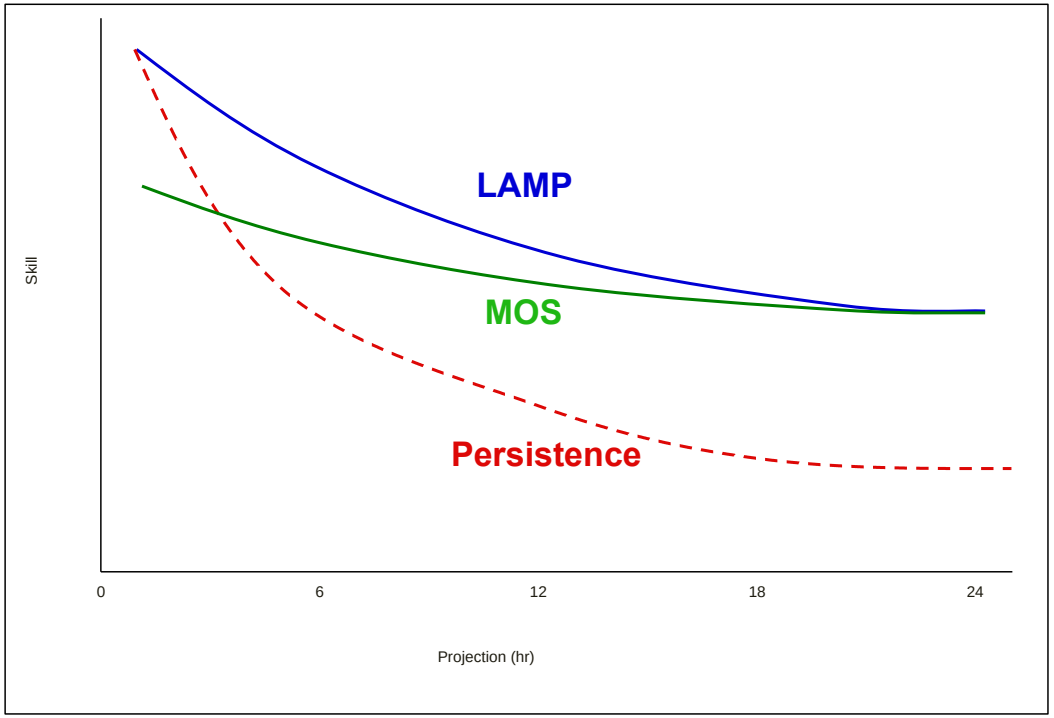
[5]Cooperative Institute for Research in the Atmosphere/Colorado State University

Outline

1. LAMP Background
2. Tour of the LAMP Web Products
3. Current Work
   - Summer implementation
   - Sky Cover redevelopment and challenges
4. Future work

LAMP Background

- LAMP is a statistical system that uses observations, MOS output, and model output to provide guidance for aviation forecasting
- LAMP acts as an update to MOS guidance
- LAMP bridges the gap between the observations and the MOS forecast
- LAMP outperforms persistence in the early period and trends towards MOS at the end of the period.
- LAMP guidance covers the short-range period of 1-25 hours (1-38 h soon)
- Runs every hour in NWS operations at HH:30 (every 15 mins for ceiling and visibility out to 3 hours HH:00, HH:15, HH:35)



LAMP Guidance Details

- LAMP provides station-oriented guidance for:
  - All LAMP forecast elements, ~2010 stations
  - CONUS, Alaska, Hawaii, Puerto Rico

- 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
- Lightning/Convection
- Ceiling height
- Conditional ceiling height
- Opaque sky cover
- Visibility
- Conditional visibility
- Obstruction to vision

- Gridded LAMP provides grid-oriented guidance for:
  - Lightning & Convection
  - Temperature & Dewpoint
  - Wind Speed & Direction
  - Ceiling Height & Visibility
  - Sky Cover
  - Probability of Precipitation (**Coming Soon**)

- Available:
  - At NWS WFOs in AWIPS
  - Via FTP, in the National Digital Guidance Database
  - Via website: http://weather.gov/mdl/lamp_home

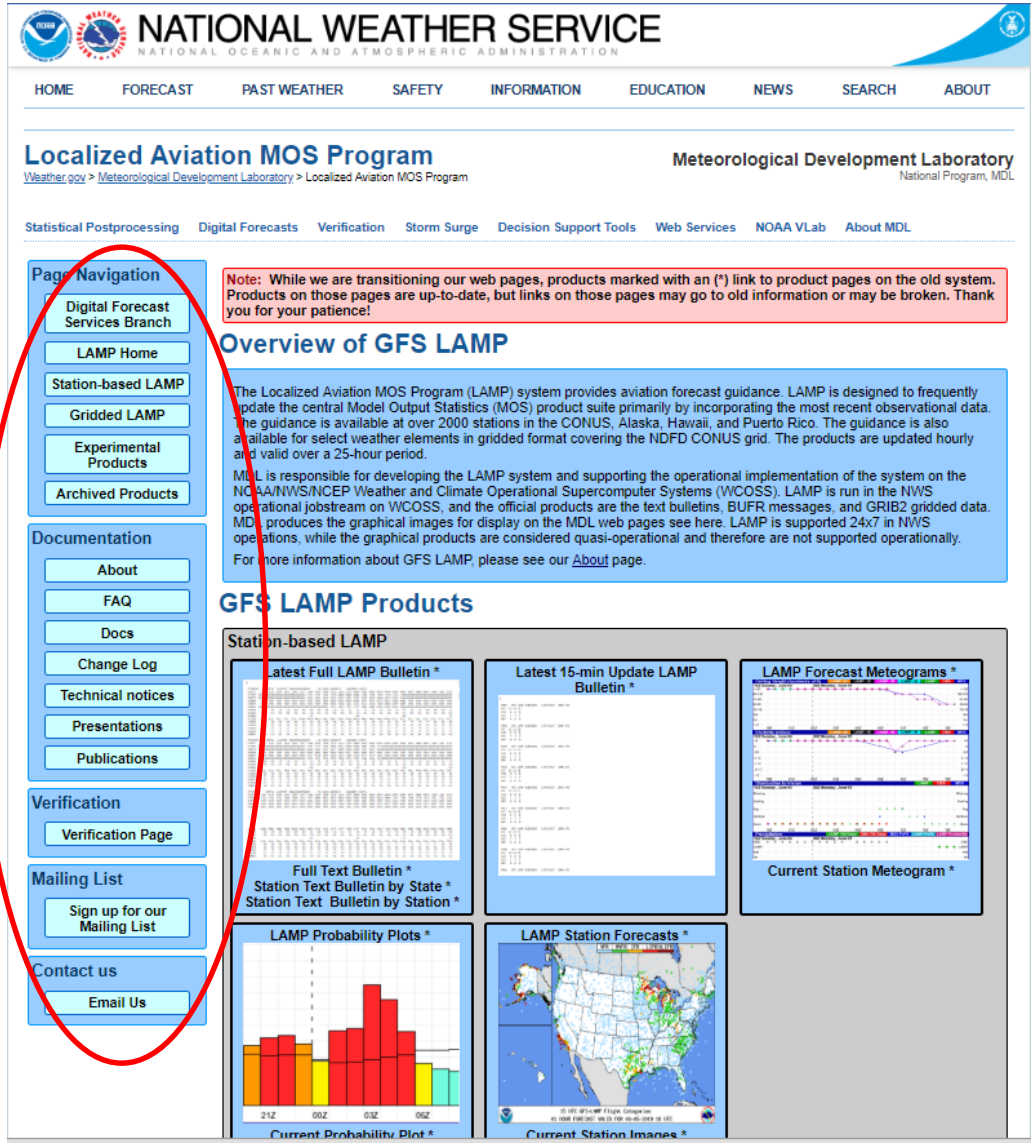
LAMP Guidance Details

- Technique details (station-based eqns or gridded eqns):
  - Differs depending on predictand data (whether the data are valid at stations [points] or on a grid)
  - Examples:
    - Station-based elements: ceiling, visibility, temperature, dewpoint
      - Predictand data source: METAR observations at stations
    - Gridded elements: convection, lightning, probability of precipitation
      - Predictand data source: Multi-Radar Multi-Sensor (MRMS) data, Earth Networks, Inc. (ENI) lightning data
- Basic idea:

  LAMP = MOS + Observations + Simple locally-run models
- Predictors:
  - Observations (METAR data, MRMS data, ENI data)
  - MOS from global models such as the GFS
  - MOS from mesoscale models such as HRRR and RAP
  - Local models: advection models, saturation deficit model
  - Climatological data

MOS = Model Output Statistics, GFS = Global Forecast System,
HRRR = High Resolution Rapid Refresh, RAP = Rapid Refresh Model

LAMP Web Page



https://www.weather.gov/mdl/lamp_home

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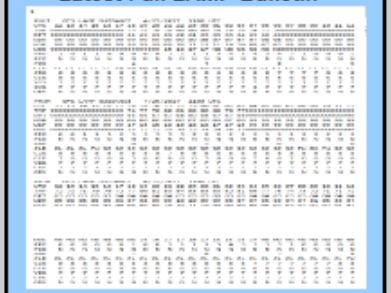
Click here to find real-time station-based forecast guidance

GFS Station-based LAMP Products

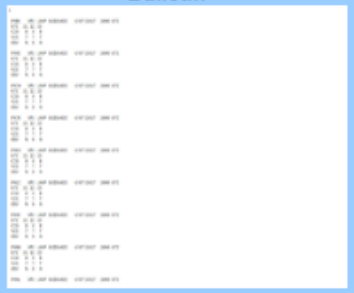
Station-based LAMP

Latest Full LAMP Bulletin *

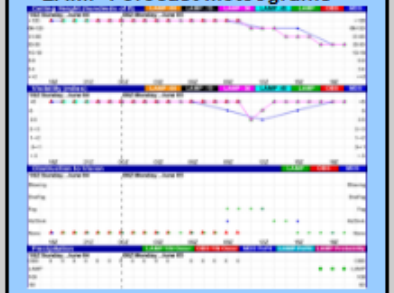


Full Text Bulletin *
Station Text Bulletin by State *
Station Text Bulletin by Station *

Latest 15-min Update LAMP Bulletin *

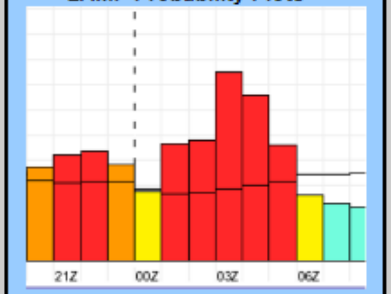


LAMP Forecast Meteograms *



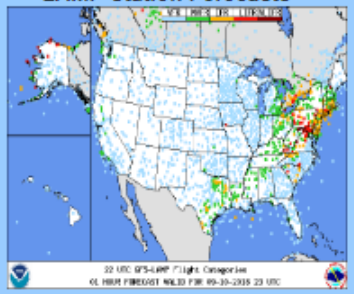
Current Station Meteogram *

LAMP Probability Plots *



Current Probability Plot *

LAMP Station Forecasts *



Current Station Images *

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KPHX PHOENIX ASOS GFS LAMP GUIDANCE 6/05/2019 2100 UTC

UTC	22	23	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22
TMP	99	100	100	99	99	97	95	93	91	89	87	86	84	82	81	79	81	84	87	90	93	95	97	99	100
DPT	37	36	36	35	35	35	36	37	37	38	39	40	41	42	42	42	42	41	40	39	39	38	37	36	36
WDR	27	27	27	27	27	27	26	25	25	27	28	31	30	14	12	11	11	11	14	24	25	27	26	26	27
WSP	11	12	11	13	13	11	10	08	08	08	05	05	04	04	05	05	06	06	06	06	06	06	07	09	08
WGS	18	19	18	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	16
PPO	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
PCO	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
P06									0						0						0				
LP1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
LC1	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
CP1	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
CC1	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
CLD	FW	FW	FW	FW	FW	FW	CL	CL	CL	CL	CL	CL	CL	CL	FW	FW	FW	FW	FW	FW	FW	FW	FW	FW	FW
CIG	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
CCG	8	8	8	8	8	7	7	7	8	7	7	7	8	8	7	7	8	8	8	8	8	8	8	8	8
VIS	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
CVS	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
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

KPHX PHOENIX ASOS GFS LAMP GUIDANCE 6/05/2019 2100 UTC

UTC	22	23	00
CIG	8	8	8
VIS	7	7	7
OBV	N	N	N

https://www.weather.gov/mdl/lamp_home

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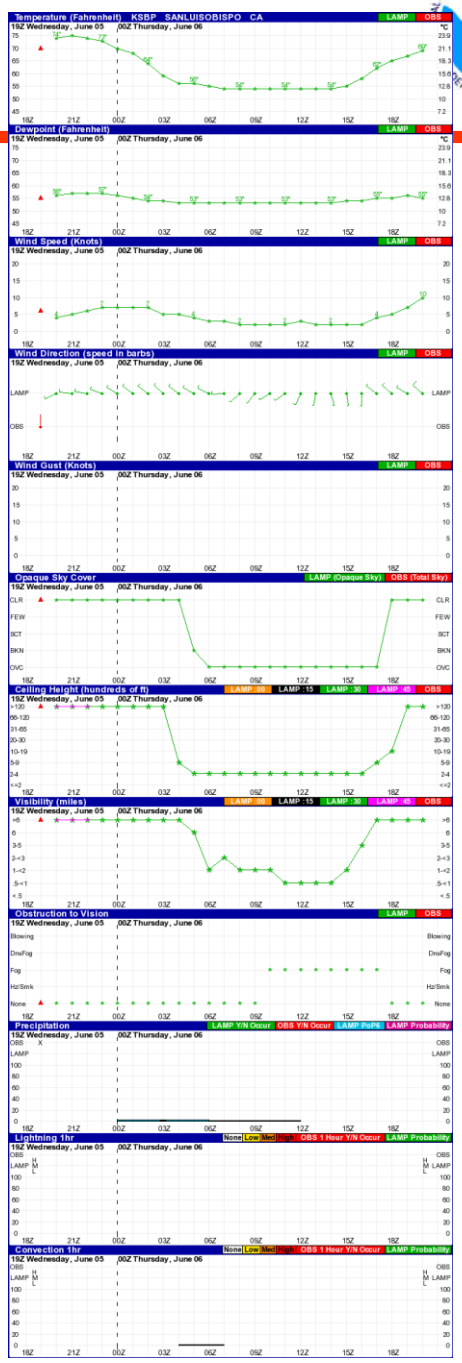
Click here for LAMP Meteograms showing the future guidance



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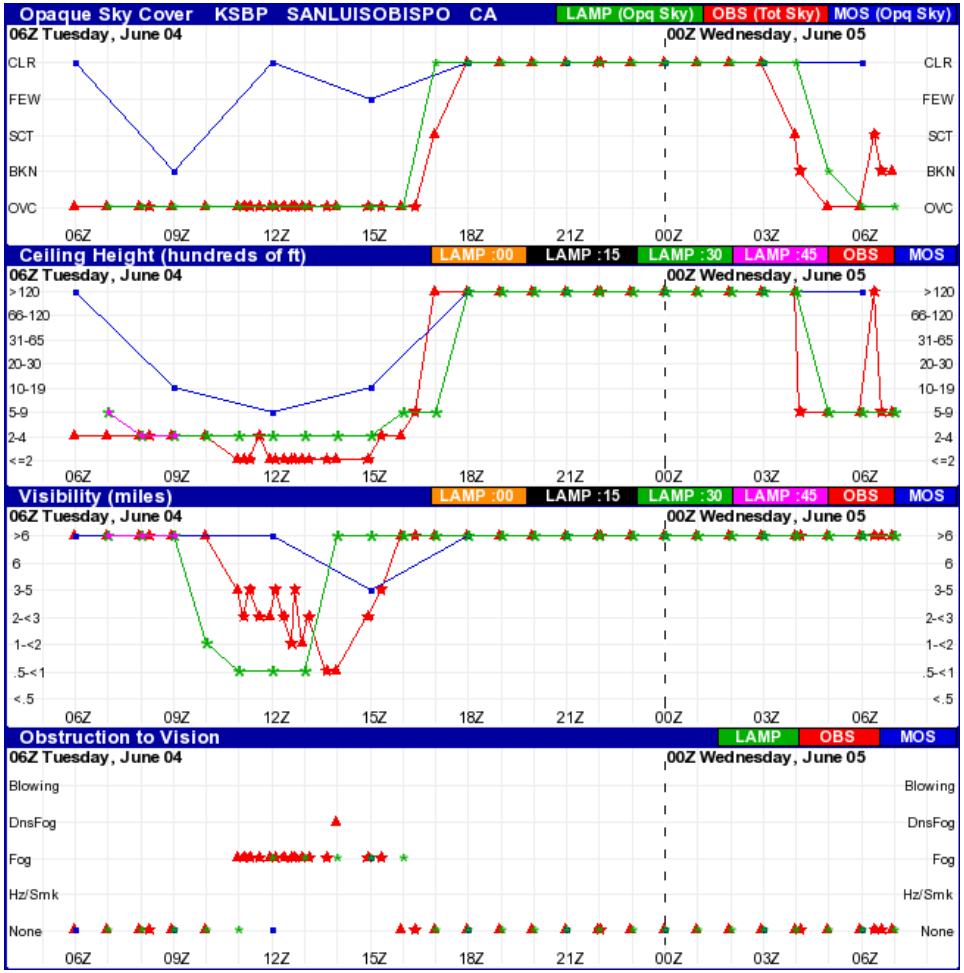
Click here for LAMP Meteograms showing the past guidance



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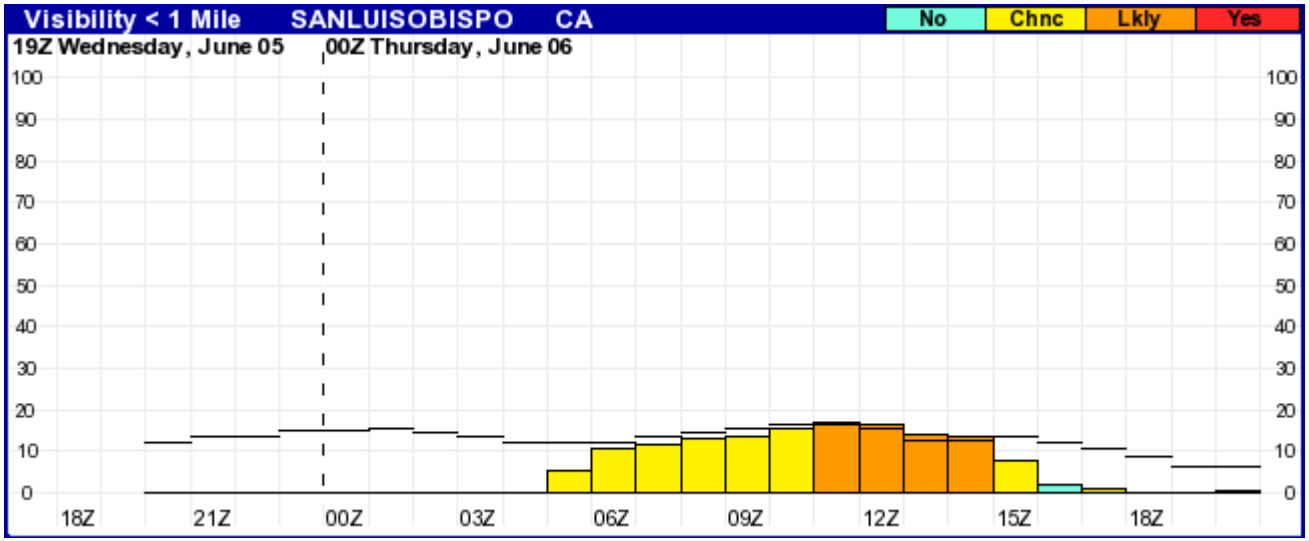
Click here for LAMP Probability and Threshold Plots



Probabilities (bars) and thresholds (lines)
KSBP
Visibility < 1 mi

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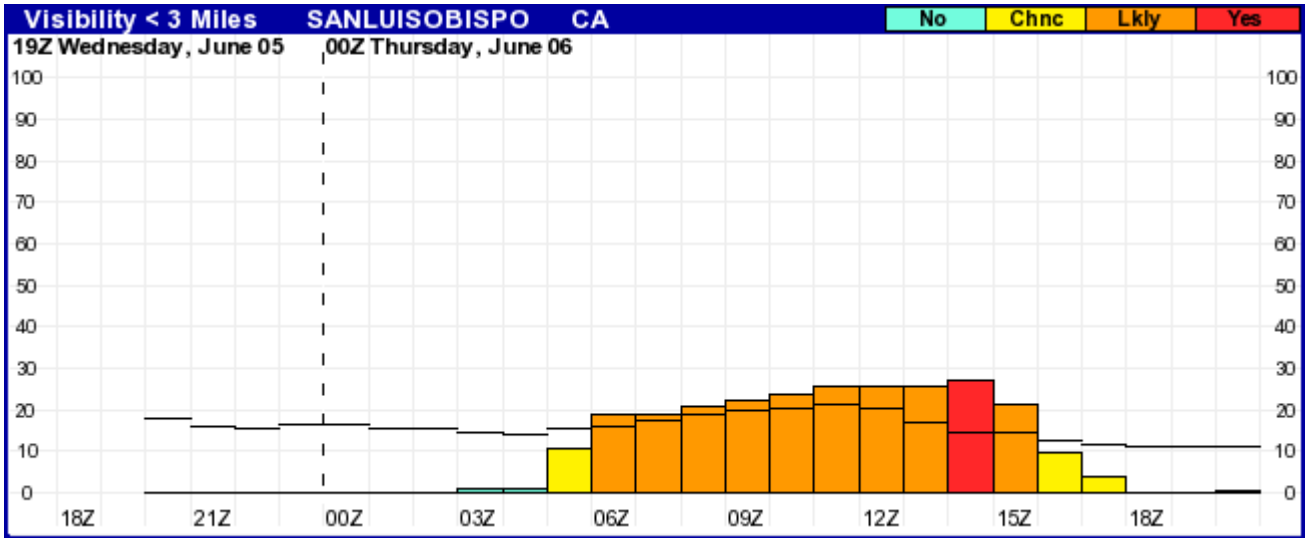

Probabilities (bars) and thresholds (lines)
KSBP
Visibility < 3 mi

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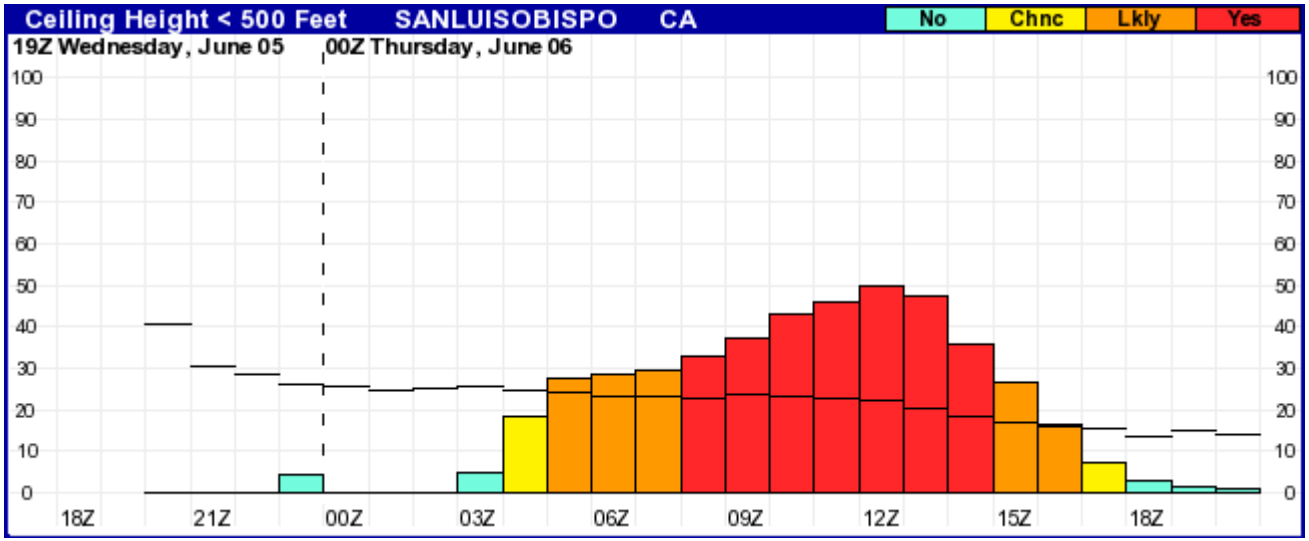

Probabilities (bars) and thresholds (lines)
KSBP
Ceiling height < 500 feet

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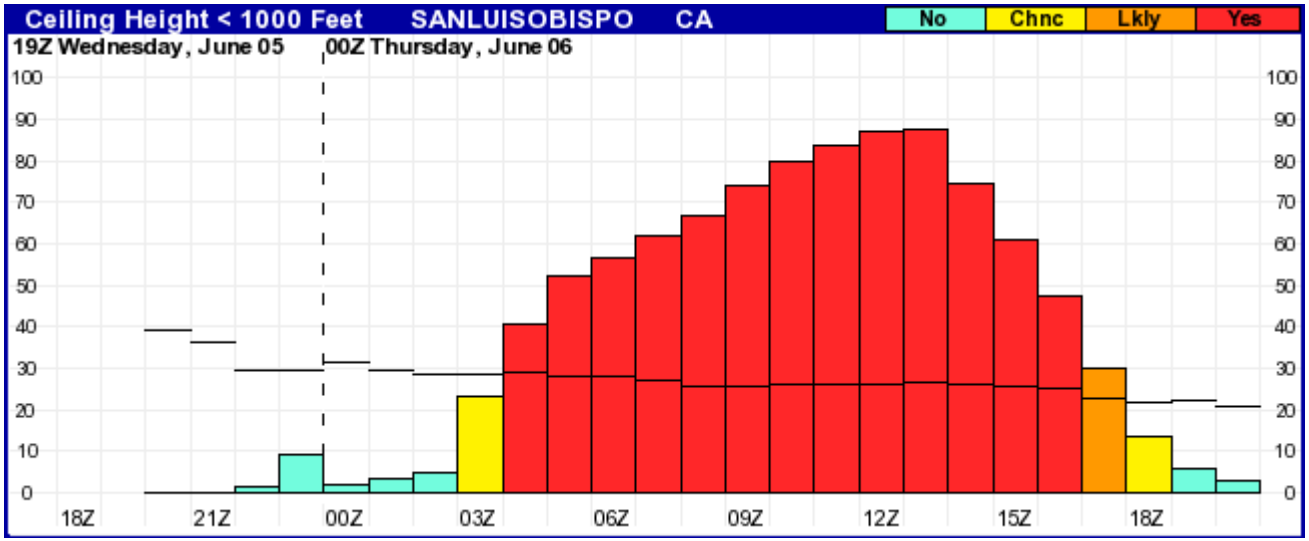

Probabilities (bars) and thresholds (lines)
KSBP
Ceiling height < 1,000 feet

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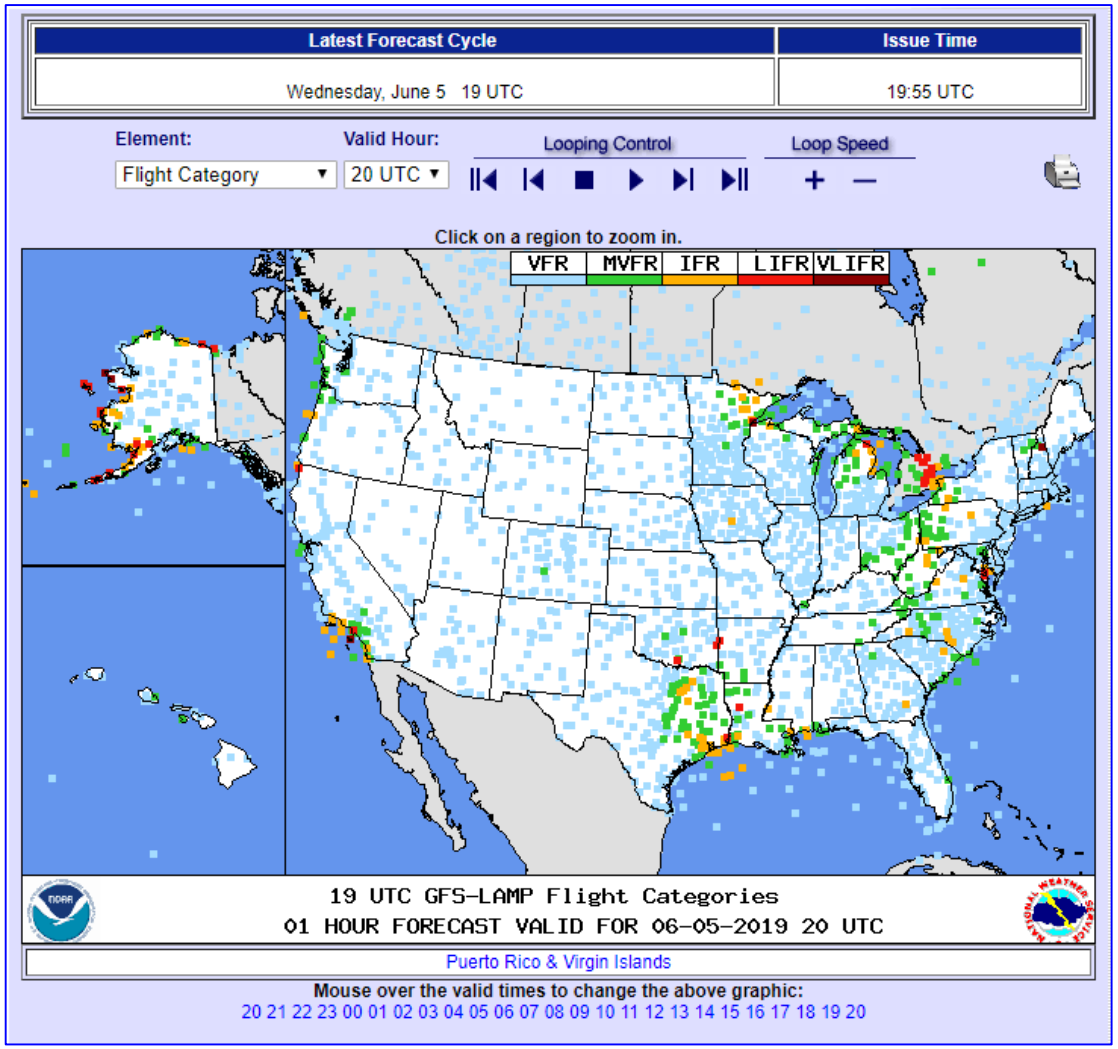

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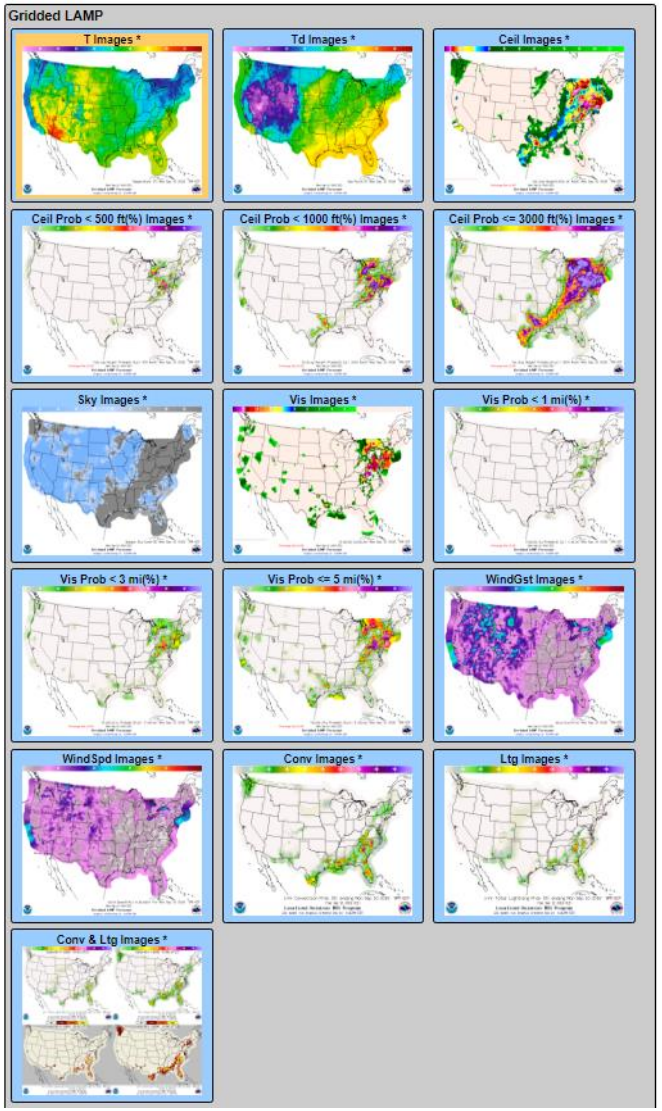

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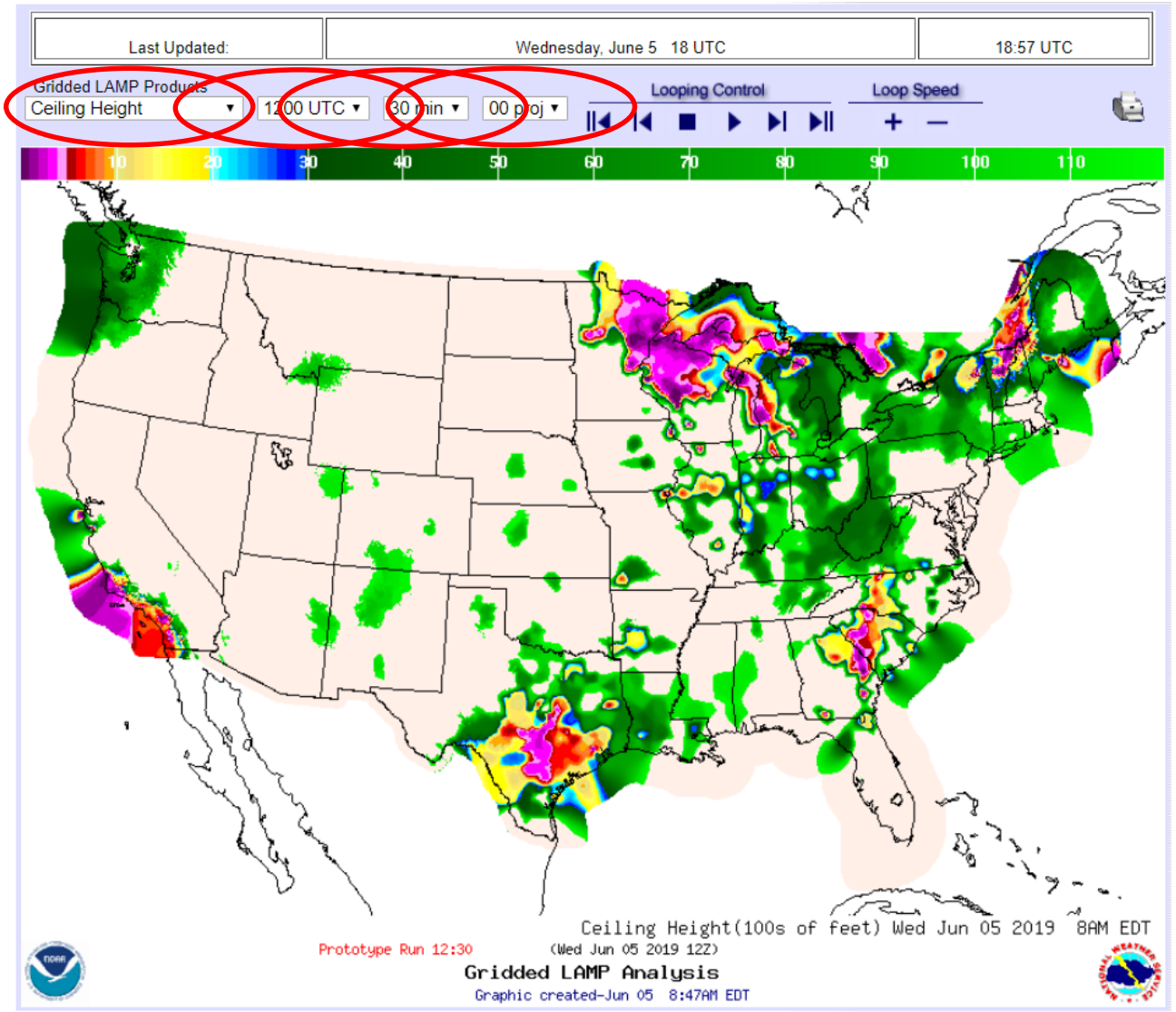

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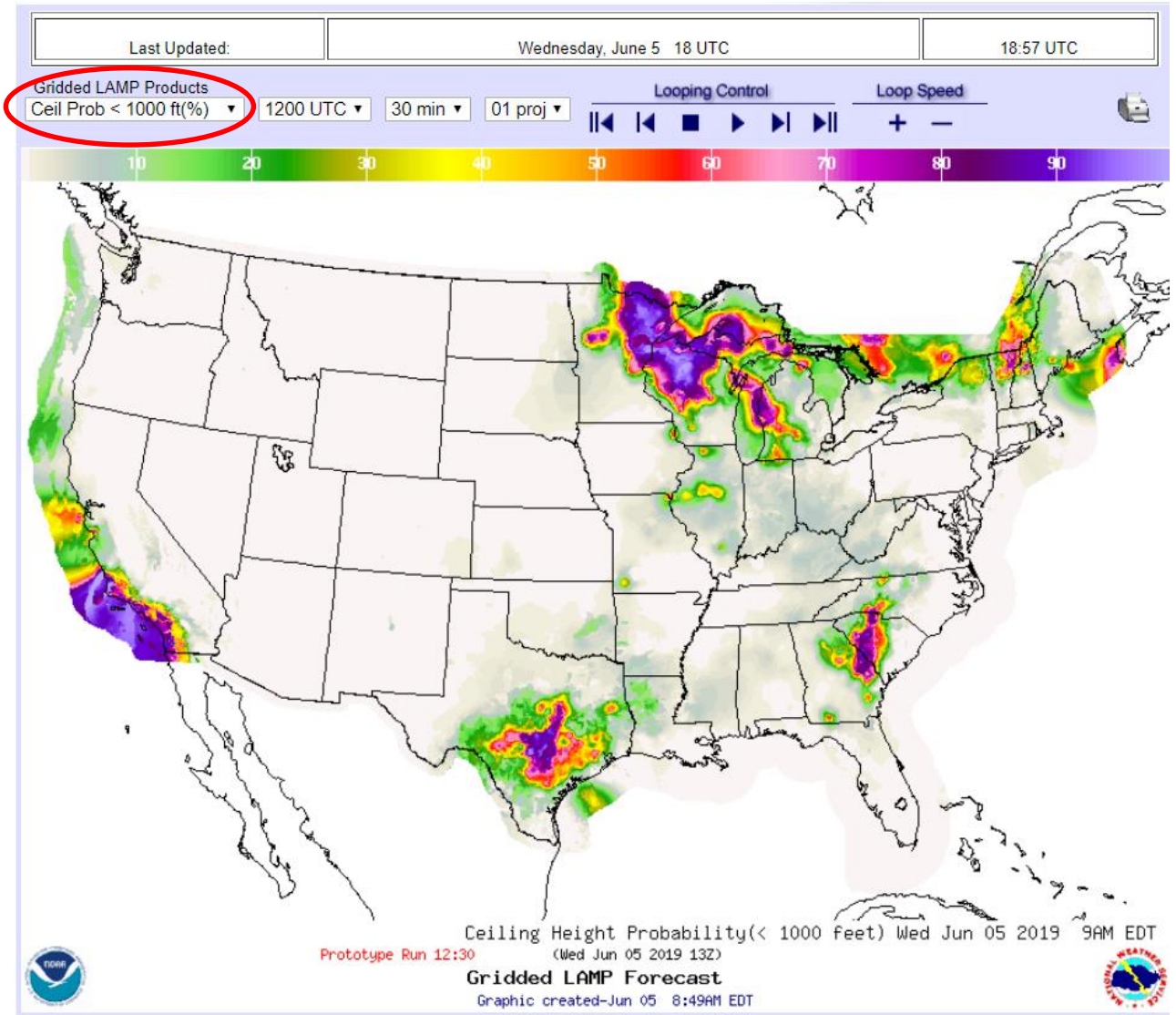

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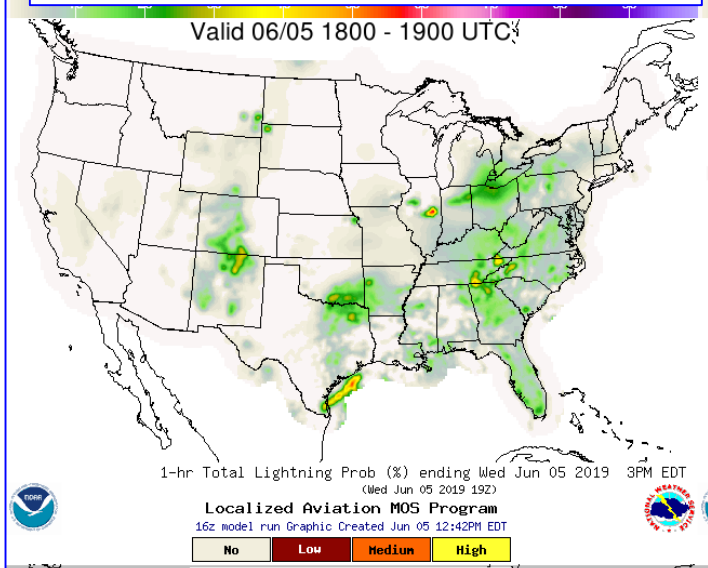
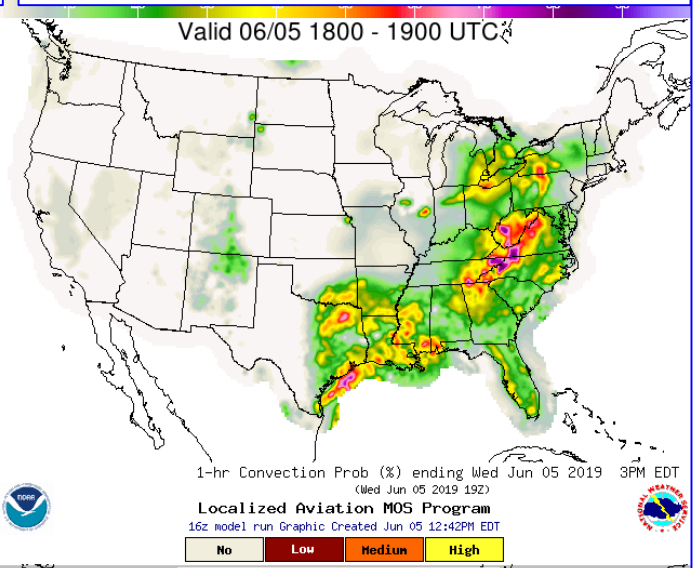
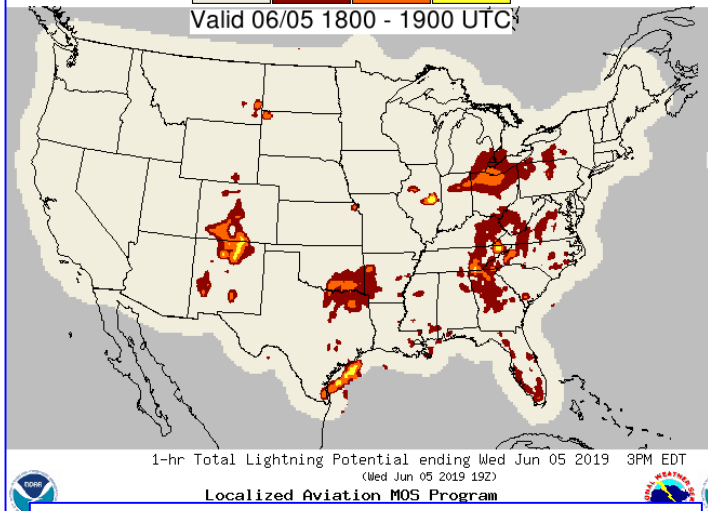
1-h Lightning Probability

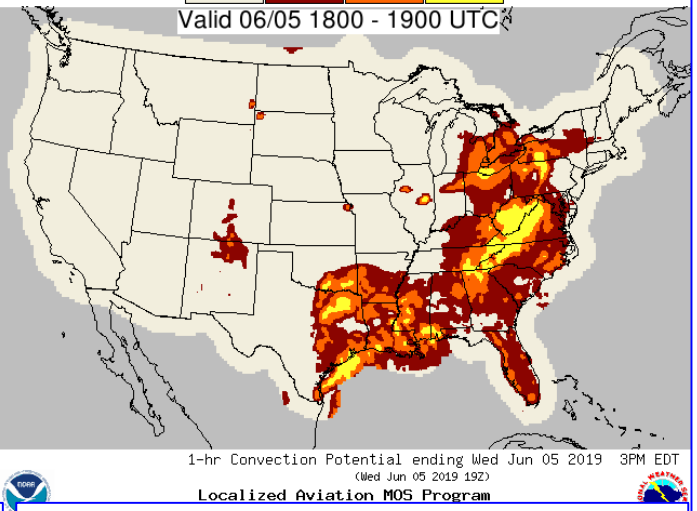


1-h Convection Probability





1-h Lightning Potential



1-h Convection Potential

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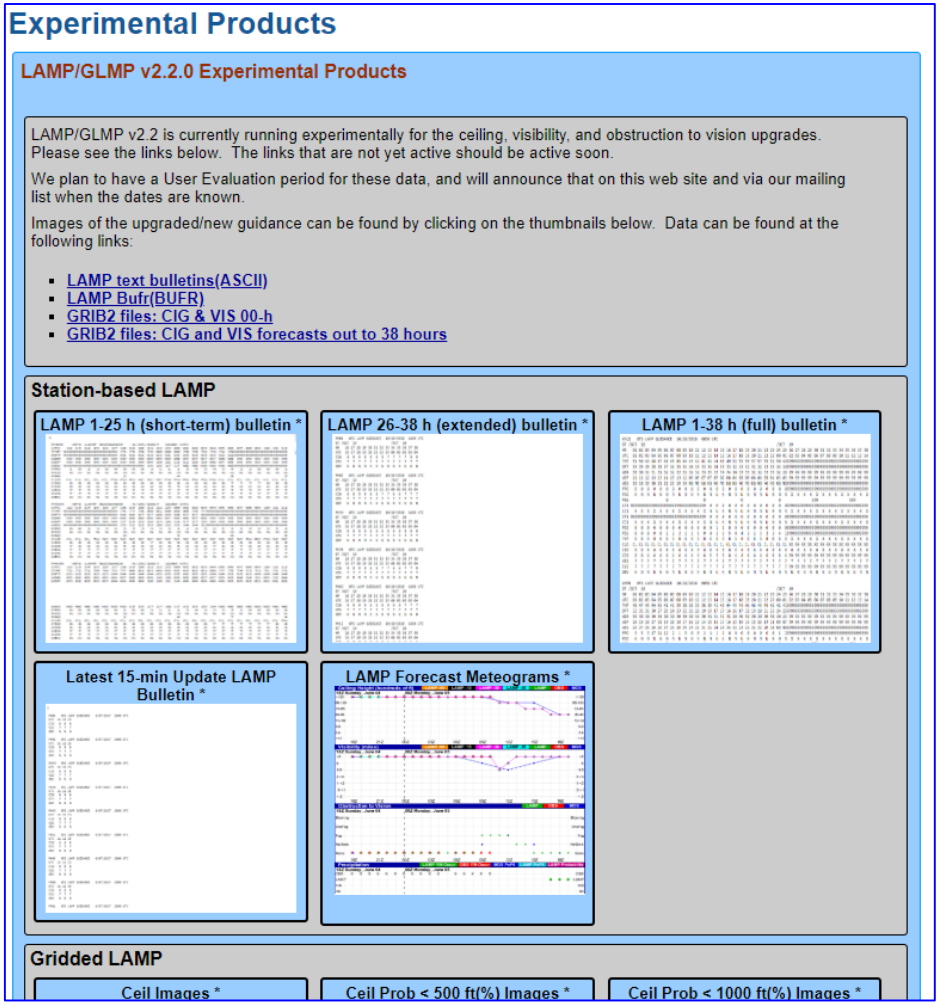
Click here to find experimental guidance that we are currently working on implementing



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LAMP Archive

About the Archived Data

Archived LAMP data are available in a UNIX compressed format in hourly files for all stations for which the guidance is produced. We have archives of these products back through August 2006.

Please be advised that some of these files are large (up to 10 megabytes), and may take time to download depending on time of day, size of the particular archive, and the type of connection you have. These archives are provided as a courtesy, and may not be available 24 hours a day.

To download the files, CLICK on the desired file (year, month, and cycle). If you run a Unix/Linux operating system, simply gunzip the files by typing 'gunzip <filename>'. If you are running a Windows or MAC Operating system, there are many free shareware programs that are available to gunzip Unix compressed files. Examples of such software can be found at the https://www.winzip.com/win/en/.

If you are having trouble finding/downloading data, please contact us and we will do our best to get you the data you need. Thank you!

2019 2018 2017 2016 2015 2014 2013 2012 2011 2010 2009 2008 2007 2006

2019

lmp_lavtxt.201901.0000z.gz
lmp_lavtxt.201901.0015z.gz
lmp_lavtxt.201901.0030z.gz
lmp_lavtxt.201901.0045z.gz
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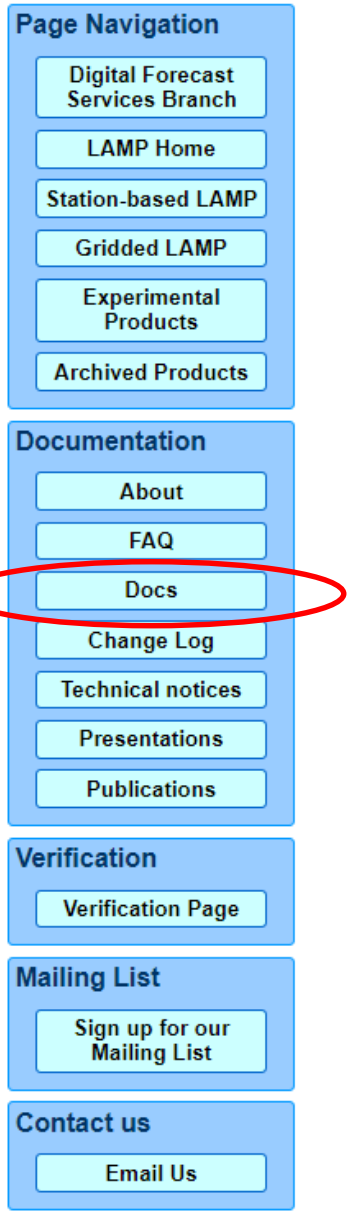

Click here to find documentation:

- Upcoming changes
  - Stations lists
  - WMO headers
  - NWS (ftp) server locations of files

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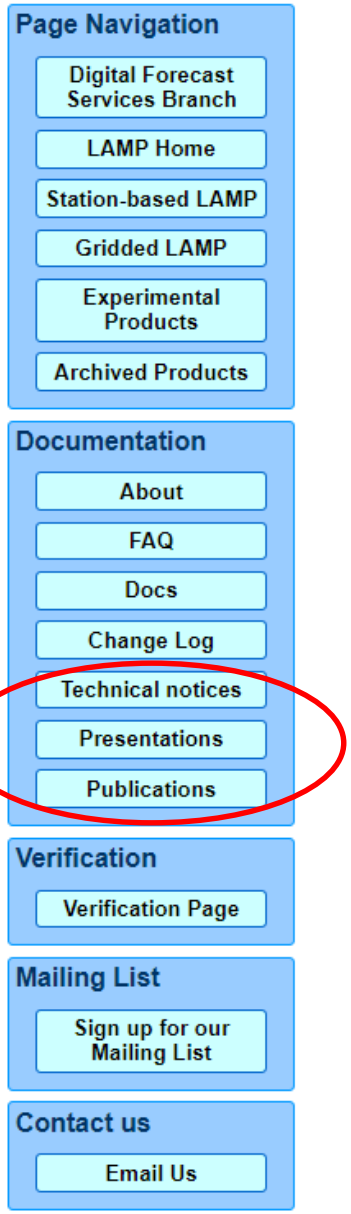
Information For Upcoming LAMP/GLMP v2.2.0 Upgrade. Estimated effective date: July 2019

An upgrade to the LAMP and Gridded LAMP systems is planned to be implemented in NWS Operations July 2019. This section deals with documentation relative to the this upgrade (v2.2.0).

- Presentations: Slide package for User Evaluation (3/10/2019, pptx format, size ~ 14.3 MB).
- LAMP/GLMP v2.2.0 User Evaluation Form **(feedback period open until April 1, 2019)**
- Notifications: Coming Soon!
- Experimental LAMP and GLMP graphics and products: GLMP and LAMP experimental web page.
- The current LAMP and GLMP product locations on the NWS server are unchanged with this implementation. For more details about the locations of these products on the NWS server, please see the links under "Products on NWS server" below.
- The new 1-, 6-, 12-h Probability of Precipitation grid files will be added to the NWS server with this implementation (Coming Soon!).
- The current LAMP and GLMP WMO headers are unchanged with this implementation. For more details about the WMO headers for these products, please see the links under "WMO Headers" below.
- The new GLMP ceiling and visibility headers from projections 26-38 h as well as the new 1-, 6, and 12-h Probability of Precipitation (Coming Soon!).
- Presentations: Science Briefing to NCEP (Coming soon!)
- Additional Stations: With this implementation making the following station changes:
  - Adding LAMP guidance for San Bernadino, CA (KSBD). There will now be LAMP guidance of ceiling height, visibility, obstruction to vision, sky cover, precipitation type, conditional ceiling, and conditional visibility for KSBD.
  - Changing the station identifer for Heber City, UT from K36U to KHCR.
  - In January 2018 we added 332 stations to the LAMP ceiling, visibility, and obstruction to vision guidance. With this implementation, we are adding LAMP sky cover, precipitation type, conditional ceiling, and conditional visibility to those 332 stations, where possible. This new guidance will be added to the text bulletins and the BUFR files.
    - Stations with LAMP additional guidance of sky cover, precipitation type, conditional ceiling, and conditional visibility.
    - New list of all stations with LAMP guidance.
- Description of the new LAMP v2.2.0 GFS LAMP Alphanumeric Text Messages
- LAMP Thresholds (v2.2.0) for AWIPS (effective Summer 2019)

https://www.weather.gov/mdl/lamp_home

LAMP Web Page



Click here to find documentation:

- Technical notices
- Presentations (AMS, NWA, NCEP Briefings, Workshop Presentations) and Training
- Publications

https://www.weather.gov/mdl/lamp_home

LAMP Web Page

Page Navigation
- Digital Forecast Services Branch
- LAMP Home
- Station-based LAMP
- Gridded LAMP
- Experimental Products
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Verification
- Verification Page

Mailing List
- Sign up for our Mailing List

Contact us
- Email Us

Click here to sign up for our mailing list to receive information about:

- Current known outages
- Future anticipated outages
- News about upcoming changes

Instructions for joining LAMP Mail List Server

The purpose of this list is to notify users of changes to LAMP webpages or other LAMP products. In order to subscribe to the LAMP users mailing list, send email to: lyris@infolist.nws.noaa.gov. No subject is necessary.

The body of the message should contain the following:

subscribe lamp_mailing_list pw=your_password

Where your_password is the password you determine. Please use a combination of at least 6 characters/numbers/special characters. Make note of this password as it will be needed to access any previous messages sent to the list server.

After the above process is completed, your request to join the mailing list will need to be approved. Upon approval you will receive an automated welcome message, and thereafter you will receive any emails that are sent to the list. Approved members can read previous messages by going to http://infolist.nws.noaa.gov/read/login.

In order to enter the site, you will be asked to enter the email address where you receive your subscription, and also the password that you determined to use.

If you have any questions or problems please feel free to Email Us.

https://www.weather.gov/mdl/lamp_home

LAMP Web Page

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- Email Us

Click here to contact the LAMP team

Thank you for contacting MDL!

Please send us an email using the form below

For the fastest response, please do the following:

- Select the best fit for your question type in the drop-down menu
- Include the name of the product or project in the subject line
- If you have a question or comment about the webpage design or contents, include the url of the page in the email body

Thank you!

Contact Form

If you want a response, you MUST include your contact information in the Contact Email or inside your message. We cannot reply to you if you do not provide the information.

I have Questions / Comments about:

Choose Topic: LAMP

Your Name:

Affiliation (optional):

Contact Email (your email):

Subject:

Message:

Captcha Image: km2fc5

Type Captcha Here:

Refresh Captcha

Submit Form

https://www.weather.gov/mdl/lamp_home

LMP/GLMP V2.2.0

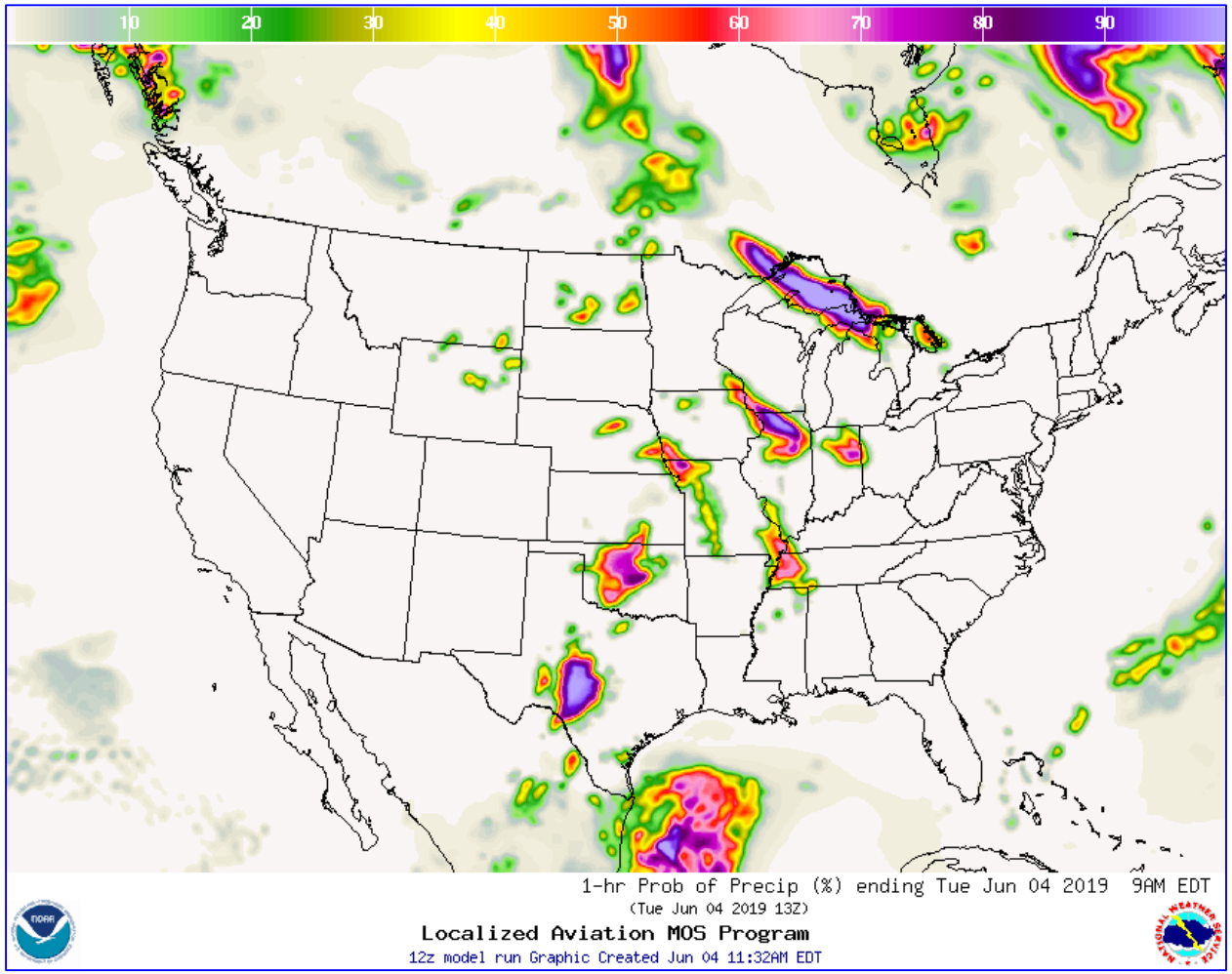
- LAMP supports the National Blend of Models:
  - The National Blend of Models (NBM) provides a skillful and spatially consistent gridded starting point for making National Digital Forecast Database (NDFD) forecasts.
  - The NBM is a key component to the NWS's efforts to evolve and build a Weather Ready Nation.
- Updated GFS MOS Ceiling & Visibility guidance & updated HRRRv3 inputs
  - Not a major "skill" upgrade over current LMP/GLMP. But using upgraded GFS MOS inputs WITHOUT redeveloping would have resulted in degradation of LMP/GLMP forecasts.
  - Most improvement after 16 hours for ceiling/vis (cool season); and for Obstruction to Vision
  - Major benefit is in extension of forecasts out to 38 hours and larger CONUS Domain
- Adding new stations to GLMP inputs
- Expanding grid domain to match the NBM CONUS domain
- Extending LAMP/GLMP C&V guidance from 25-hrs to 38-hrs
- Code handed off April 19, 2019. Implementation planned July 2019

New Elements: Gridded LAMP POPs

- LAMP/GLMP v2.2.0 (January 2019):
  - Adding 1-, 6-, and 12-hr Probability of Precipitation (POP01/POP06/POP12) in CONUS
  - All LAMP cycles out to 38 hours for use in NBM
  - CONUS grid domain to match the NBM CONUS domain
  - MRMS 1-h gauge-corrected QPE used to define predictand
  - Uses ECMWF-based MOS, NAM-based MOS, RAP, HRRR, MRMS, observations as predictors (no GFS MOS component due to upcoming GFS upgrades)
  - Dissemination:
    - Make POP grids available internally to NBM
    - In the future (V2.3), make POP guidance (no ECMWF inputs) available externally for TAF production

New Elements: Gridded LAMP POPs

POP01 *12 UTC June 4, 2019 1-38 h projections*



POP01 loop

Time Extension: Forecasts to 38 hours

- Bulletins:
  - Ceiling, visibility, and obstruction to vision guidance will go out to 38 hours – more elements will be extended in the future
  - Current 1-3 h and current 1-25 h bulletins will continue
  - Cycle time in bulletins will now correctly reflect nominal time of the run (HH00, HH15, HH30, or HH45)
  - Will add separate “extended” bulletin covering 26-38 hours for SBN

```
KPHX   GFS LAMP GUIDANCE   6/05/2019  2130 UTC
DT       /JUNE  7
HR   26 27 28 29 30 31 32 33 34 35 36 37 38
UTC  23 00 01 02 03 04 05 06 07 08 09 10 11
CIG   8  8  8  8  8  8  8  8  8  8  8  8  8
VIS   7  7  7  7  7  7  7  7  7  7  7  7  7
OBV   N  N  N  N  N  N  N  N  N  N  N  N  N
```

  - Will add “full” 1-38 h bulletin to website

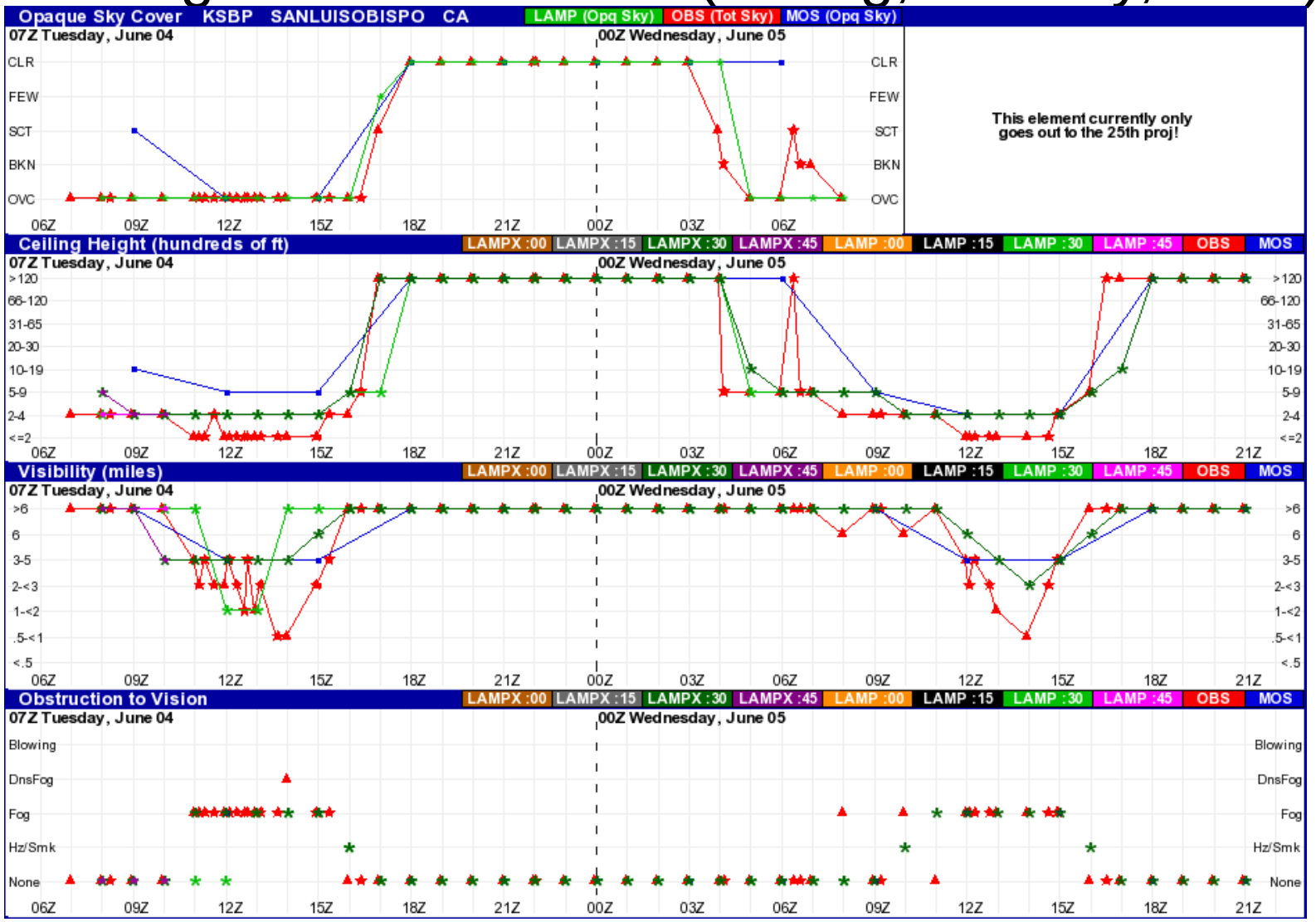
Time Extension : Forecasts to 38 hours

Example of a 38-h “Full” LAMP Bulletin (available on website only):

```
KPHX   GFS LAMP GUIDANCE   6/05/2019  2130 UTC
 DT /JUNE  5/JUNE  6                                                               /JUNE   7
 HR   01 02 03 04 05 06 07 08 09 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38
 UTC  22 23 00 01 02 03 04 05 06 07 08 09 10 11 12 13 14 15 16 17 18 19 20 21 22 23 00 01 02 03 04 05 06 07 08 09 10 11
 TMP  99100100 99 99 97 95 93 91 89 87 86 84 82 81 79 81 84 87 90 93 95 97 99100999999999999999999999999999999999999999
 DPT  37 36 36 35 35 35 36 37 37 38 39 40 41 42 42 42 42 41 40 39 39 38 37 36 36999999999999999999999999999999999999999
 WDR  27 27 27 27 27 27 26 25 25 27 28 31 30 14 12 11 11 11 14 24 25 27 26 26 27 99 99 99 99 99 99 99 99 99 99 99 99 99
 WSP  11 12 11 13 13 11 10 08 08 08 05 05 04 04 05 05 06 06 06 06 06 06 07 09 08 99 99 99 99 99 99 99 99 99 99 99 99 99
 WGS  18 19 18 NG NG NG NG NG NG NG NG NG NG NG NG NG NG NG NG NG NG NG NG NG 16999999999999999999999999999999999999999
 PPO   0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0999999999999999999999999999999999999999
 PCO   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  X  X  X  X  X  X  X  X  X  X  X  X  X
 P06                           0                 0                 0               999               999
 LP1   1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0999999999999999999999999999999999999999
 LC1   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  X  X  X  X  X  X  X  X  X  X  X  X  X
 CP1   0  0  0  0  0  0  1  0  0  0  0  0  1  0  0  0  0  0  0  0  0  0  0  0  0999999999999999999999999999999999999999
 CC1   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  X  X  X  X  X  X  X  X  X  X  X  X  X
 CLD  FW FW FW FW FW FW CL CL CL CL CL CL CL CL FW FW FW FW FW FW FW FW FW FW FW XX XX XX XX XX XX XX XX XX XX XX XX XX
 CIG   8  8  8  8  8  8  8  8  8  8  8  8  8  8  8  8  8  8  8  8  8  8  8  8  8  8  8  8  8  8  8  8  8  8  8  8  8  8
 CCG   8  8  8  8  8  7  7  7  8  7  7  7  8  8  7  7  8  8  8  8  8  8  8  8  8 99 99 99 99 99 99 99 99 99 99 99 99 99
 VIS   7  7  7  7  7  7  7  7  7  7  7  7  7  7  7  7  7  7  7  7  7  7  7  7  7  7  7  7  7  7  7  7  7  7  7  7  7  7
 CVS   7  7  7  7  7  7  7  7  7  7  7  7  7  7  7  7  7  7  7  7  7  7  7  7  7 99 99 99 99 99 99 99 99 99 99 99 99 99
 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  N  N  N  N  N  N  N  N  N  N  N  N  N
```

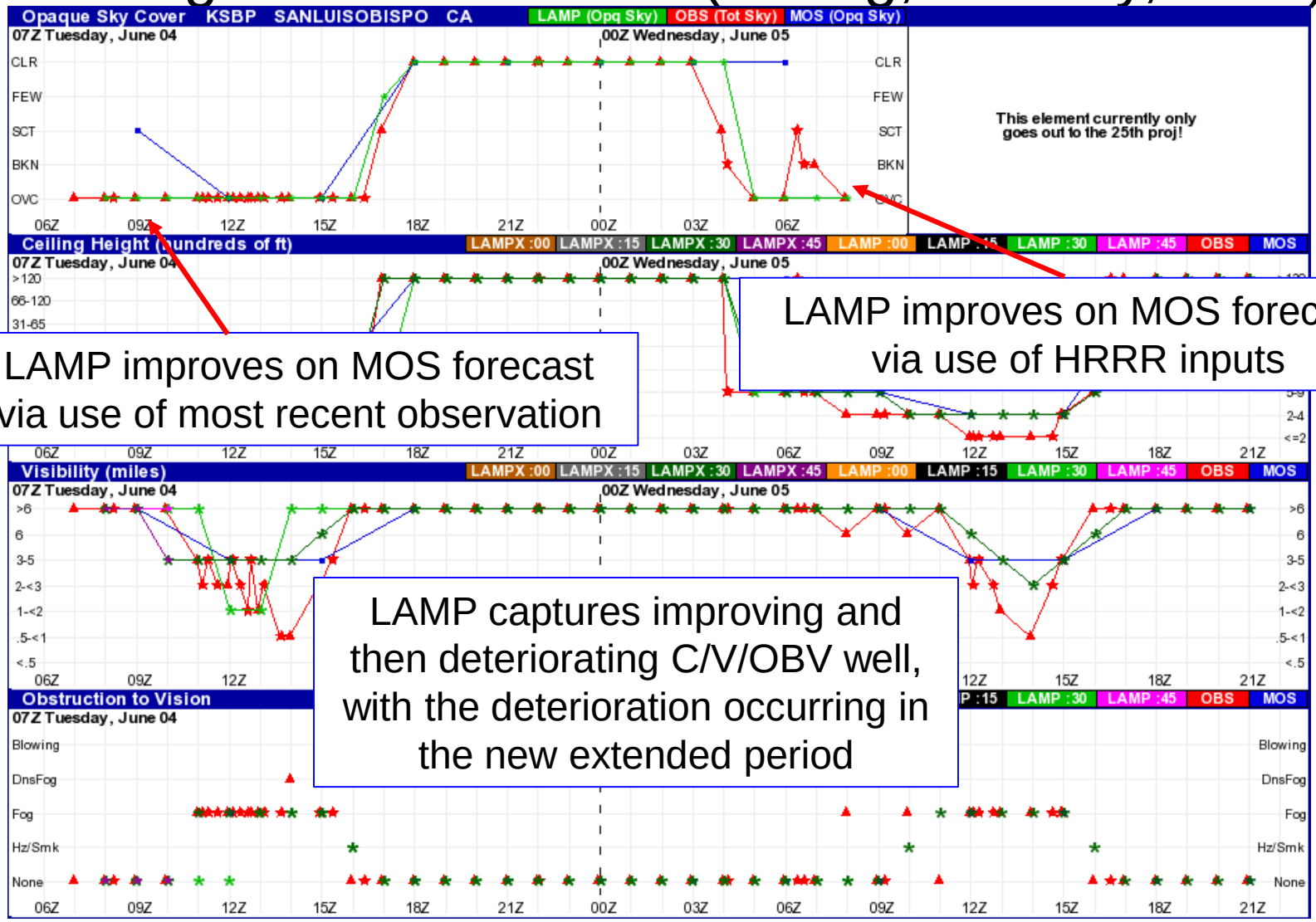
Time Extension : Forecasts to 38 hours

- Meteograms to 38 hours (ceiling, visibility, OBV):



Time Extension : Forecasts to 38 hours

- Meteograms to 38 hours (ceiling, visibility, OBV):



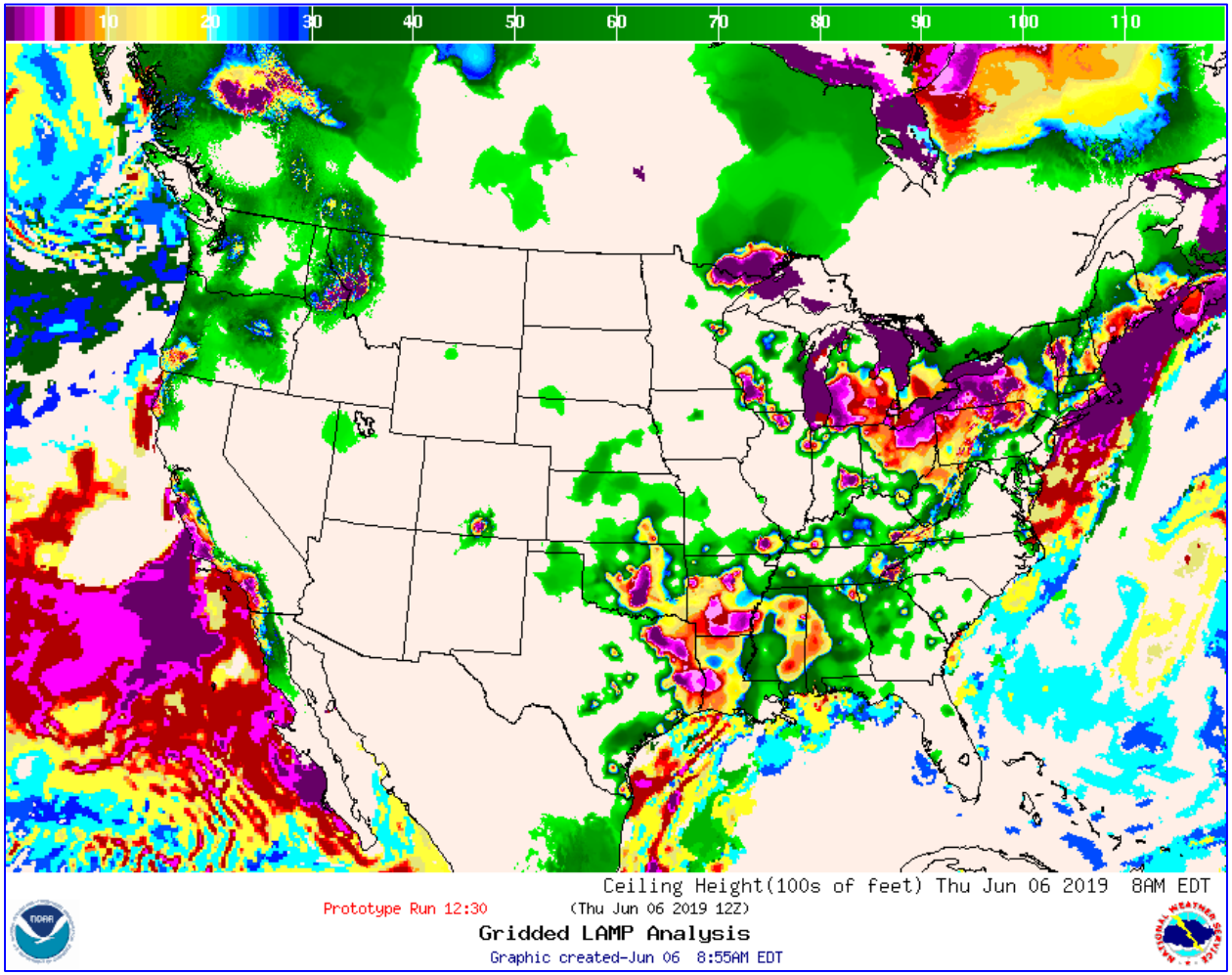
LAMP improves on MOS forecast via use of most recent observation

LAMP improves on MOS forecast via use of HRRR inputs

LAMP captures improving and then deteriorating C/V/OBV well, with the deterioration occurring in the new extended period

Spatial Expansion

- GLMP valid over NBM domain (ceiling, visibility, POP01/POP06/POP12):



Expanded LAMP Grid: C&V grids clipped for SBN and after 17 hours. Full grid sent to NBM, AWC, and NOMADS.

LAMP/GLMP v2.2

Station Additions/Changes (per NWS field requests)

- Add San Bernadino, CA to the GFS-LAMP system:

  KSBD SAN_BERNARDINO CA 34.10N 117.23W

KSBD GFS LAMP GUIDANCE 6/06/2019 1430 UTC

DT	/JUNE 6								/JUNE 7																								/JUNE 8					
HR	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38
UTC	15	16	17	18	19	20	21	22	23	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	00	01	02	03	04
LP1	0	0	0	0	0	0	2	2	3	2	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0999999999999999999999999999999999999999													
LC1	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	X	X	X	X	X	X	X	X	X	X	X	X	X
CP1	0	0	0	0	0	0	1	2	2	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0999999999999999999999999999999999999999													
CC1	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	X	X	X	X	X	X	X	X	X	X	X	X	X
CIG	3	4	8	8	8	8	8	8	8	8	8	8	8	8	8	5	8	8	6	4	3	3	3	3	3	4	5	8	8	8	8	8	8	8	8	8	8	8
VIS	3	5	5	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	6	6	5	4	5	5	5	6	7	7	7	7	7	7	7	7	7	7
OBV	HZ	HZ	HZ	HZ	N	N	N	N	N	N	N	N	N	N	N	N	N	N	HZ	HZ	HZ	HZ	BR	BR	HZ	HZ	HZ	HZ	N	N	N	N	N	N	N	N	N	N

- The identifier for Heber City, UT:

  HEBER_CITY_MUNI_ARPT UT 40.48N 111.43W

  is changing from K36U to KHCR.

KHCR GFS LAMP GUIDANCE 6/06/2019 1430 UTC

DT	/JUNE 6								/JUNE 7																								/JUNE 8					
HR	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38
UTC	15	16	17	18	19	20	21	22	23	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	00	01	02	03	04
LP1	4	3	1	1	2	5	10	7	15	6	8	9	8	9	6	5	6	4	2	1	1	0	0	1	1999999999999999999999999999999999999999													
LC1	N	N	N	N	N	N	N	N	L	N	N	N	N	L	N	N	N	N	N	N	N	N	N	N	N	X	X	X	X	X	X	X	X	X	X	X	X	X
CP1	11	7	3	2	3	5	8	9	18	8	9	9	7	7	5	4	5	4	3	1	0	0	0	0	0999999999999999999999999999999999999999													
CC1	L	N	N	N	N	N	N	N	L	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	X	X	X	X	X	X	X	X	X	X	X	X	X
CLD	BK	BK	BK	BK	BK	BK	BK	BK	BK	BK	OV	OV	OV	OV	OV	OV	OV	OV	OV	BK	SC	SC	SC	SC	FW	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX
CIG	8	8	8	8	8	8	8	8	8	8	8	7	7	7	7	7	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	7	8
CCG	7	7	7	7	7	7	7	7	7	7	7	6	6	6	6	6	6	7	7	7	7	7	7	7	7	99	99	99	99	99	99	99	99	99	99	99	99	99
VIS	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
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	N	N	N	N	N	N	N	N	N	N	N	N	N

- Additional guidance will be added to incomplete stations when and where possible in future implementations.

Summary

LAMP/HRRR v2.2.0 Implementation

- Changes:
  1. Redevelopment of C, V, and OBV guidance
  2. Adding guidance for new elements for 1-, 6-, and 12-hr POP
  3. Time extension to 38-hrs for C, V, POPs
  4. Spatial expansion for C, V, POPs
  5. Miscellaneous station changes for LAMP, adding input stations to Gridded LAMP
- Current schedule: implementation July 30, 2019

Current Work

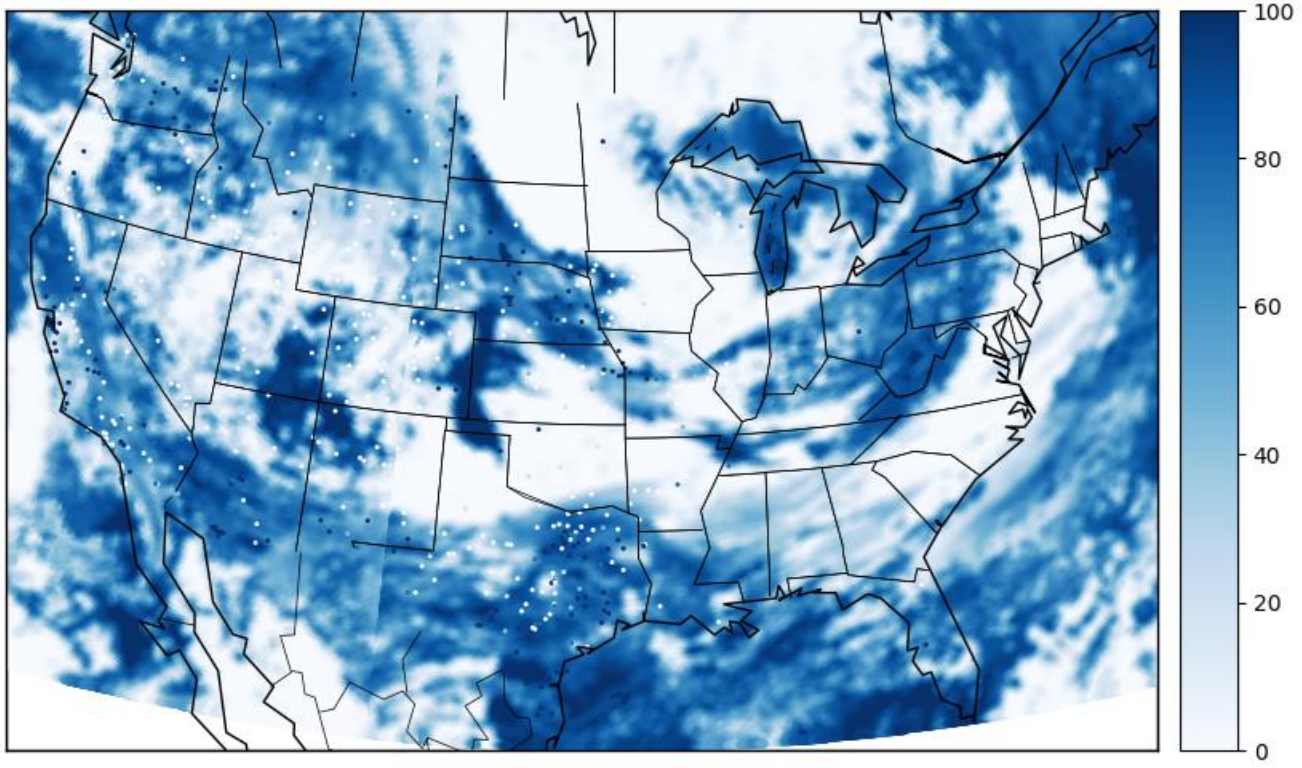
- Updating other LAMP elements to include HRRR/RAP data and cover the 38-h period to support the 30-h TAF and the NBM:
  - Sky cover
    - Redeveloping Sky Cover to include the HRRR at stations (all areas) and on the grid (CONUS)
    - Investigating use of Satellite data to assist with this work – challenges to overcome
    - Implementation winter 2020-2021

METAR overlay vs. METAR + SCP

METAR observations represented by dots (white = clear, dark blue = overcast)

Background data = Effective Cloud Amount Data from CIMSS/University of Wisconsin

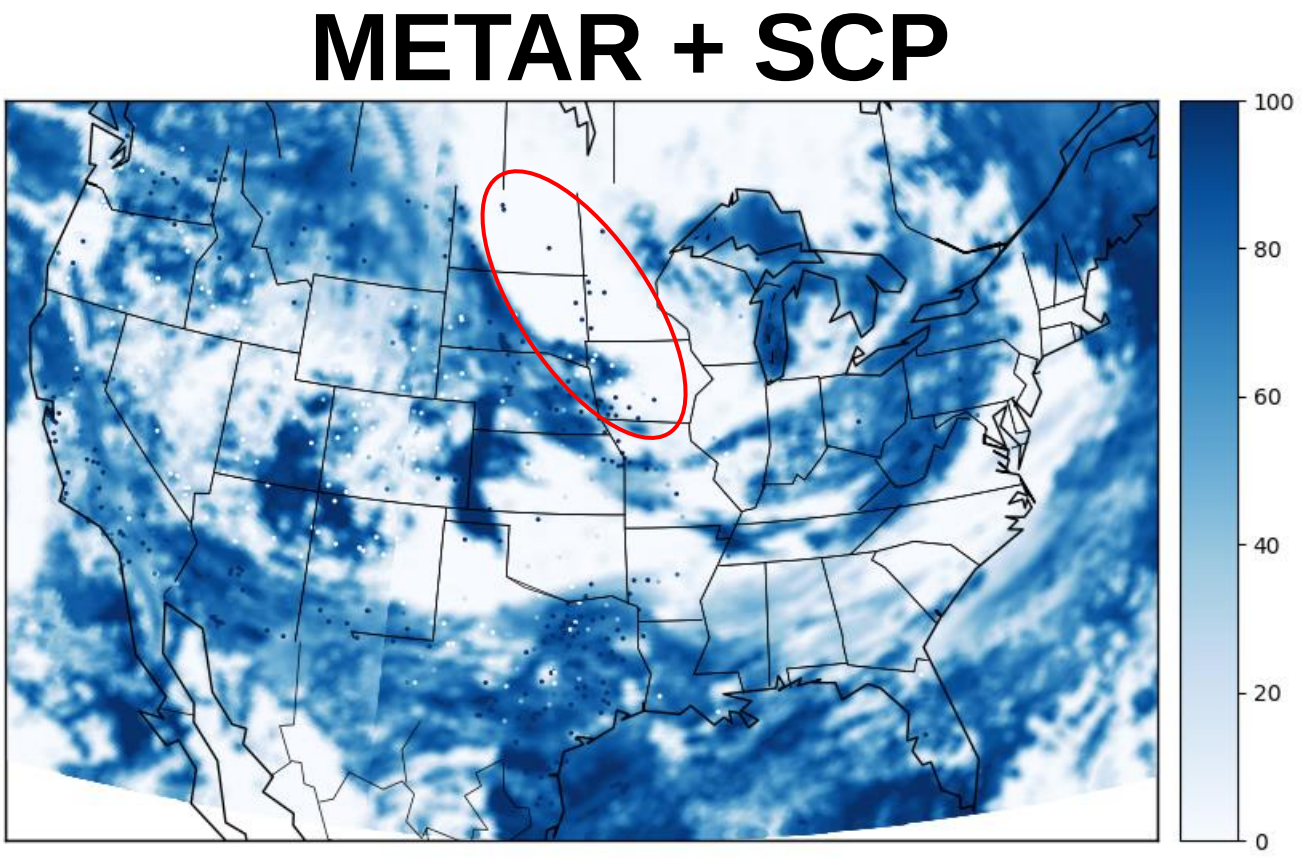
METAR



METAR + SCP overlay

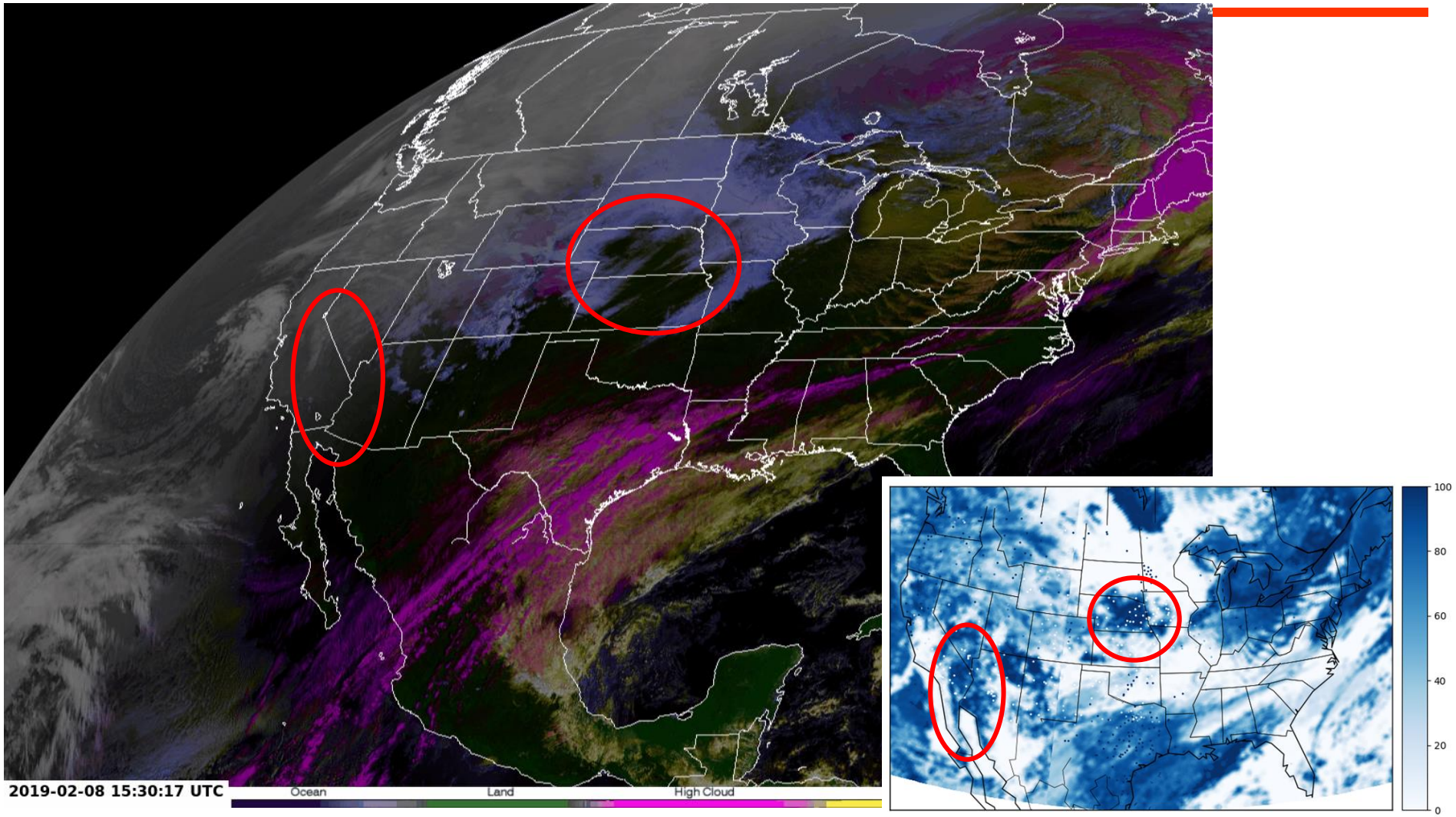
Use of SCP data seems to improve except for the obs circled in red. These are the obs that are affected negatively by missing SCP-East data.

Remainder of SCP-East data is missing as of January 2018. SCP-West data may be lost this summer. Replacements from GOES-16 and GOES-17 planned but not yet operational.



SCP = ASOS Satellite Cloud Product, used to augment METAR observations above 12,000 feet

Challenges with using satellite data



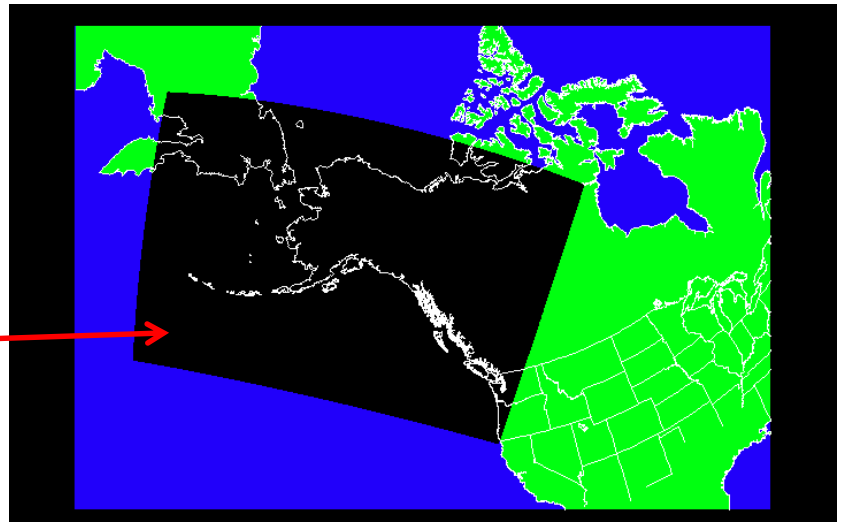
ECAM showing clouds where there are snow boundaries or desert sun glint

Future Work

- Updating other LAMP elements to include HRRR/RAP data and cover the 38-h period to support the 30-h TAF and the NBM:
  - Sky cover
  - Temperature
  - Dewpoint
  - Winds
  - Conditional ceiling
  - Conditional visibility

Future Work

- The Gridded LAMP system is being extended to create gridded guidance over the Alaska domain for:
  - Ceiling height
  - Visibility
  - Convection
  - lightning



- Alaska Gridded LAMP will:
  - follow existing methodology for CONUS Gridded LAMP
  - use Rapid Refresh (RAP) and/or HRRR model output
- Schedule:
  - MDL will work with AWC and AAWU on demonstrations and evaluation
  - Planned AK Gridded LAMP prototype evaluations:
    - Ceiling and visibility 2019; Convection and lightning 2020

* This task is funded through the Office of Atmospheric Research's Joint Technology Transition Initiative

Additional Resources

Additional Resources:

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

- LAMP Experimental website: http://www.weather.gov/mdl/lamp_experimental

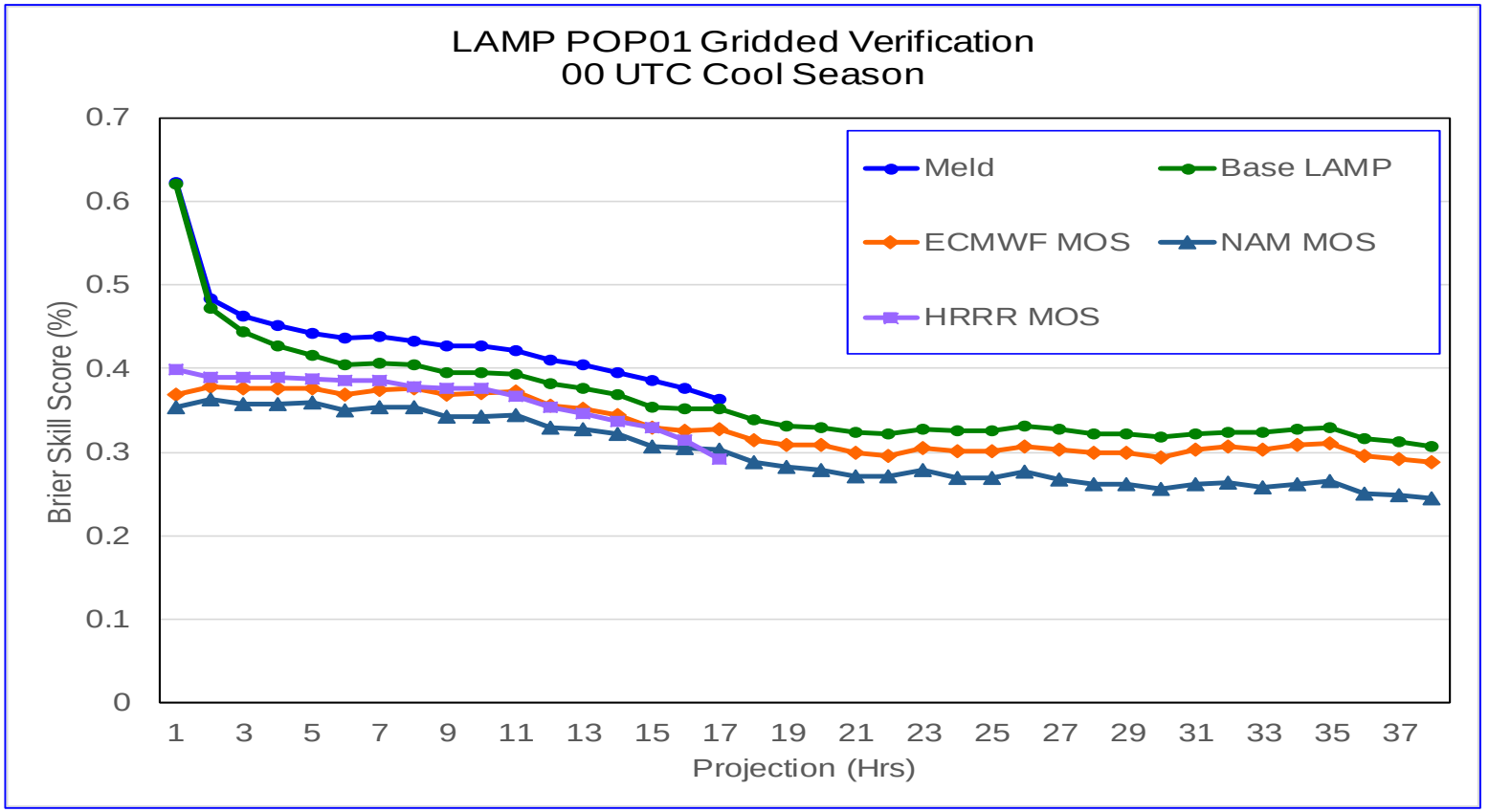
- Contacts: Judy.Ghirardelli@noaa.gov

Thank you!

Backup Slides

New Elements: Gridded LAMP POPs

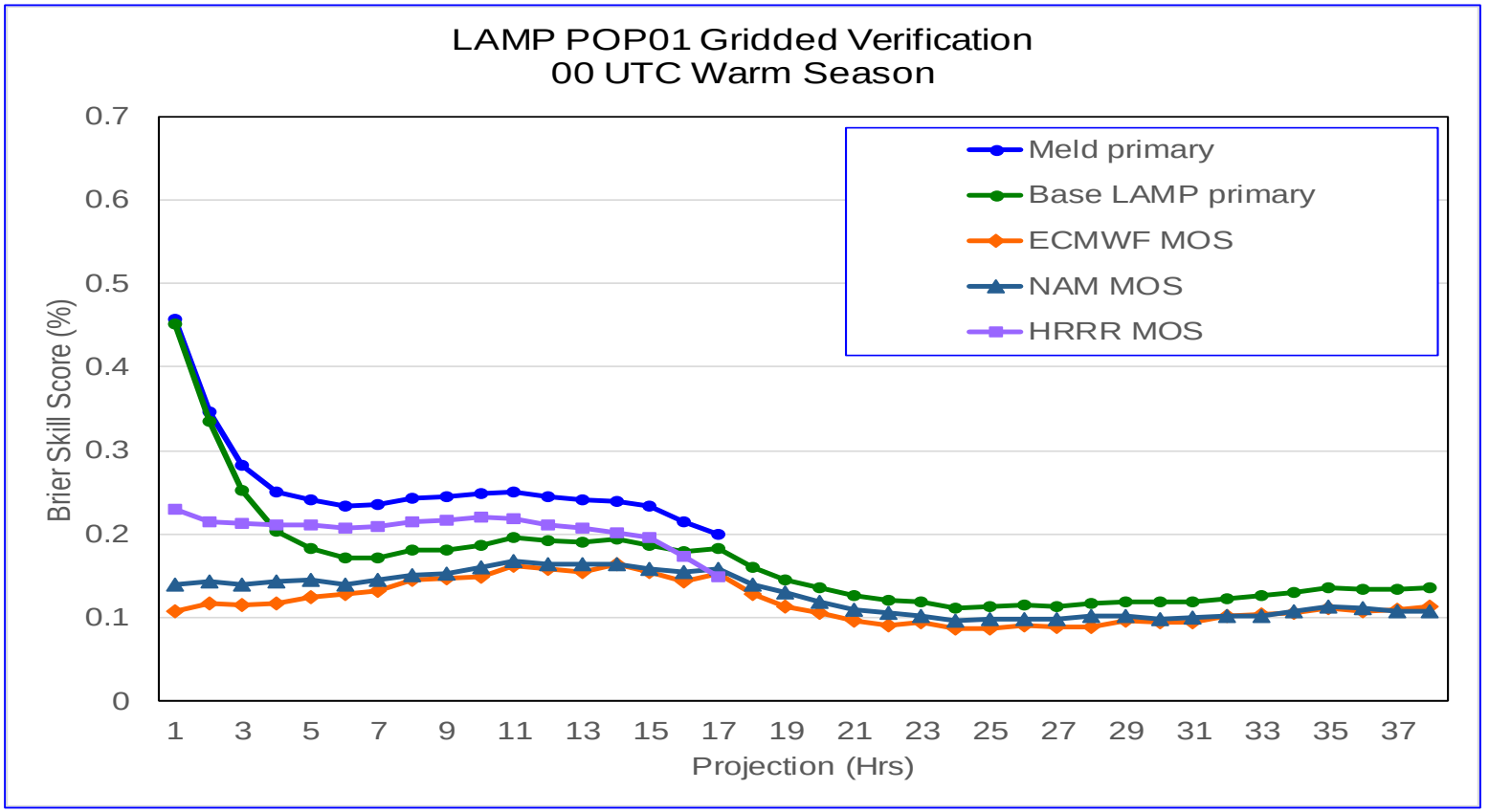
- 1-, 6-, and 12-h Probability of Precipitation (POP01, POP06, POP12) to 38 h; POP01 guidance can aid fine scale timing and positioning of predicted precipitation



POP01 00 UTC Cool

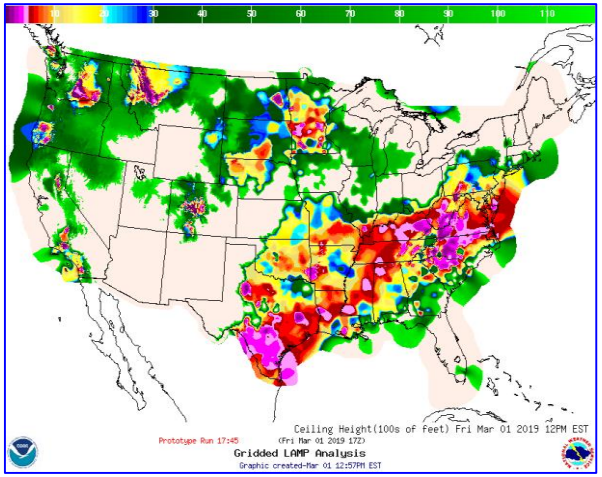
New Elements: Gridded LAMP POPs

- 1-, 6-, and 12-h Probability of Precipitation (POP01, POP06, POP12) to 38 h; POP01 guidance can aid fine scale timing and positioning of predicted precipitation



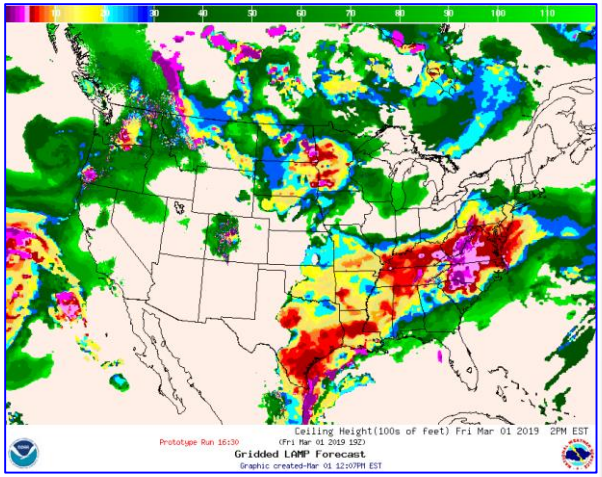
POP01 00 UTC Warm

Mitigation for weakness of grids in ocean: New C&V Grid Details



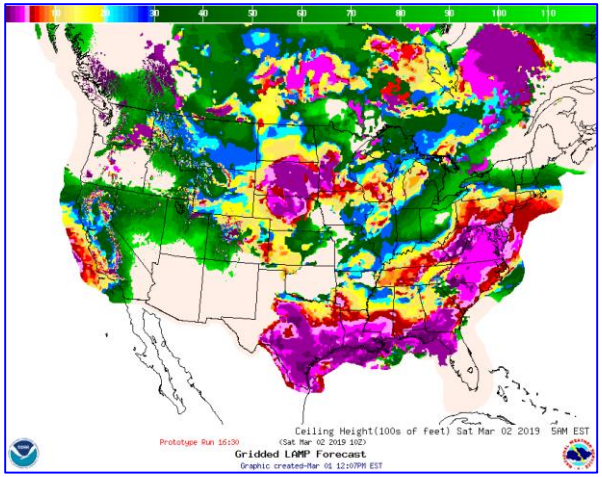
Current Operational: Clipped to CONUS

Grid size: 2145 x 1377



V2.2.0*
00 – 17 hours:
Full NBM Domain

Grid size: 2345 x 1597



V2.2.0*
18 – 38 hours:
NBM Domain with oceans and Gulf of Mexico clipped out

Grid size: 2345 x 1597

- Note: due to requirement to minimize footprint growth on SBN, V2.2.0 C&V Gridded LAMP grids sent on SBN will continue to be clipped to CONUS.
- V2.2.0 C&V Gridded LAMP grids sent to NOMADS and viewable on website will be as above (middle and right).