NATIONAL WEATHER SERVICE

Increased Temporal Resolution of LAMP and Gridded LAMP Forecast Guidance for Ceiling Height & Visibility*

Intermountain West Aviation Weather Safety (IWAWS) Workshop
Salt Lake City, UT, June 21, 2024

Presenter: Phil Shafer, Meteorological Development Laboratory

* Disclaimer: Portions of this research is in response to requirements and funding by the Federal Aviation Administration (FAA). The views expressed are those of the authors and do not necessarily represent the official policy or position of the FAA.

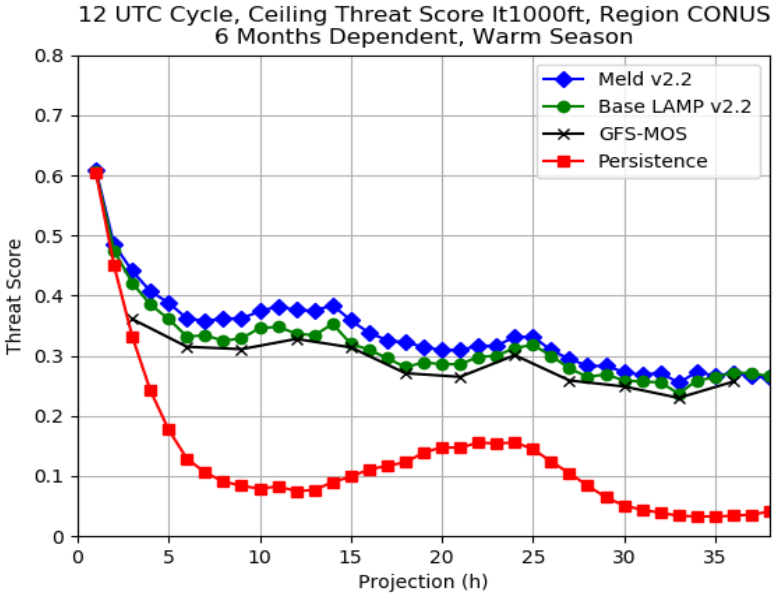
Outline

1. LAMP Background
2. Tour of LAMP/GLMP Web Products
3. LAMP/GLMP 15-minute High Impact Weather (HIW) C&V Guidance
4. Current/Future work

1. LAMP Background

LAMP Background

- What is LAMP? 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 - bridges the gap between the observations and the MOS forecast.
- LAMP guidance covers the short-range period of 1-38 hours for most elements.
- Runs every hour in NWS operations (every 15 minutes out to 3 hours for ceiling and visibility).
- LAMP supports the National Blend of models (NBM).



LAMP Background: Meld Technique

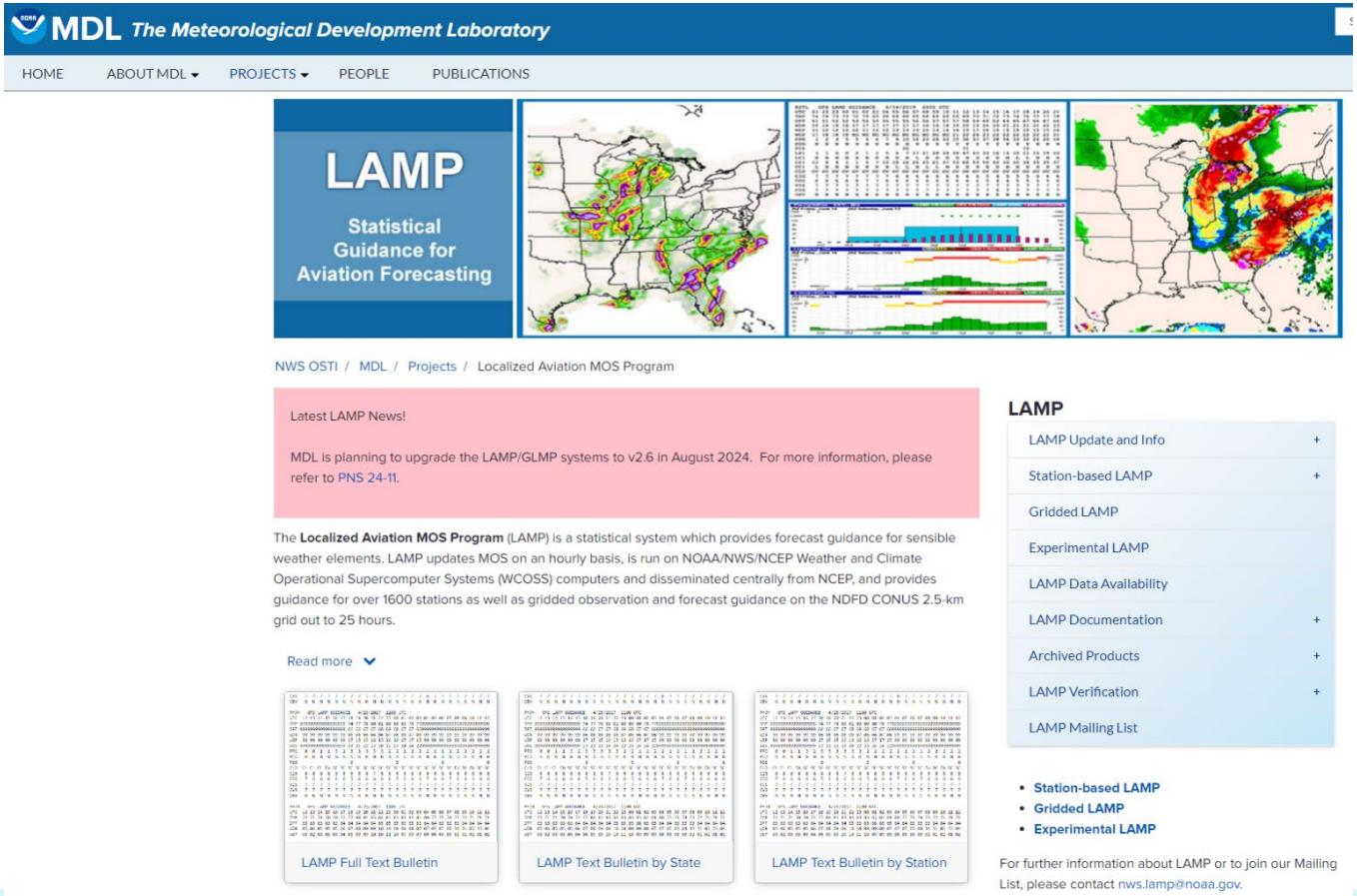
- Step 1: Base LAMP:
  - Station-based Base LAMP = Observations + locally-run models + GFS MOS
  - Technique = Linear Regression where predictors are statistically related to predictands via regression equations
  - Gridded Base LAMP = Station-based Base LAMP analyzed to a grid

- Step 2: Meld LAMP:
  - Station-based Meld LAMP = Obs + Base LAMP + HRRR MOS
  - Gridded Meld LAMP = Gridded Obs Base LAMP + Gridded forecasts Base LAMP + Gridded HRRR MOS
  - Combining HRRR information with Base LAMP results in increased skill

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

2. Tour of LAMP/GLMP Web Products

LAMP Web Page: https://vlab.noaa.gov/web/mdl/lamp



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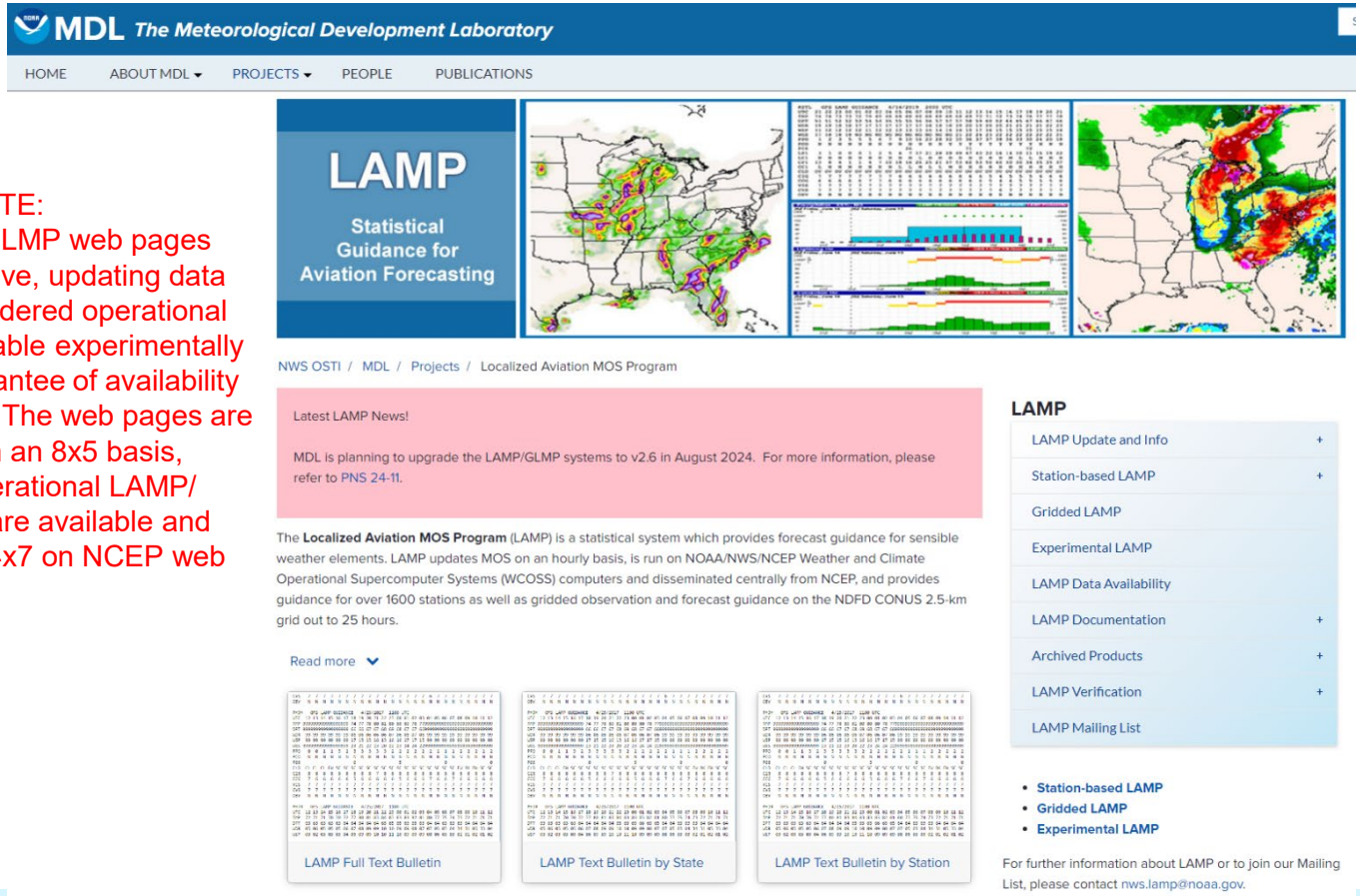
PLEASE NOTE:
The LAMP/GLMP web pages that display live, updating data are not considered operational but are available experimentally with no guarantee of availability in the future. The web pages are supported on an 8x5 basis, while the operational LAMP/ GLMP data are available and supported 24x7 on NCEP web services.



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NWS OSTI / MDL / Projects / Localized Aviation MOS Program / LAMP Update and Info

LAMP Information and Documentation

Information for LAMP/GLMP v2.5 upgrade which was implemented in June 2023.

This section deals with the documentation relative to LMP/GLMP v2.5.

- Presentations (download):
  - Slide package for User Evaluation
  - Science briefing to NCEP Director
- Public Information Statement requesting comments
- Service Change Notice
- Experimental LAMP and GLMP graphics and products: GLMP and LAMP experimental web page.
- Some LAMP and GLMP WMO headers are being discontinued with this implementation. Updated header documents for LAMP and GLMP are available at the following links:
  - LAMP headers effective with implementation of v2.5
  - GLMP headers effective with implementation of v2.5
- Station changes:
  - 335 stations are being added to the text bulletins and BUFR message with this upgrade. The list of added stations can be found here.
  - 33 stations are being removed with this upgrade as a result of MOS guidance no longer being available for these stations. The list of stations being removed can be found here.
- LAMP Thresholds for AWIPS (unchanged with this implementation)

LAMP

- LAMP Update and Info -
- LAMP Prob and Thresh
- LAMP Thresholds +
- LAMP NWS Webservices
- GLMP Background
- LAMP Elements
- LAMP GRIB Encoding +
- LAMP Binary Scaling +
- LAMP Job Sheets
- Station-based LAMP +
- Gridded LAMP
- Experimental LAMP
- LAMP Data Availability
- LAMP Documentation +

Click here for information on most recent implementation

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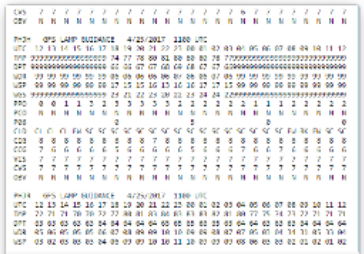
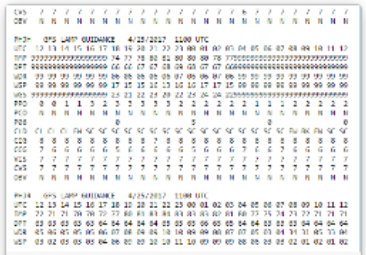
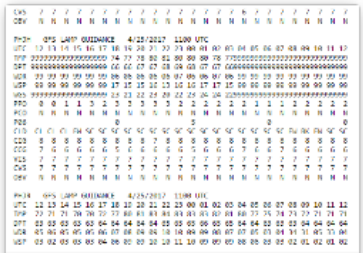


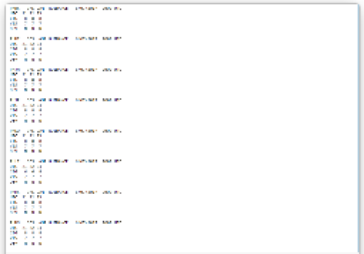
LAMP Full Text Bulletin



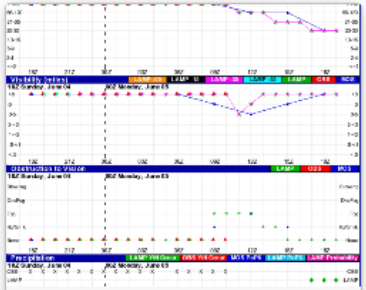
LAMP Text Bulletin by State



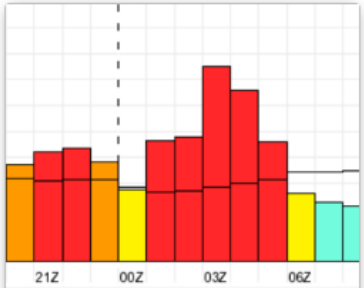
LAMP Text Bulletin by Station



LAMP Bulletin Latest 15 Minute Update



LAMP Forecast Meteograms



LAMP Probability Plots

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

LAMP

- LAMP Update and Info +
- Station-based LAMP +
- Gridded LAMP
- Experimental LAMP
- LAMP Data Availability
- LAMP Documentation +
- Archived Products +
- LAMP Verification +
- LAMP Mailing List

LAMP Web Page: https://vlab.noaa.gov/web/mdl/lamp

```
KSLC    SALT LAKE CITY         GFS LAMP 1130 UTC    6/14/2024
UTC  12 13 14 15 16 17 18 19 20 21 22 23 00 01 02 03 04 05 06 07 08 09 10 11 12
TMP  79 78 81 84 86 88 89 90 92 93 93 93 93 93 92 86 83 80 78 78 77 75 74 72 71
DPT  37 38 39 39 38 37 37 37 36 37 36 36 36 35 36 39 39 39 39 38 39 39 39 39 39
WDR  16 16 16 17 17 18 17 19 24 30 33 33 34 36 35 05 15 16 14 16 15 17 18 16 16
WSP  14 14 15 15 16 16 14 09 08 07 08 10 09 08 07 05 07 07 08 08 08 07 07 09 08
WGS  24 24 25 24 24 24 NG NG NG NG 16 NG NG NG NG NG NG NG NG NG NG NG NG NG NG
PPO   0  0  0  0  0  0  0  0  0  0  0  1  1  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
P01   0  0  0  0  0  0  0  0  1  2  2  2  1  1  1  1  2  3  5  4  3  4  2  3  4
PC1   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                    5                    9           9
LP1   0  0  0  0  0  0  0  0  0  4  5  6  3  2  2  1  1  1  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  1  1  0  0  0  0  3  5  6  3  3  2  2  0  0  0  0  0  1  1  1  1
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  BK BK BK BK BK BK SC SC SC SC SC SC SC SC SC BK BK BK BK BK BK BK BK BK BK
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  8  8  8  8  8  8  8  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  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
```

Click here to find LAMP text bulletins

LAMP

- LAMP Update and Info +
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- LAMP Verification +
- LAMP Mailing List

LAMP Web Page: https://vlab.noaa.gov/web/mdl/lamp

Click here for meteograms showing future guidance

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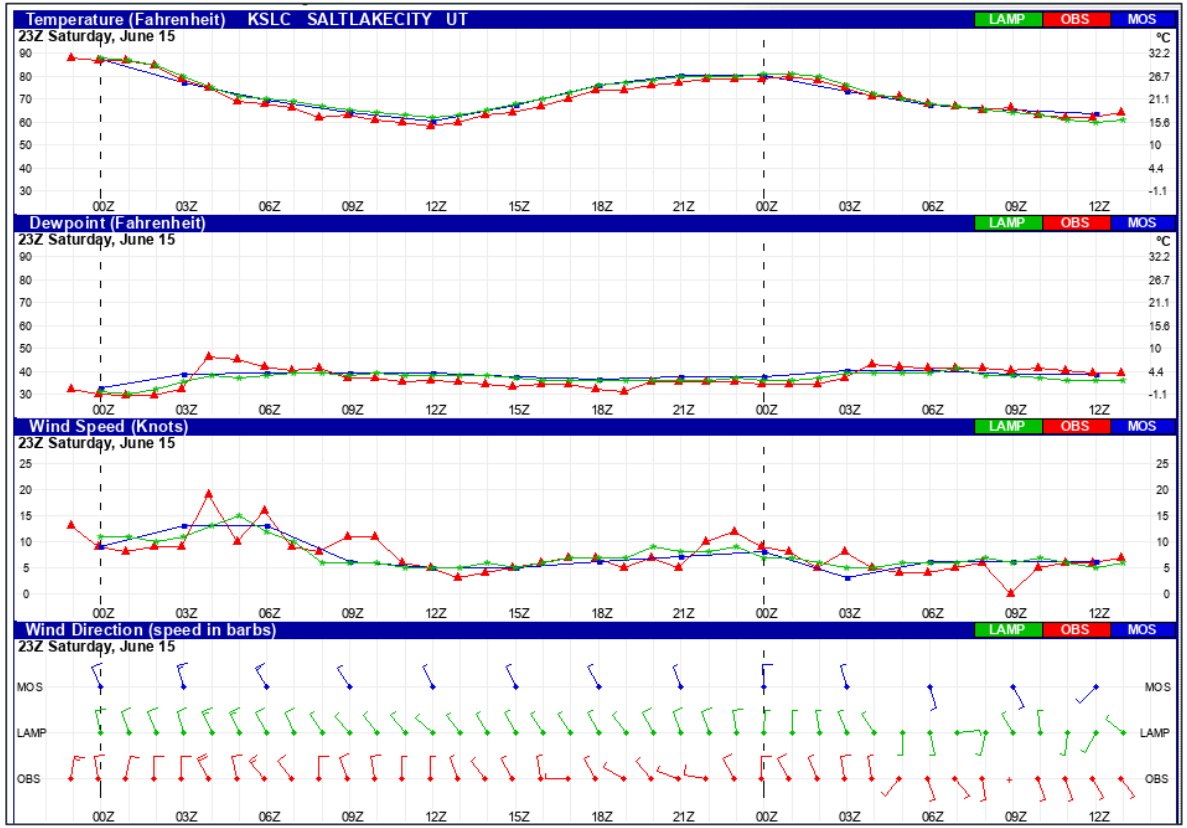

Click here for meteograms showing past guidance and verifying observations

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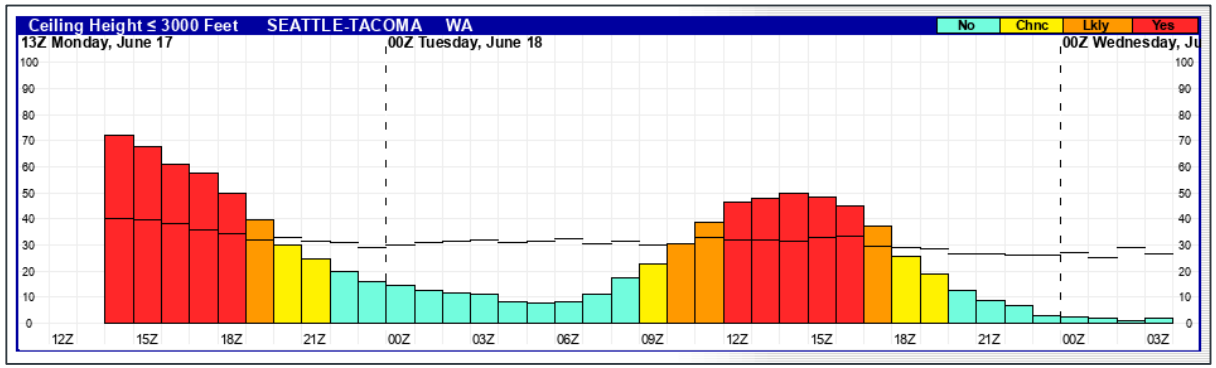

Probabilities (bars) and thresholds (lines) KSEA
Ceiling height <= 3,000 feet

Click here for LAMP Probability and Threshold Plots

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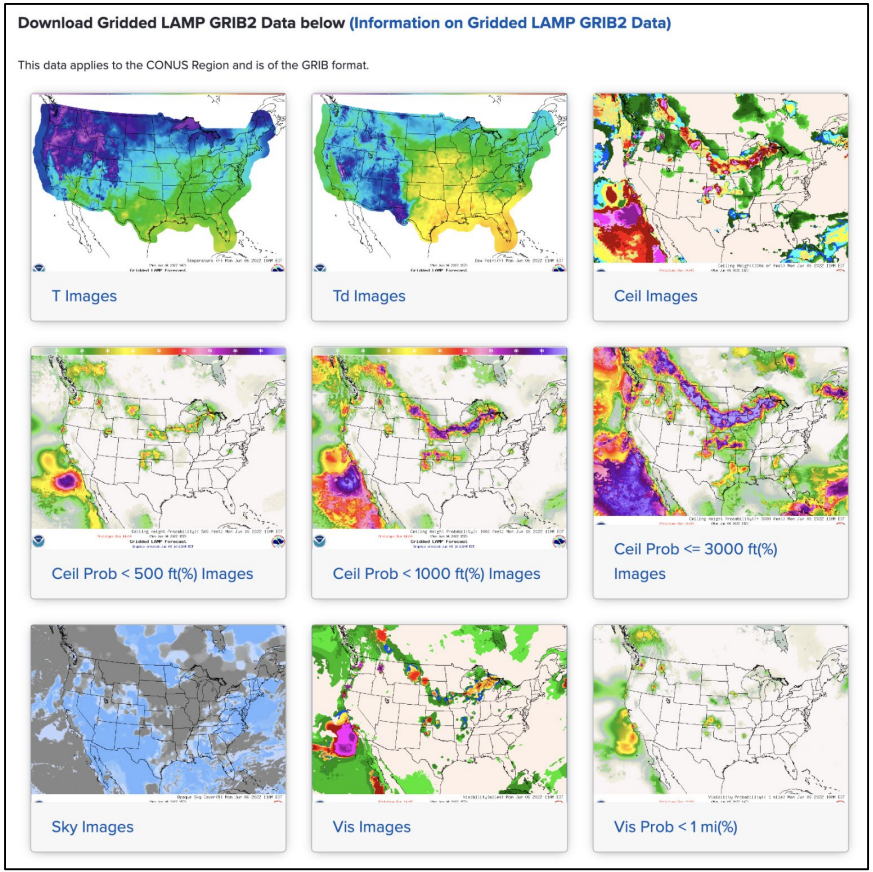

Click here to find real-time gridded forecast guidance

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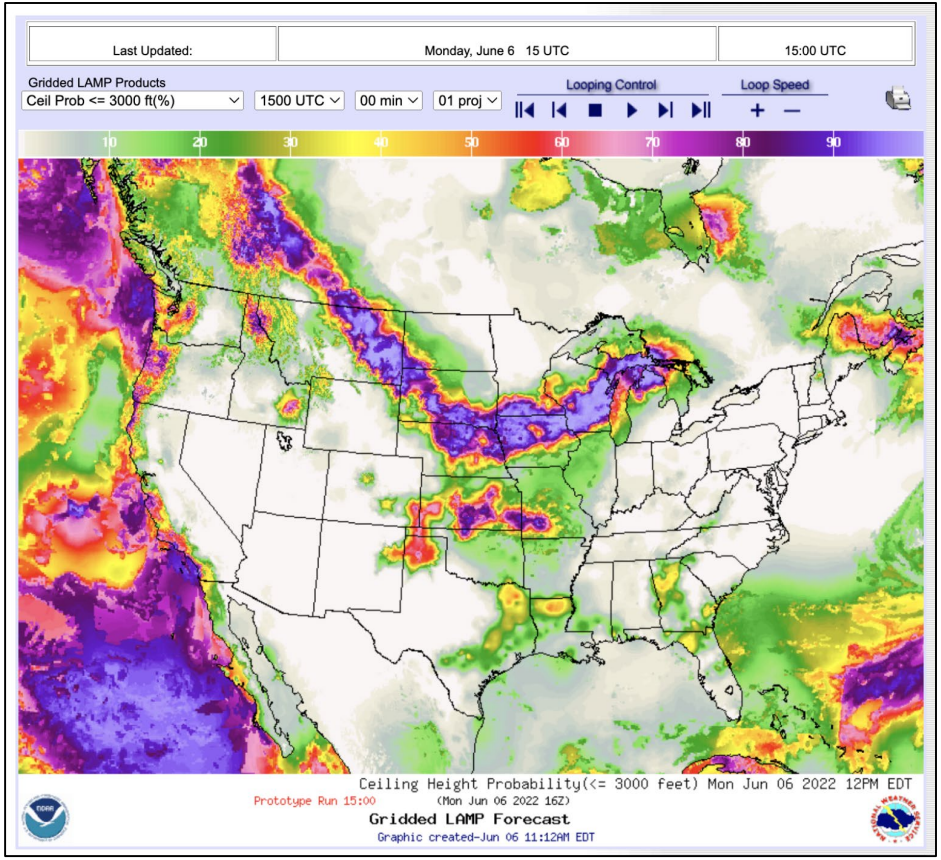

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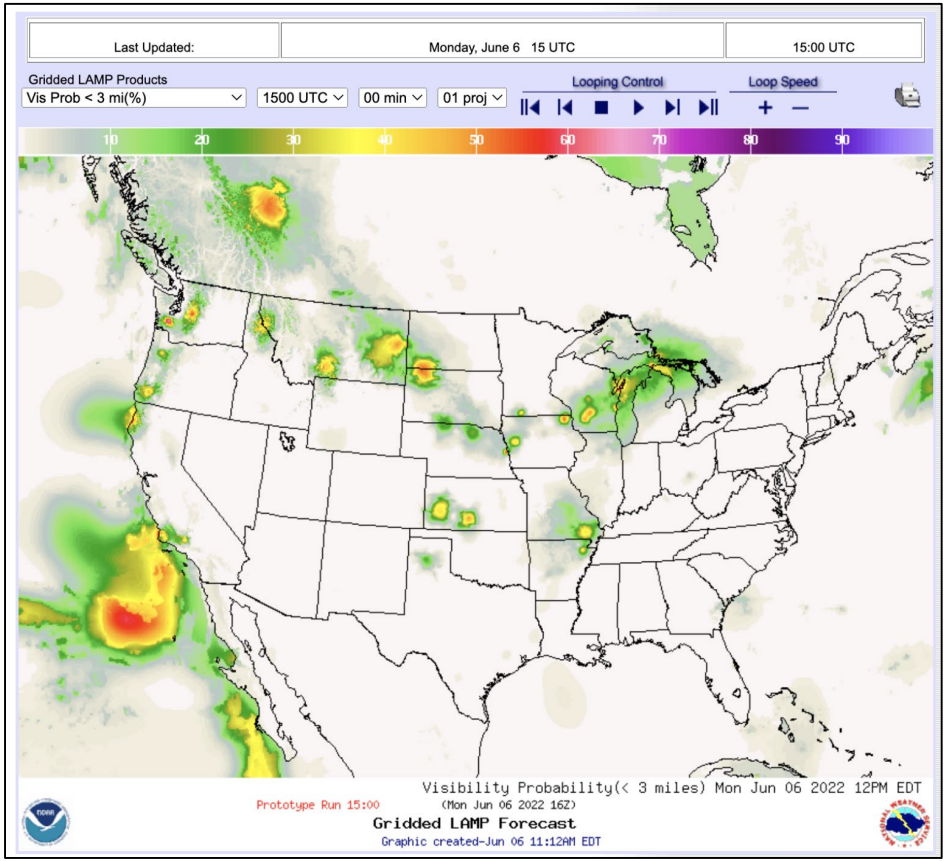

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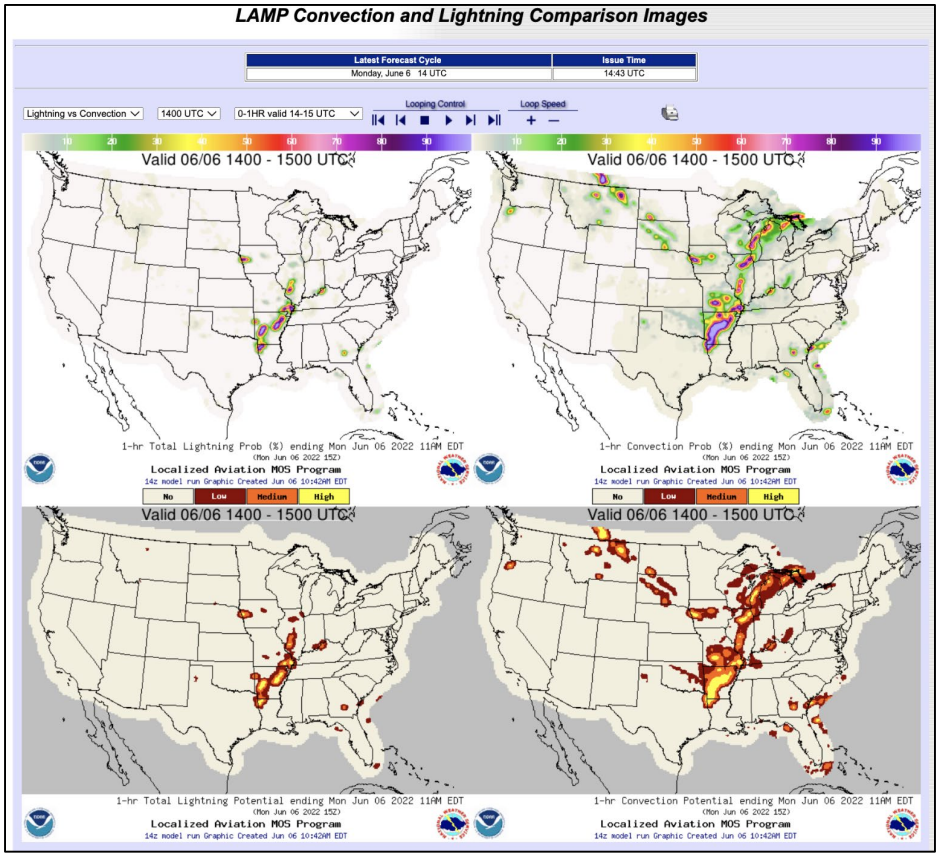

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NWS OSTI / MDL / Projects / Localized Aviation MOS Program / Experimental LAMP

Latest LAMP News!

MDL is planning to upgrade the LAMP/GLMP systems to v2.6 in August 2024. For more information, please refer to PNS 24-11.

LAMP/GLMP Experimental Products

NWS/MDL has solicited comments on the proposed LAMP and Gridded LAMP v2.6 upgrade via the following Public Information Statement: PNS 24-11 and will implement the changes on or about August 10, 2024.
Summary of proposed changes (see PNS for further details):

For more details, please see our slides detailing the "User Evaluation Information for LAMP/GLMP v2.6 and Proposed Termination of LAMP Station Plot Webpage" at this link.

(1) Addition of station-based guidance for ceiling height and visibility valid for 15-minute periods out to six hours, updated every 15 minutes (96 cycles per day). This will include guidance for the lowest category ceiling height and lowest category visibility condition that is forecast to occur during each 15-minute period. The guidance will be produced in a text bulletin format that displays ceiling height and visibility categories valid for 15-minute periods out to six hours for 1841 CONUS stations.

(2) Addition of GLMP guidance for ceiling height and visibility valid for 15-minute periods out to six hours, updated every 15 minutes (96 cycles per day). This will include probabilistic and deterministic guidance for the lowest ceiling height and lowest visibility condition that is forecast to occur during each 15-minute period. The guidance will be produced in GRIB2 format on the National Blend of Models (NBM) CONUS domain for the following variables:

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

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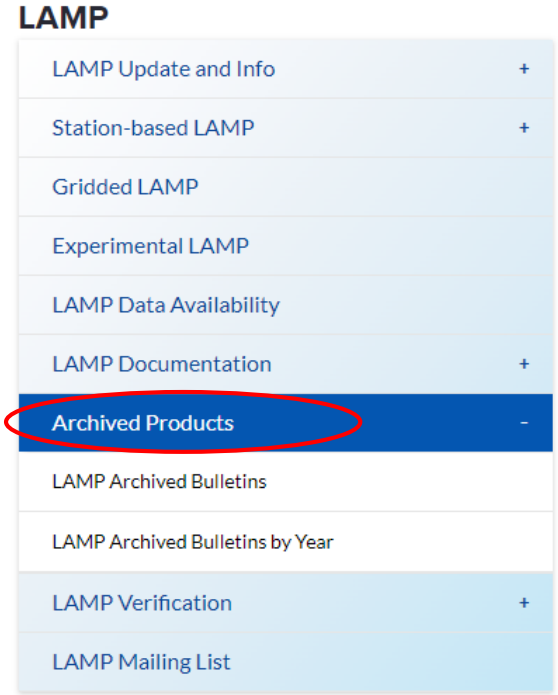
NWS OSTI / MDL / Projects / Localized Aviation MOS Program / Archived Products

Active Products

Product	Format	Archive URL
LAV Text Messages	Text	https://vlab.noaa.gov/web/mdl/lamp-archived-bulletins
LAV Text Messages	Text	https://vlab.noaa.gov/web/mdl/lamp-archived-bulletins-year
Convection and Lightning Probability and Potential GRIB2 Files	GRIB	https://lamp.mdl.nws.noaa.gov/glmp/lamp_archive_cnvltg.php

Click here to find archived LAMP products



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Instructions for joining LAMP Mail List

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- If you have questions or to report a problem.
- To request to be added to our email list for notifications so that you will be aware of changes to LAMP webpages or other LAMP products.

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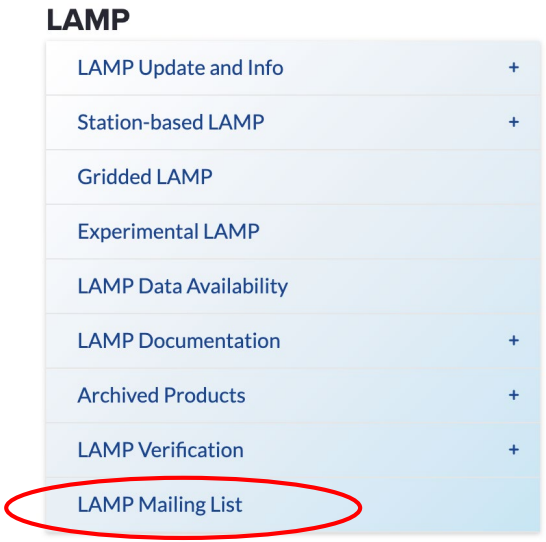

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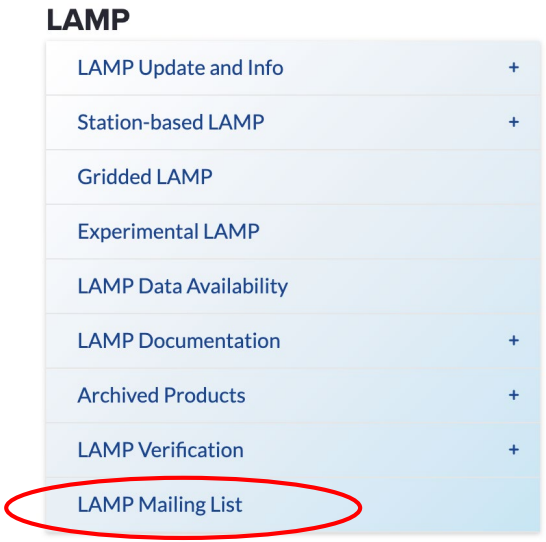


3. LAMP/GLMP 15-Minute High Impact Weather (HIW) C&V Guidance

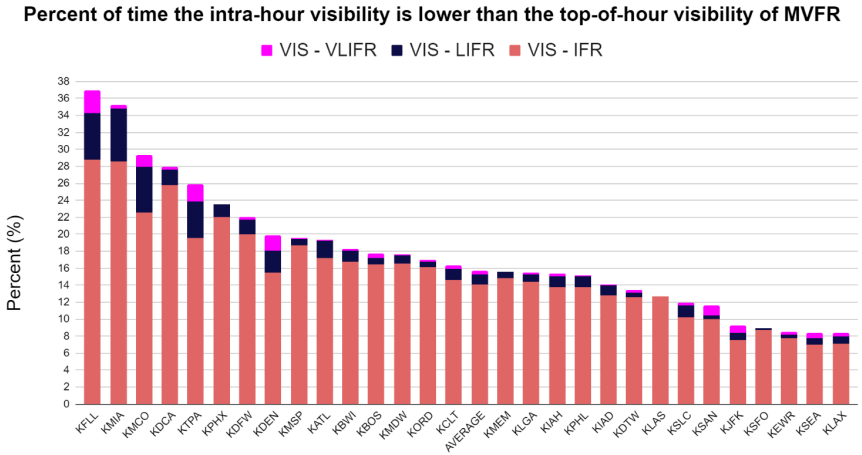
Increasing Temporal Resolution of GLMP

- Current Gridded LAMP forecast projections are hourly, valid at the top of the hour.
- MDL was tasked by the Federal Aviation Administration Aviation Weather Research Program (FAA AWRP) to increase the temporal resolution of Gridded LAMP ceiling height and visibility guidance from 1 hour time steps to 15 minute time steps in the first six hours of the forecast period.
  - Aviation decision-making operators, including the Helicopter Air Ambulance operators, use the NWS Aviation Weather Center (AWC) Graphical Forecasts for Aviation - Low Altitude (GFA-LA) platform which currently uses GLMP data to update every 15 minutes with the latest observational and hourly forecast data.
  - GFA-LA users requested a higher temporal resolution C&V forecast to support decision making.
  - Providing updated GLMP guidance for C&V every 15 minutes for 15-minute periods (instead of valid at the top of the hour) will help fill the gap in the GFA-LA tool.

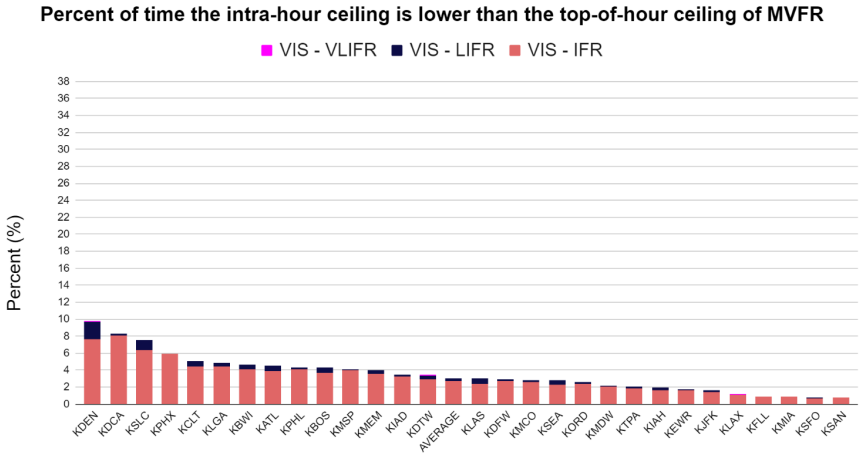
Subhourly High Impact Weather

How often do top of hour observations miss impactful events during the hour?

Visibility



Ceiling



- Forecasts focused on predicting C&V at the top of the hour miss impactful C&V that occur between the hours.
- Intra-hour variability higher for visibility than for ceiling.

High Impact Weather C&V Development

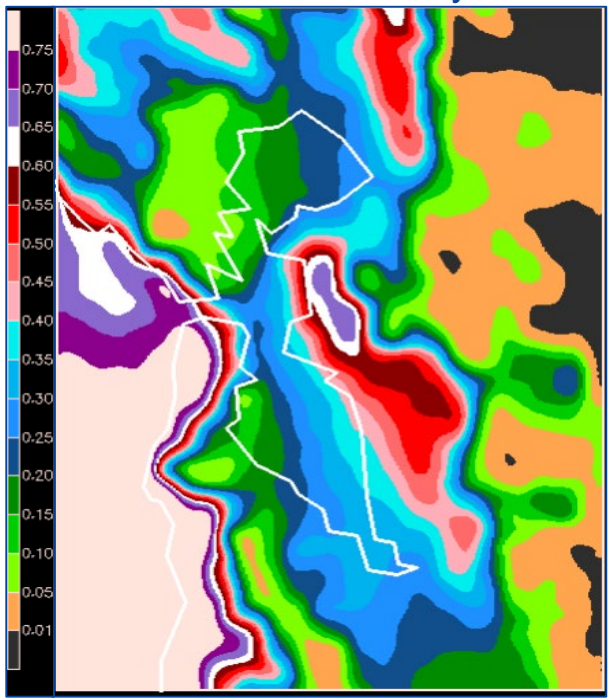
- High Impact Weather (HIW) C/V predictand is defined as the **lowest C/V observed over a 15-minute period** ending at 14, 29, 44, and 59 minutes past the hour.
  - Most recent observation is persisted into the period unless a new observation indicates a worse condition.
  - Furthest lookback is 15-minute period prior to the previous hour.
- 3-step regression approach (similar to hourly C&V):
  1. 15-min Base LAMP = GFS MOS + 15-min Advection + Observations
  2. 15-min HRRR MOS = Sub-hourly HRRR predictors
  3. 15-min Meld LAMP = 15-min Base LAMP + 15-min HRRR MOS
- Predictors include:
  - 15-min advected radar composite reflectivity (MRMS)
  - HRRR-based proxy C&V climatology

High Impact Weather C&V Development

- Base LAMP and Meld equations and thresholds were developed for each 15-minute period out to six hours (total of 24 projections)
- Will run for **96 cycles per day** - output out to six hours will be available every 15 minutes at nominal times of **HH:00, HH:15, HH:30, and HH:45**

HRRR-Based Proxy Climatology

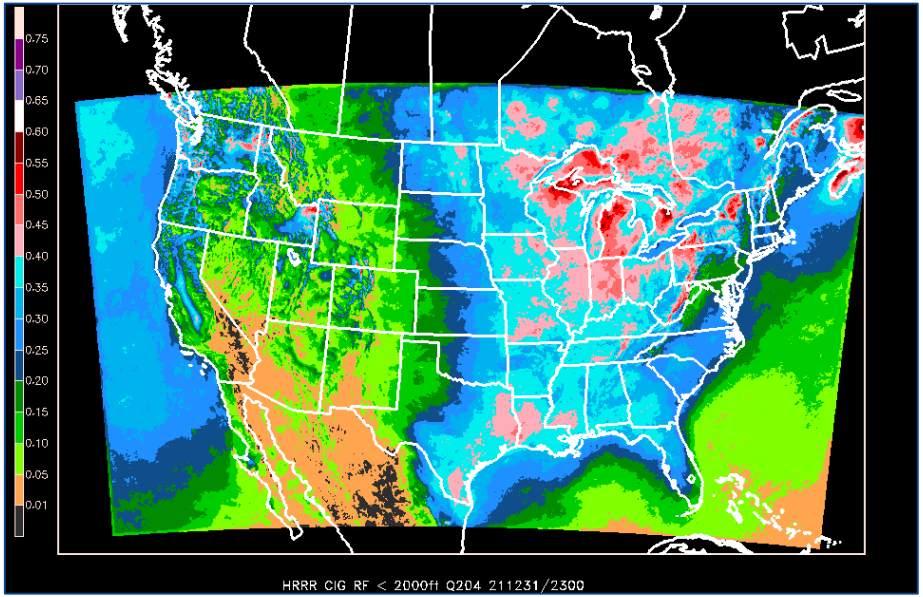
San Francisco Bay



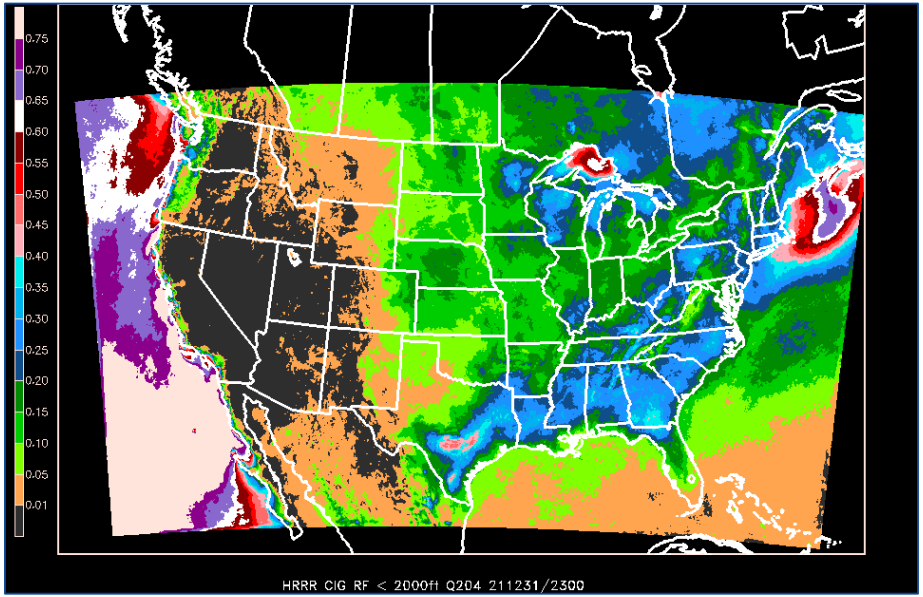
HRRR CIG RF < 1700 ft, July, 1200 UTC

- HRRR-based ceiling height and visibility relative frequencies (RFs) were calculated for all grid points over the HRRR CONUS domain for each month, time of day, and several C&V thresholds.
- Serves as proxy climatology predictor in 15-min C&V HRRR MOS equations.

HRRR-Based Proxy Climatology

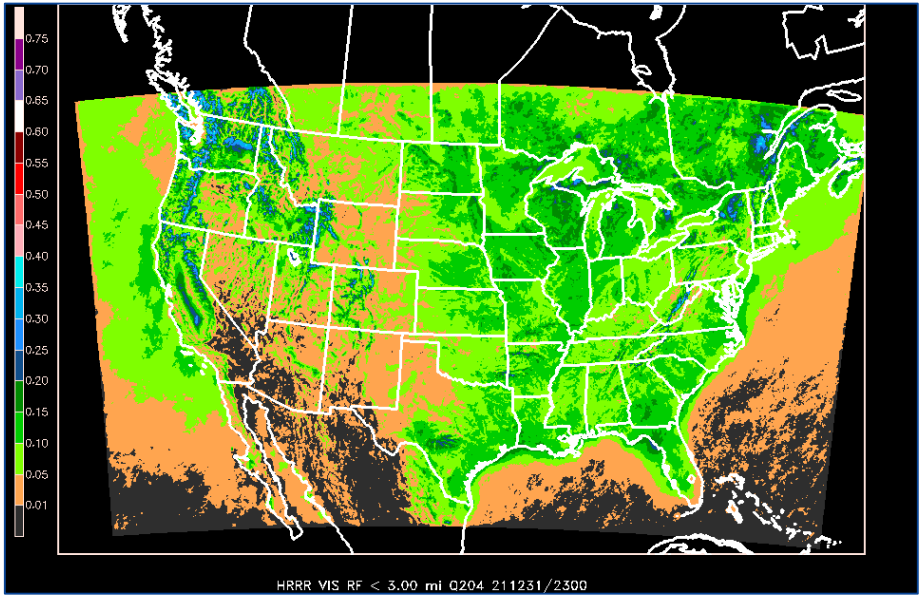


HRRR CIG RF < 2000 ft, Jan, 1200 UTC

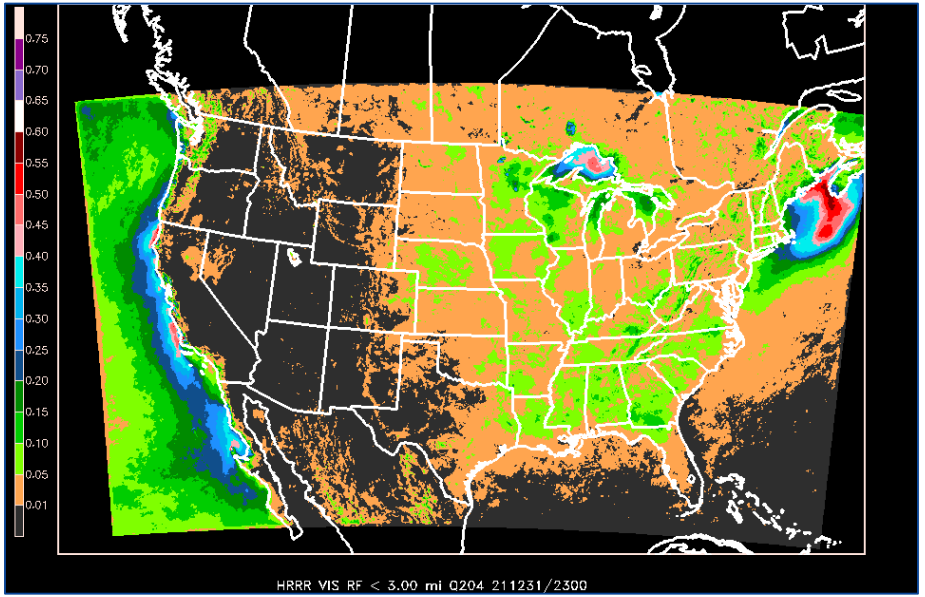


HRRR CIG RF < 2000 ft, July, 1200 UTC

HRRR-Based Proxy Climatology



HRRR VIS RF < 3 mi, Jan, 1200 UTC



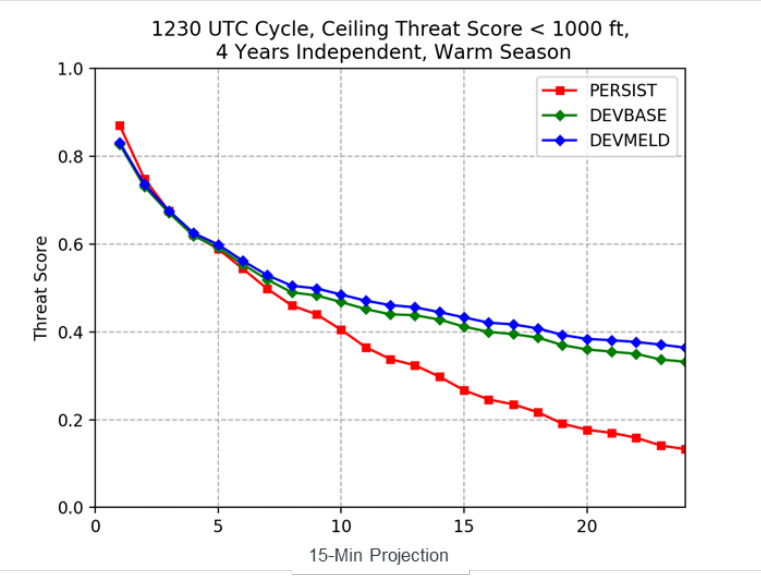
HRRR VIS RF < 3 mi, July, 1200 UTC

15-Minute HIW C&V Verification

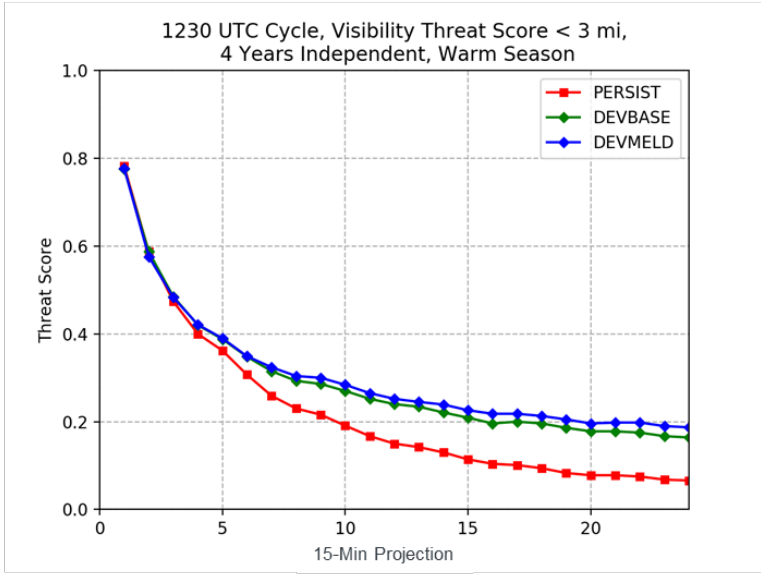
- Development period:
  - 4 years of warm season data (April-Sep 2017 – 2020)
  - 4 years of cool season data (Jan-Mar/Oct-Dec 2017 – 2020)
- Independent 4-fold cross validation:
  - Four developments were completed by withholding a different year from each of the development periods above
  - Much better than using single developmental and test samples
  - Results presented are for all 4 independent years combined
- ~1,850 CONUS stations verified
- Only IFR thresholds shown for 1230 UTC cycle - results for other thresholds and cycles are similar. (Note - the independent results are from an initial/preliminary development that did not include the HRRR-based climatology.)

15-min HIW Independent Verification: Warm Season

Ceiling < 1,000 feet



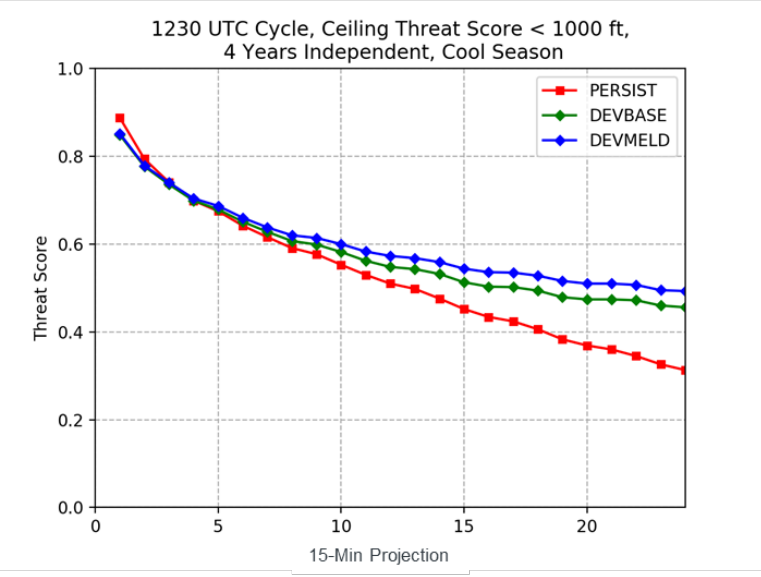
Visibility < 3 miles



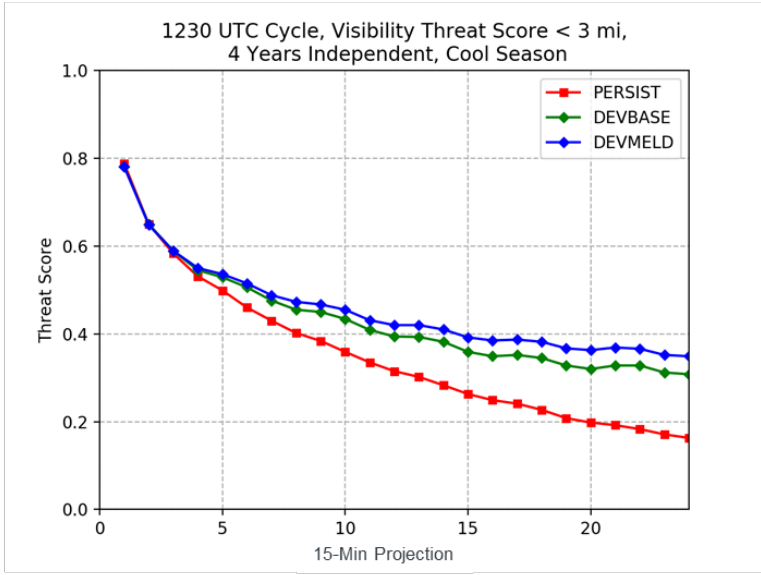
15-min Meld LAMP (blue) shows improvement over 15-min Base LAMP (green) at later projections due to the decreased predictive strength of the observation and the increasing predictive strength of the HRRR

15-min HIW Independent Verification: Cool Season

Ceiling < 1,000 feet



Visibility < 3 miles



15-min Meld LAMP (blue) shows improvement over 15-min Base LAMP (green) at later projections due to the decreased predictive strength of the observation and the increasing predictive strength of the HRRR

15-Minute Text Bulletin

KBWI	BALTIMORE								GFS LAMP 1930 UTC								2/13/2024						
UTC	19	20	20	20	20	21	21	21	21	22	22	22	22	23	23	23	23	00	00	00	00	01	01	01
MIN	45	00	15	30	45	00	15	30	45	00	15	30	45	00	15	30	45	00	15	30	45	00	15	30
CIG	6	6	8	8	8	8	8	8	8	8	8	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	7	7	7	7	7	7	7	7	7	7	7

UTC: Ending hour of the 15-minute valid period

LAV Ceiling Height (CIG) Categories

1 < 200 feet
2 200 - 400 feet
3 500 - 900 feet
4 1000 - 1900 feet
5 2000 - 3000 feet
6 3100 - 6500 feet
7 6600 - 12,000 feet
8 > 12,000 feet or unlimited ceiling

LAV Visibility (VIS) Categories

1 < 1/2 miles
2 1/2 - < 1 miles
3 1 - < 2 miles
4 2 - < 3 miles
5 3 - 5 miles
6 6 miles
7 > 6 miles

15-Minute Text Bulletin

KBWI	BALTIMORE					GFS LAMP 1930 UTC							2/13/2024										
UTC	19	20	20	20	20	21	21	21	21	22	22	22	22	23	23	23	23	00	00	00	00	01	01	01
MIN	45	00	15	30	45	00	15	30	45	00	15	30	45	00	15	30	45	00	15	30	45	00	15	30
CIG	6	6	8	8	8	8	8	8	8	8	8	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	7	7	7	7	7	7	7	7	7	7	7

MIN: Ending minute of the valid period

LAV Ceiling Height (CIG) Categories

1	< 200 feet
2	200 - 400 feet
3	500 - 900 feet
4	1000 - 1900 feet
5	2000 - 3000 feet
6	3100 - 6500 feet
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2	1/2 - < 1 miles
3	1 - < 2 miles
4	2 - < 3 miles
5	3 - 5 miles
6	6 miles
7	> 6 miles

15-Minute Text Bulletin

KBWI	BALTIMORE						GFS LAMP 1930 UTC							2/13/2024									
UTC	19	20	20	20	20	21	21	21	21	22	22	22	22	23	23	23	23	00	00	00	00	01	01	01
MIN	45	00	15	30	45	00	15	30	45	00	15	30	45	00	15	30	45	00	15	30	45	00	15	30
CIG	6	6	8	8	8	8	8	8	8	8	8	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	7	7	7	7	7	7	7	7	7	7	7

CIG: Lowest forecasted LAMP categorical ceiling height during the 15-minute period

LAV Ceiling Height (CIG) Categories

1	< 200 feet
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4	1000 - 1900 feet
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15-Minute Text Bulletin

KBWI	BALTIMORE								GFS LAMP 1930 UTC								2/13/2024						
UTC	19	20	20	20	20	21	21	21	21	22	22	22	22	23	23	23	23	00	00	00	00	01	01	01
MIN	45	00	15	30	45	00	15	30	45	00	15	30	45	00	15	30	45	00	15	30	45	00	15	30
CIG	6	6	8	8	8	8	8	8	8	8	8	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	7	7	7	7	7	7	7	7	7	7	7

VIS: Lowest forecasted LAMP categorical visibility during the 15-minute period

LAV Ceiling Height (CIG) Categories

1	< 200 feet
2	200 - 400 feet
3	500 - 900 feet
4	1000 - 1900 feet
5	2000 - 3000 feet
6	3100 - 6500 feet
7	6600 - 12,000 feet
8	> 12,000 feet or unlimited ceiling

LAV Visibility (VIS) Categories

1	< 1/2 miles
2	1/2 - < 1 miles
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4	2 - < 3 miles
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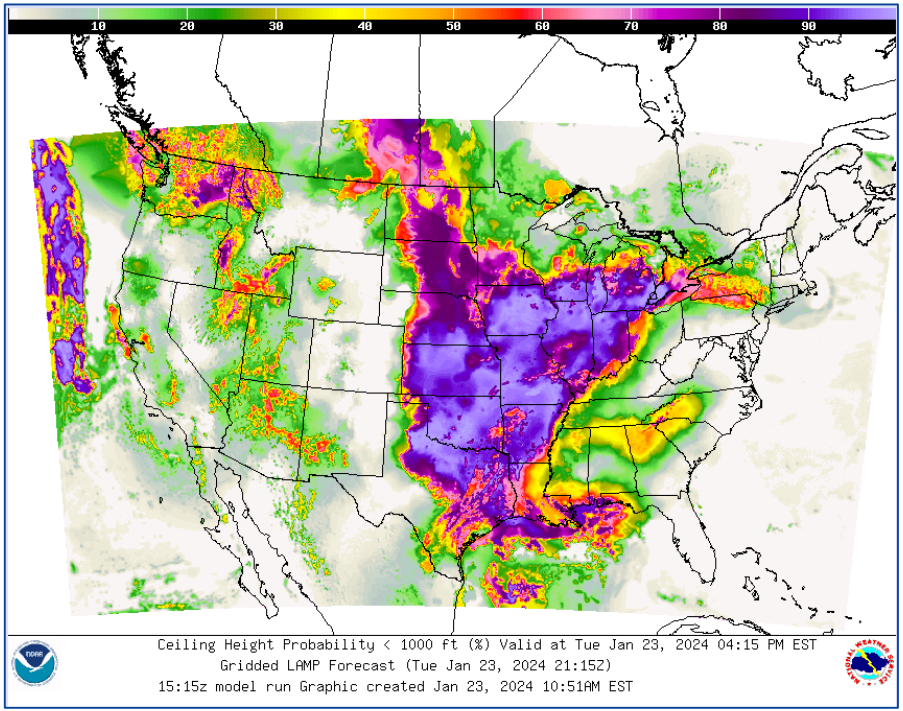
6	6 miles
7	> 6 miles

Gridded LAMP 15-min HIW C&V

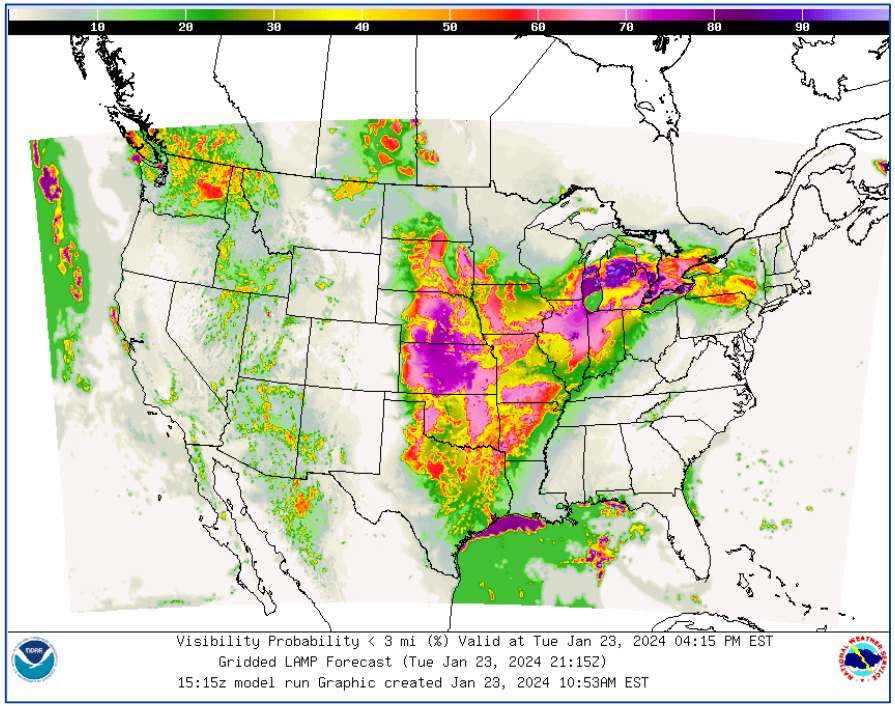
- Gridded 15-min Meld = Gridded 15-min Base LAMP + Gridded HRRR MOS + Gridded Observations
- 3-step process to make Gridded 15-min Meld C&V:
  1. 15-min Base LAMP C&V probabilities at stations are analyzed to 2.5-km NBM CONUS grid
  2. 15-min HRRR MOS equations are evaluated at each 2.5-km grid point
  3. 15-min Meld equations (which use observations, Base LAMP and HRRR MOS as predictors) are evaluated at each 2.5-km grid point
  4. Thresholds applied to gridded probabilities to derive deterministic C&V on the grid.
- National Blend of Models (NBM) CONUS grid - note that spatial extent of guidance will be limited to extent of sub-hourly HRRR.
- Will run for **96 cycles per day** - output out to six hours will be available every 15 minutes at nominal times of **HH:00, HH:15, HH:30, and HH:45**

Gridded LAMP 15-min HIW C&V

Prob Cig < 1,000 ft

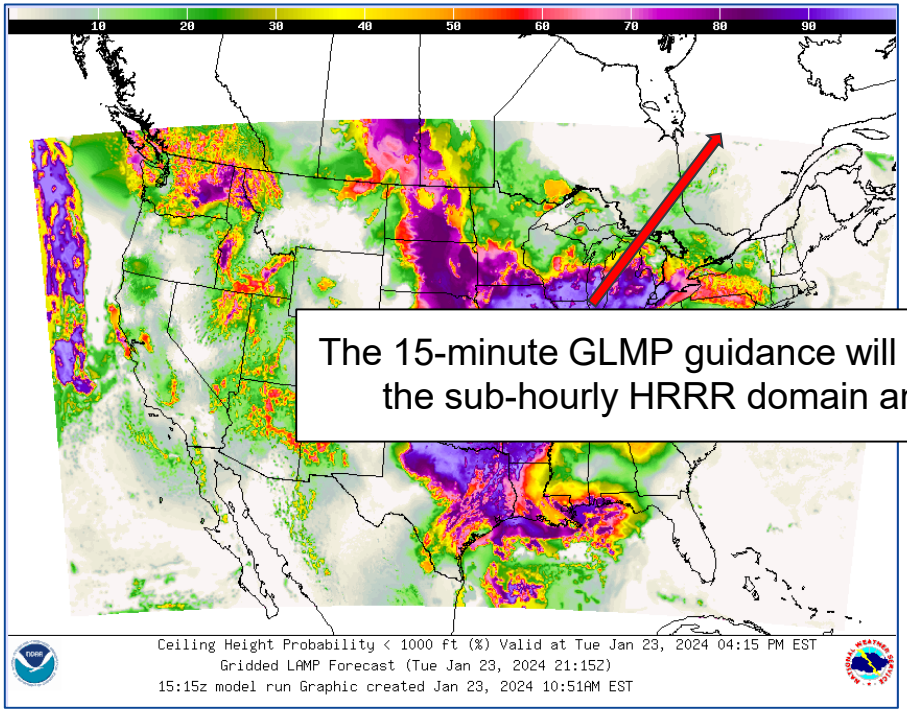


Prob Vis < 3 miles

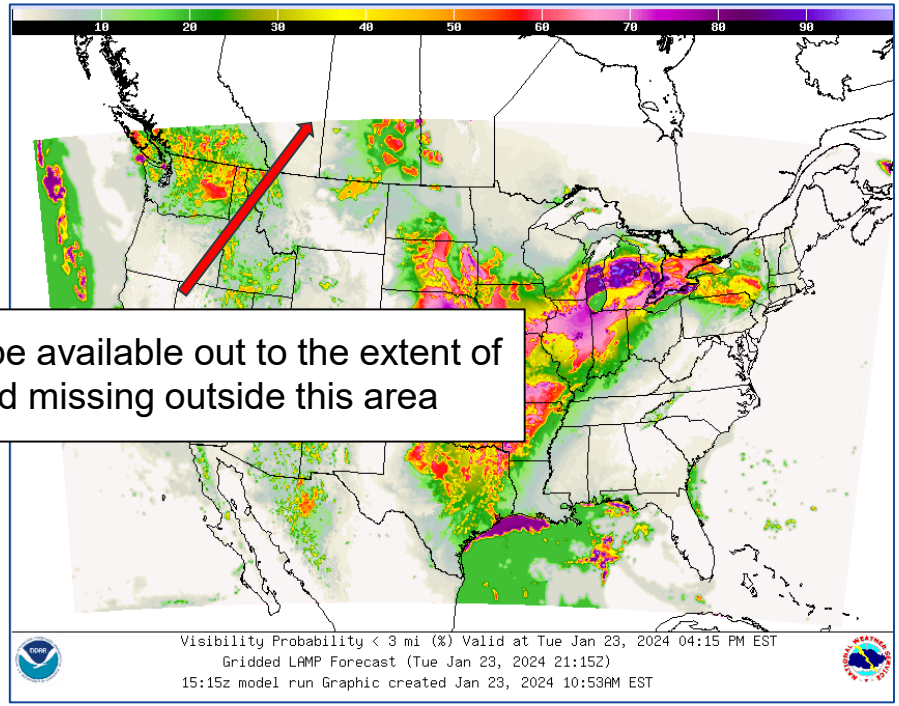


Gridded LAMP 15-min HIW C&V

Prob Cig < 1,000 ft



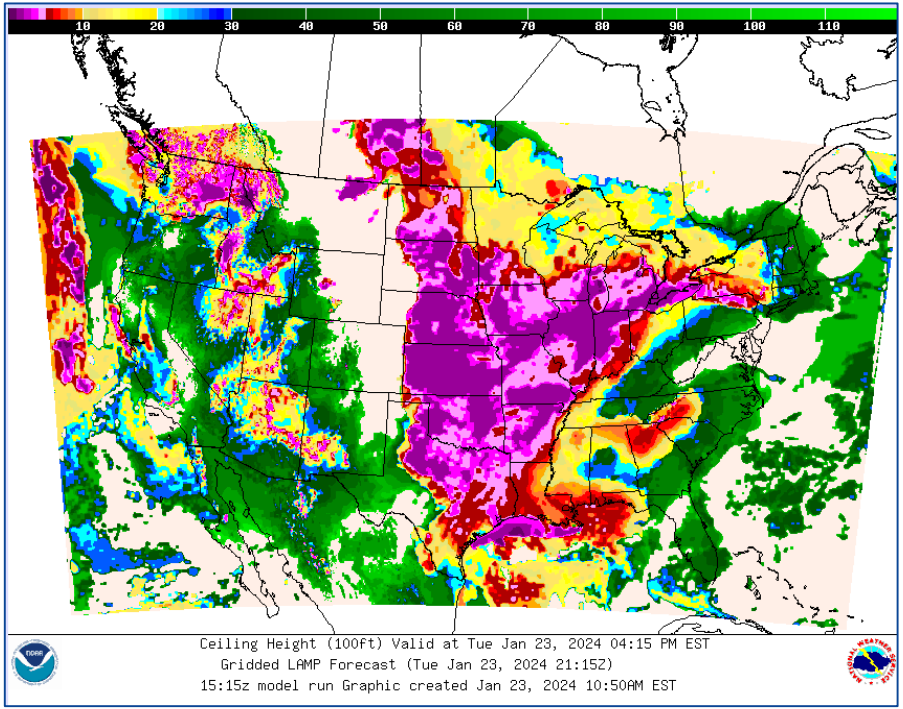
Prob Vis < 3 miles



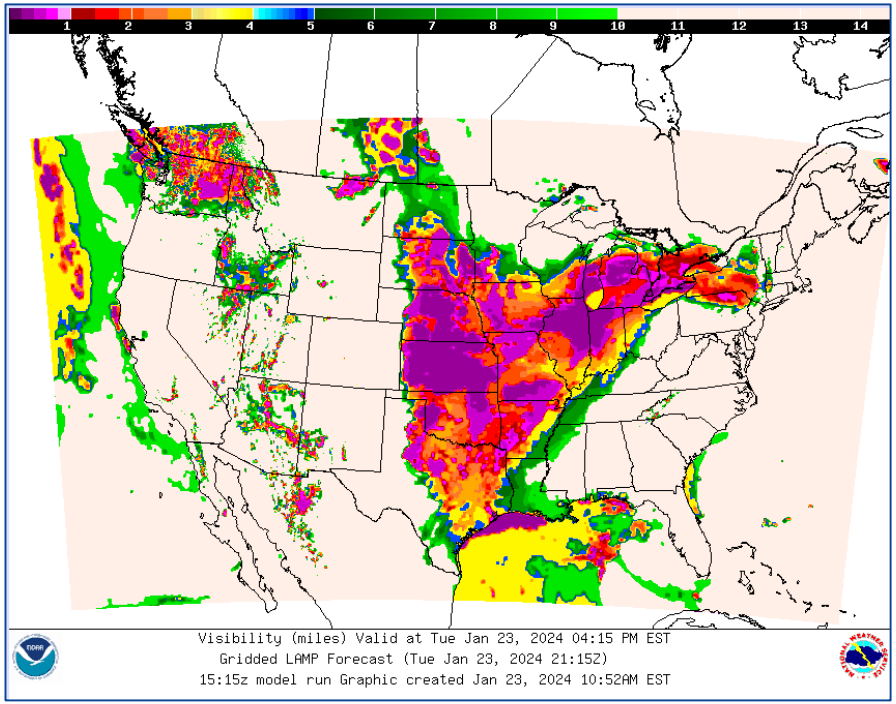
The 15-minute GLMP guidance will be available out to the extent of the sub-hourly HRRR domain and missing outside this area

Gridded LAMP 15-min HIW C&V

Ceiling Height



Visibility



Product Availability

- New 15-minute guidance will be included in planned LAMP/GLMP v2.6 upgrade scheduled for later this Summer.
- When implemented, the 15-minute text bulletins containing categorical C&V guidance out to six hours will be available on NCEP Web Services / NOMADS
- When implemented, the 15-minute Gridded LAMP C&V guidance in GRIB2 format will be available on NCEP Web Services / NOMADS
  - Deterministic ceiling height and visibility
  - Probability of ceiling height < 500 ft, < 1000 ft, and <= 3000 ft
  - Probability of visibility < 1 mi, < 3 mi, and <= 5 mi
- AWC plans to evaluate these products further for inclusion in the GFA-LA.

4. Current/Future Work

LAMP/GLMP v2.6 Upgrade (Summer 2024)

- Planned LAMP/GLMP v2.6 upgrade:
  - Addition of station-based and gridded guidance for ceiling height and visibility valid for 15-minute periods out to six hours, updated every 15 minutes (96 cycles per day)
  - Several minor bug fixes
- Code delivered to NCO in May 2024.
- Planned implementation in August 2024.

Onset/Cessation of Flight Categories

- FAA-funded work to develop guidance for onset/cessation of flight categories at Core 30 airports:
  - Generated from 15-minute C&V guidance through six hours
  - AWC plans to create new onset/cessation dashboard

```
KBOS   BOSTON              GFS LAMP 1330 UTC   3/29/2024
UTC   13 14 14 14 14 15 15 15 15 16 16 16 16 17 17 17 17 18 18 18 18 19 19 19
MIN   45 00 15 30 45 00 15 30 45 00 15 30 45 00 15 30 45 00 15 30 45 00 15 30
FLT    M  M  M  M  M  M  M  M  M  V  V  V  V  V  V  V  V  V  V  V  V  V  V  V
VFR                                +-----------------------------------------
MVF   ----------------------------/
IFR
LIF
VLI
CIG    5  5  5  5  5  5  5  5  5  5  6  6  6  6  6  6  6  6  6  6  7  6  7  7
VIS    7  7  6  7  7  5  5  5  6  6  6  7  7  7  7  7  7  7  7  7  7  7  7  7
CPVL   0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
CPL    0  1  0  0  1  2  3  4  3  4  4  5  2  3  2  3  0  0  0  0  0  0  0  0
CPI    5  6  4  7 14 18 19 17 15 18 17 16 11 13 12 13  7  6  6  8  5  5  6  6
CP2K  10 20 15 26 26 35 37 32 32 34 32 23 16 18 17 17 10 12 12 14  9 10  9  9
CPM   18 42 42 55 54 60 58 52 52 44 38 26 23 26 24 24 16 16 14 17 12 12 10 11
CPVFR 82 58 58 45 46 40 42 48 48 56 62 74 77 74 76 76 84 84 86 83 88 88 90 89
VPVL   0  0  1  1  1  0  0  1  2  2  3  2  2  2  2  2  2  2  3  3  3  3  2  3
VPL    0  2  2  3  3  0  0  1  2  4  4  5  4  5  5  5  4  6  6  6  5  6  5  6
VPI    3  9 11 13 12 16 19 17 15 19 18 18 14 16 16 16 13 16 15 16 12 14 12 14
VPM    4 21 31 29 26 37 42 39 34 34 33 30 23 28 25 26 22 26 24 25 19 24 20 22
VPVFR 96 79 69 71 74 63 58 61 66 66 67 70 77 72 75 74 78 74 76 75 81 76 80 78
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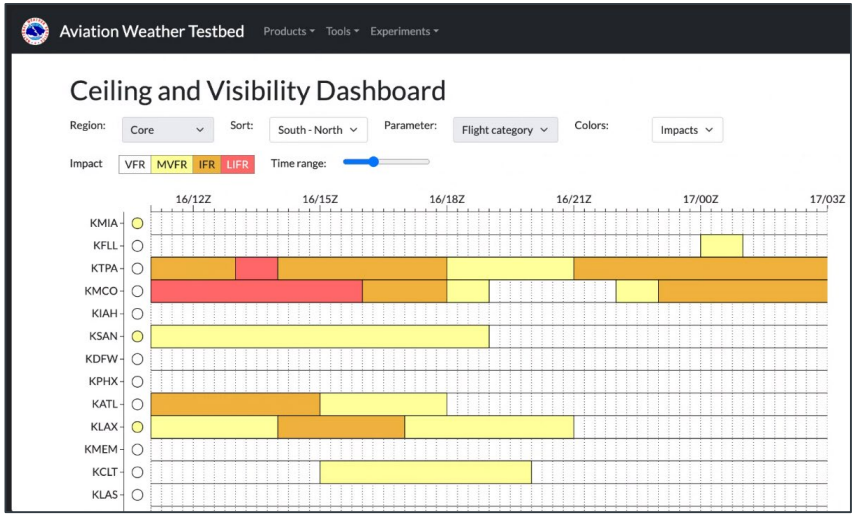
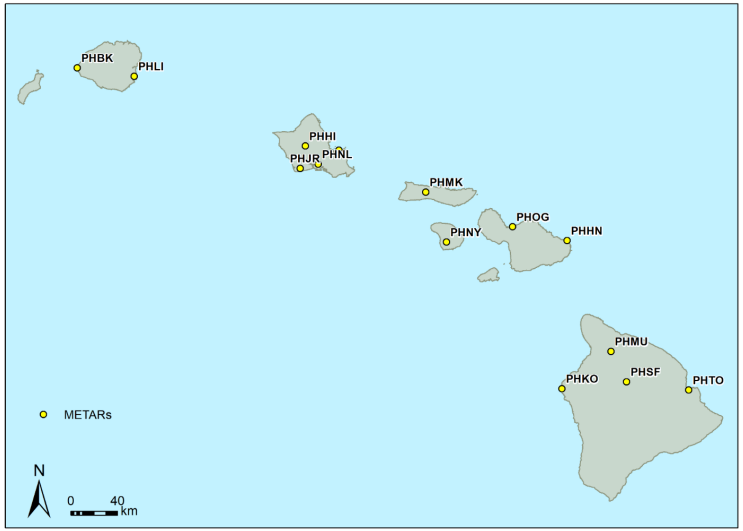
Prototype LAMP onset/cessation text bulletin



Initial prototype of AWC onset/cessation dashboard

Gridded LAMP Guidance for Hawaii

- FAA-funded work to develop hourly GLMP ceiling height and visibility guidance for Hawaii domain:
  - Challenging problem - not many C&V observations, no HRRR input
  - Development will include RAP input (and possibly other models)
  - Exploring AI/ML techniques (CNN, Random Forest, XGBoost)
  - Will support NBM over Hawaii
- Planned completion of initial prototype for one cycle - March 2025

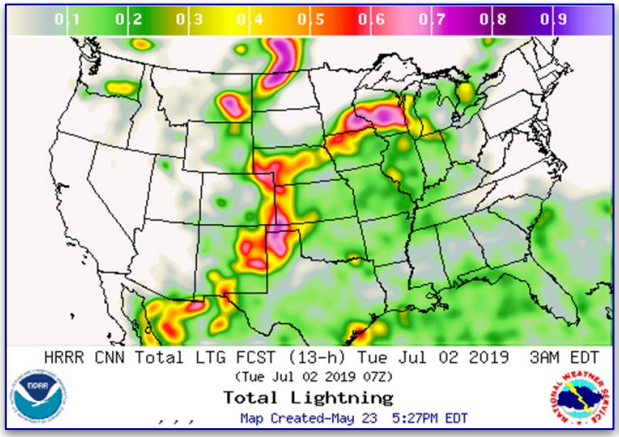


Hawaii stations that report ceiling or visibility

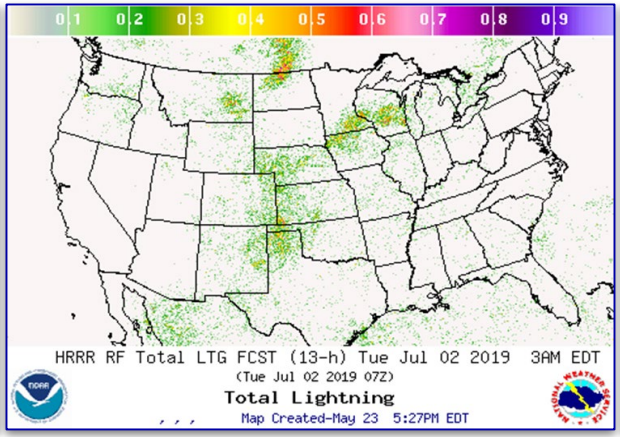
Artificial Intelligence/Machine Learning
Fire Weather - Lightning

Image credit: NOAA Weather in Focus Photo Contest 2015 | Kevin Skow

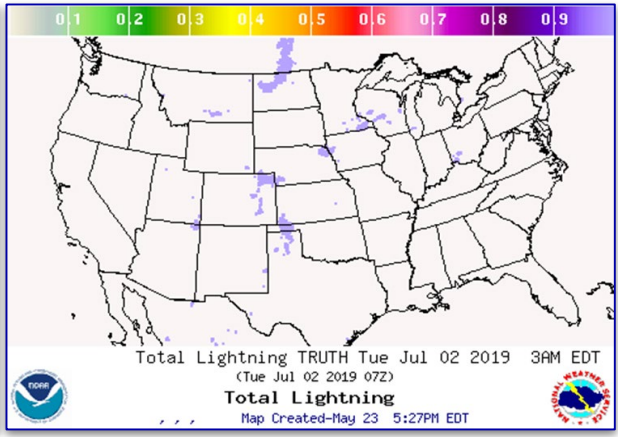
- Improving Fire Weather Guidance using:
  - Convolutional Neural Networks (CNN)
  - Random Forests
  - XGBoost
  - Recurrent Neural Networks (RNN)



CNN



Random Forest



Verifying Truth (Lightning)

Additional Future Work*

- Further investigate usability of satellite data to improve GLMP guidance between stations.
- Further investigate AI/ML techniques for improving LAMP guidance.
- Prepare for transition of LAMP/GLMP inputs from HRRR/RAP to RRFS.
- Assimilation of camera visibility observations into GLMP.
- Improvements to Alaska GLMP C&V using satellite data.
- GLMP Cloud Layer guidance for CONUS.

* All future plans are contingent on funding and should be considered as tentative.

Thank you!

Questions?

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nws.lamp@noaa.gov

LAMP Web Page:
https://vlab.noaa.gov/web/mdl/lamp