LAMP/GLMP v2.6 Science Briefing to the NCEP Director*

NATIONAL WEATHER SERVICE

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* 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.

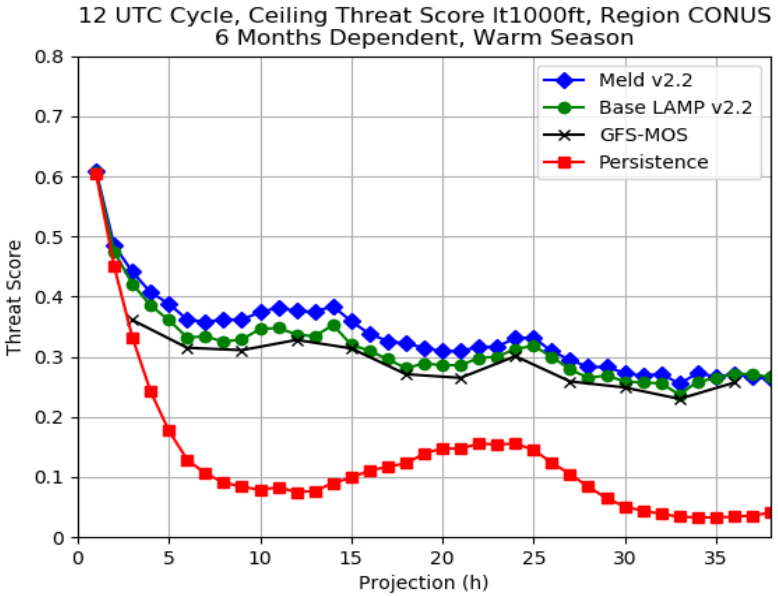
Outline

- LAMP Background
- Summary of v2.6 upgrades
  - Station-based 15-min C&V
  - Gridded LAMP (GLMP) 15-min C&V
  - Bug Fixes
- Product changes
- Upgrade Benefits
- Feedback and Schedule

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

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.

Upgrade Summary

LMP/GLMP V2.6 Upgrade Highlights

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):
   a. Guidance for the **lowest** ceiling height category and **lowest** visibility category that is forecast to occur during each **15-minute period** (this differs from the traditional hourly guidance where forecast projections are valid for a snapshot in time at the top of the hour).
   b. 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.**
   c. When implemented the text bulletins will be available on NCEP Web Services / NOMADS.

1. Addition of Gridded LAMP guidance for ceiling height and visibility valid for **15-minute periods** out to six hours, updated every 15 minutes (96 cycles per day):
   a. Probabilistic and deterministic guidance for the **lowest** ceiling height and **lowest** visibility condition that is forecast to occur during each **15-minute period**.
   b. Produced in GRIB2 format on NBM CONUS domain.
   c. When implemented the GRIB2 data will be available on NCEP Web Services / NOMADS.

LMP/GLMP V2.6 Upgrade Highlights

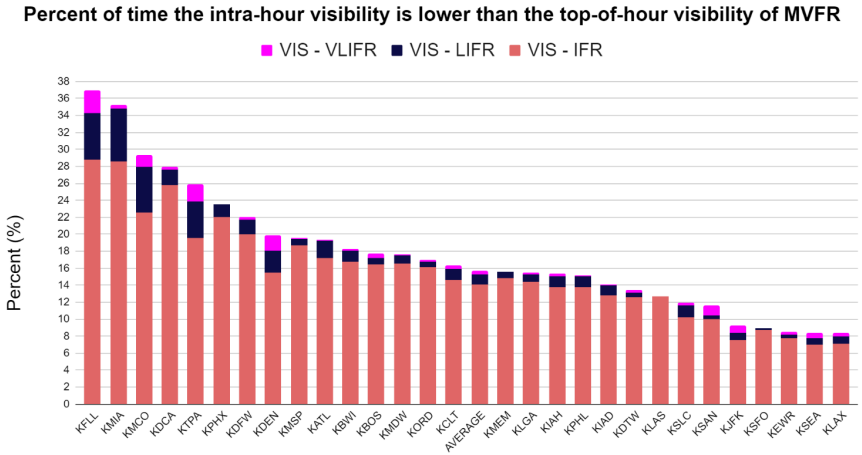
3. Minor bug fixes:
   a. Addition of a post-processing check for GLMP wind gusts to prevent negative values from occurring on the grid.
   b. Removal of a problematic mesonet station (TRJHS) from the GLMP temperature analysis.
   c. An adjustment to the LAMP advection model (used as a predictor in LAMP guidance) to prevent a visibility predictor from getting out of bounds and causing unreasonable temperature/dewpoint forecasts, mainly for stations in HI.
   d. Correcting the metadata for a mis-located station (KGVW) that was being used in the LAMP advection model analysis (note that this station was being tossed from the analysis most of the time and thus had little impact on the advection output).

LAMP/GLMP V2.6 Upgrades:
LAMP High Impact Weather (HIW) C&V

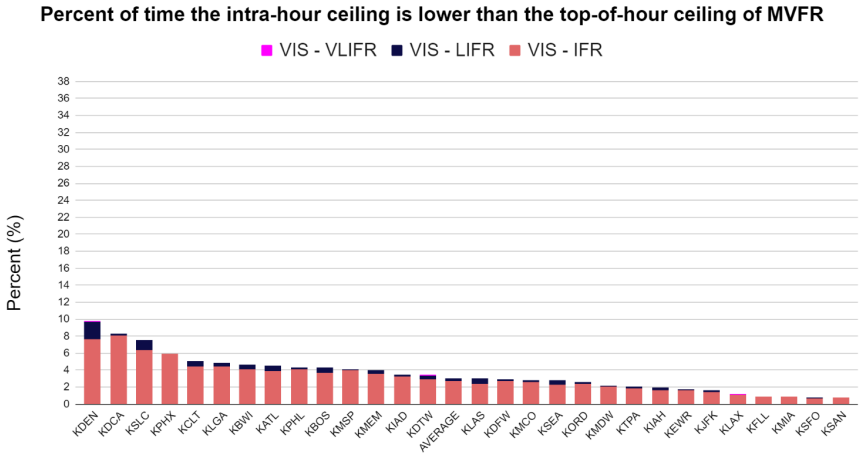
Subhourly High Impact Weather

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

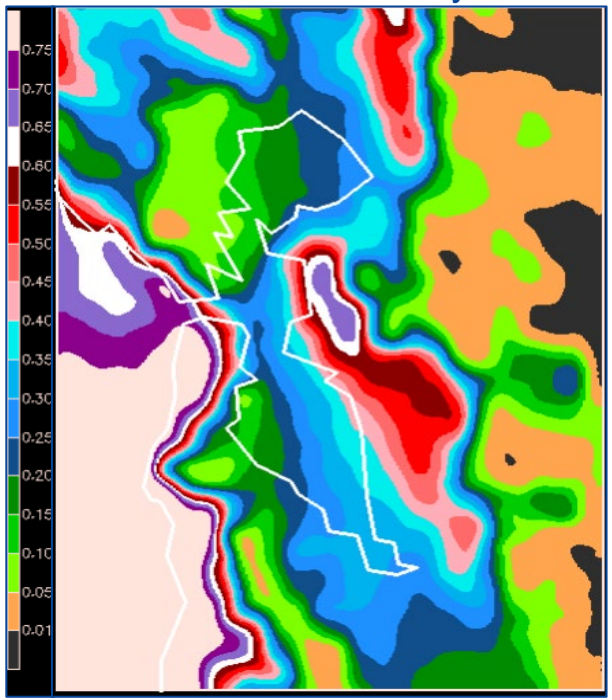
- High Impact Weather (HIW) C/V predictand is defined as the **lowest C/V observed over a 15-minute period** ending at 14, 29, 44, and 59 minutes past the hour.
  - Most recent observation is persisted into the period unless a new observation indicates a worse condition.
  - Furthest lookback is 15-minute 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

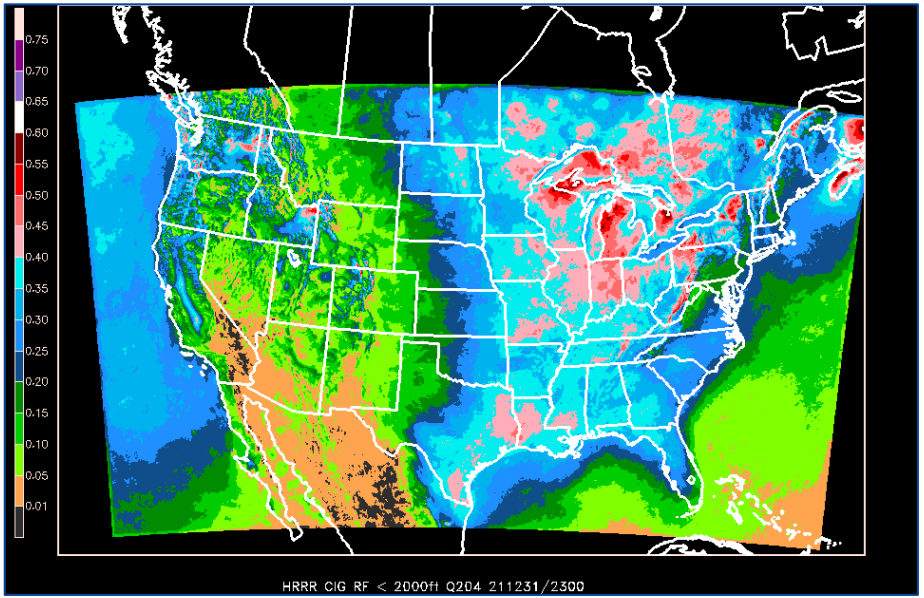
San Francisco Bay



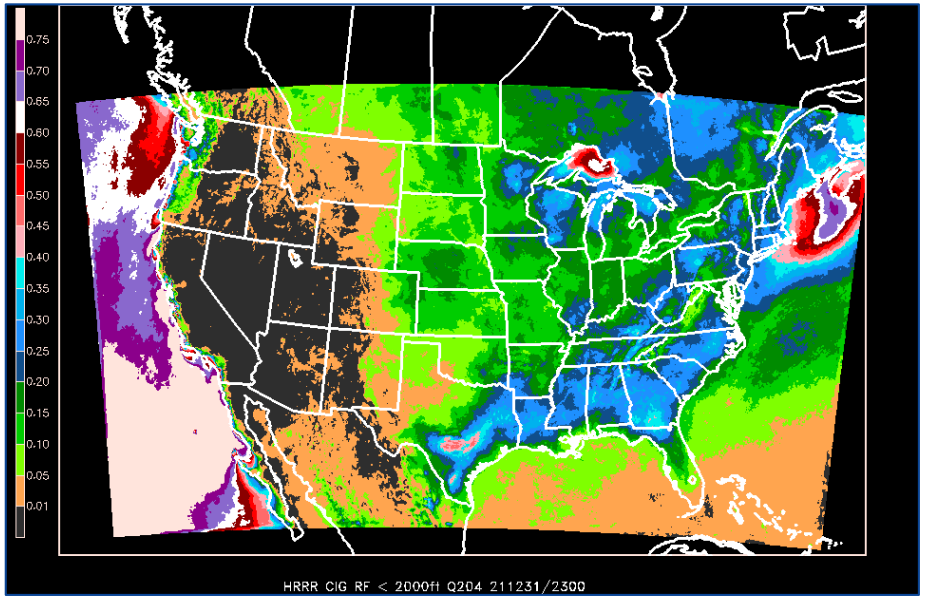
HRRR CIG RF < 1700 ft, July, 1200 UTC

- 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

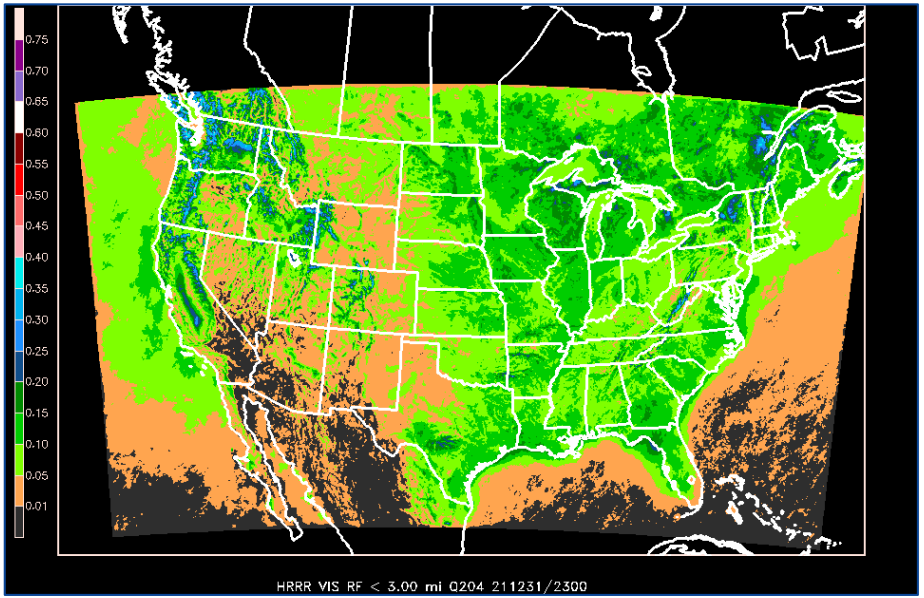


HRRR CIG RF < 2000 ft, Jan, 1200 UTC

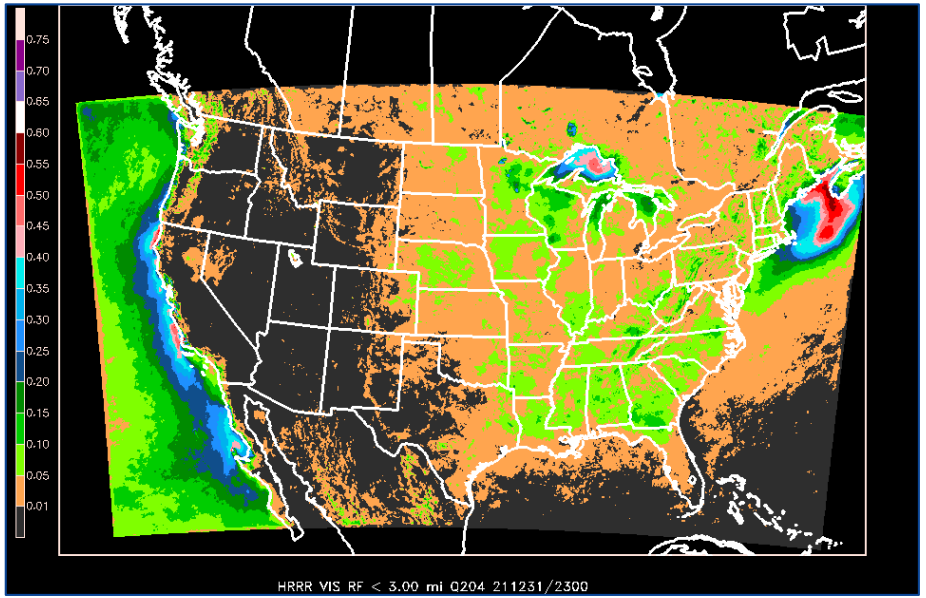


HRRR CIG RF < 2000 ft, July, 1200 UTC

HRRR-Based Proxy Climatology



HRRR VIS RF < 3 mi, Jan, 1200 UTC



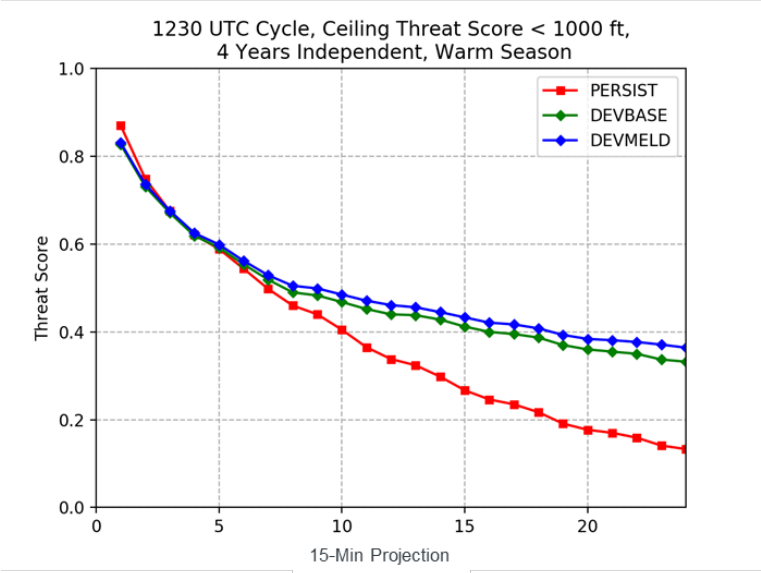
HRRR VIS RF < 3 mi, July, 1200 UTC

15-Minute HIW C&V Verification

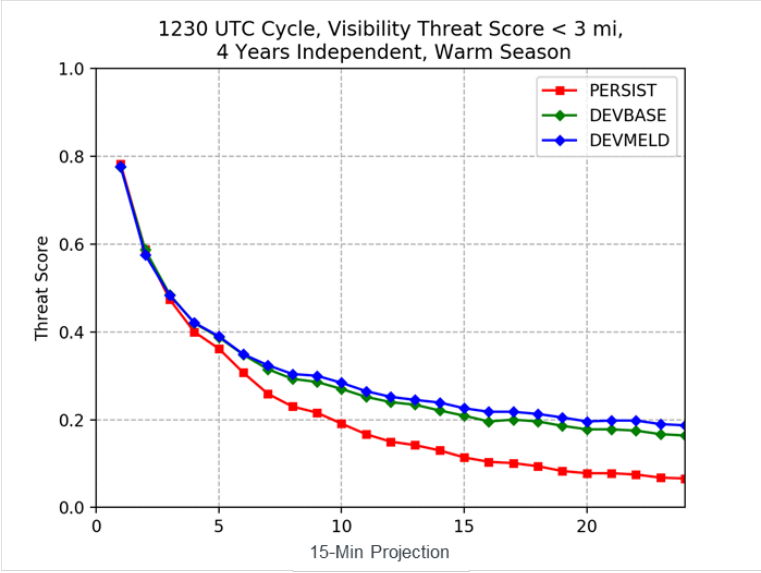
- Development period:
  - 4 years of warm season data (April-Sep 2017 – 2020)
  - 4 years of cool season data (Jan-Mar/Oct-Dec 2017 – 2020)
- Independent 4-fold cross validation:
  - Four developments were completed by withholding a different year from each of the development periods above
  - Much better 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



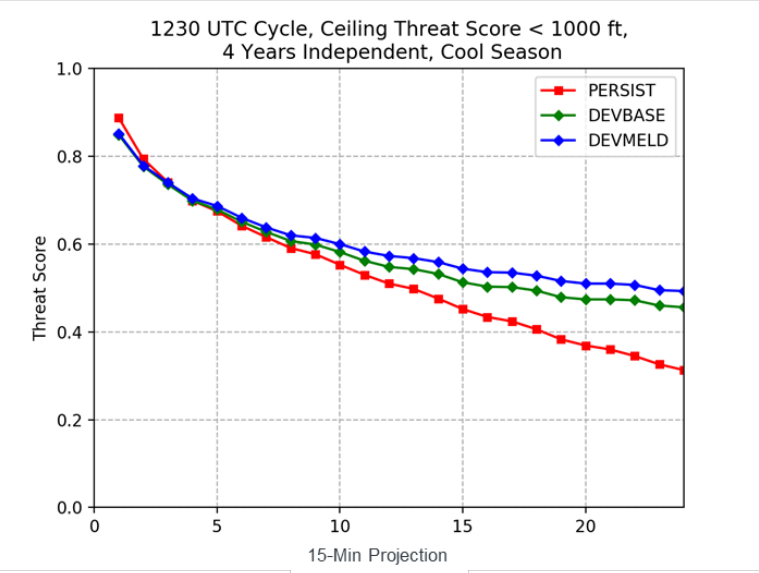
Visibility < 3 miles



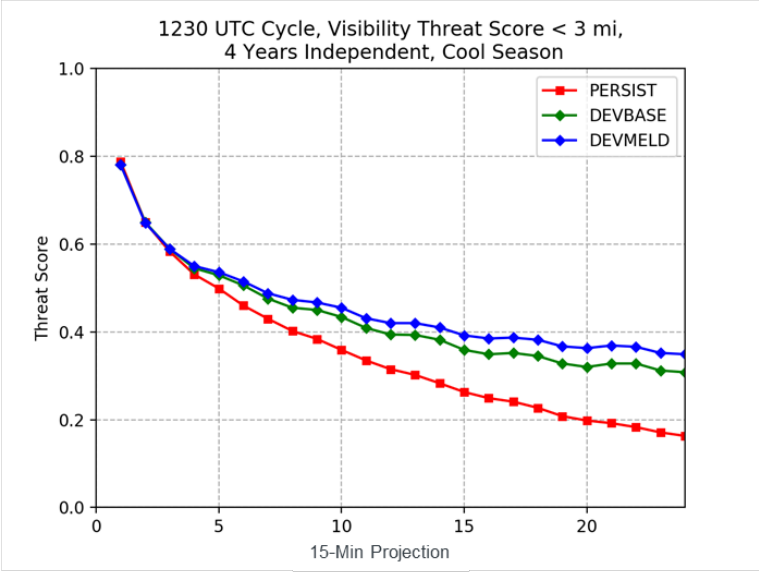
15-min Meld LAMP (blue) shows improvement over 15-min Base LAMP (green) at later projections due to the decreased predictive strength of the observation and the increasing predictive strength of the HRRR

15-min HIW Independent Verification: Cool Season

Ceiling < 1,000 feet



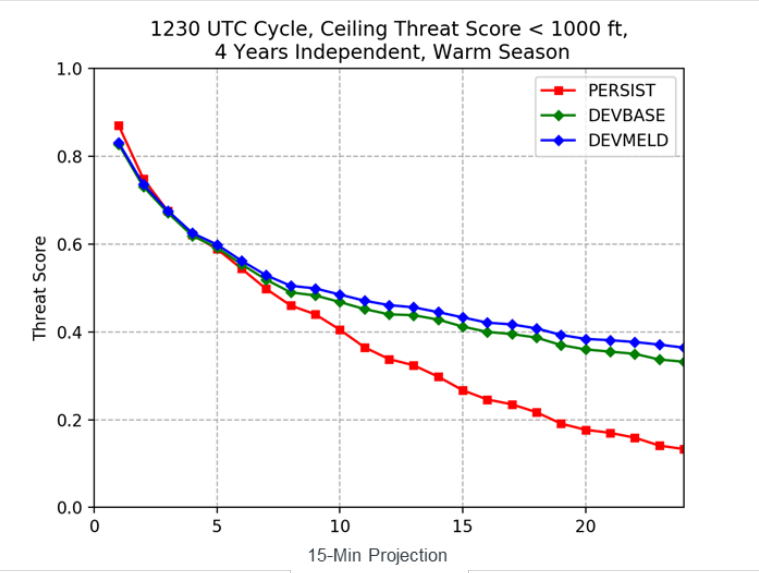
Visibility < 3 miles



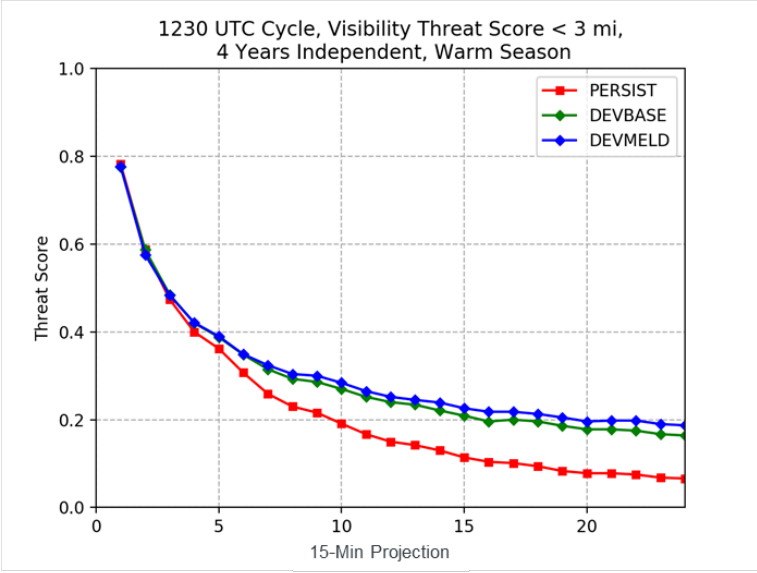
15-min Meld LAMP (blue) shows improvement over 15-min Base LAMP (green) at later projections due to the decreased predictive strength of the observation and the increasing predictive strength of the HRRR

15-min HIW Dependent Verification: Warm Season

Ceiling < 1,000 feet



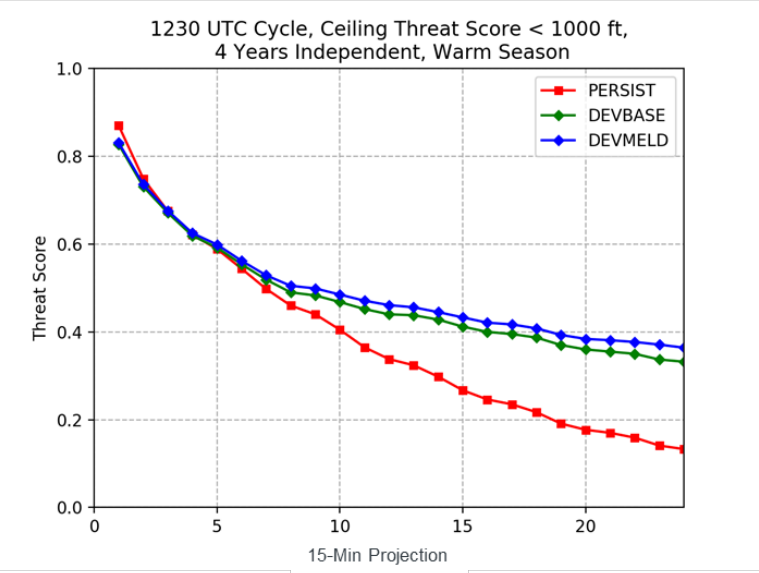
Visibility < 3 miles



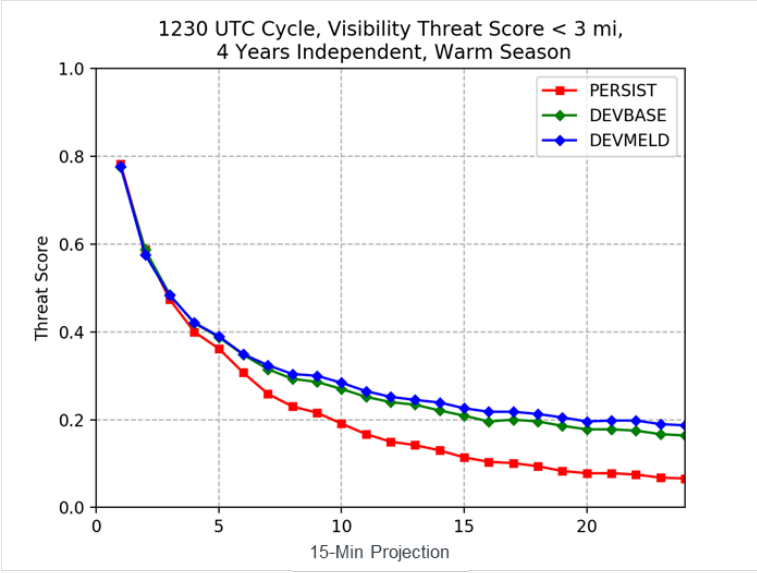
15-min Meld LAMP (blue) shows improvement over 15-min Base LAMP (green) at later projections due to the decreased predictive strength of the observation and the increasing predictive strength of the HRRR

15-min HIW Dependent 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
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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

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LAV Visibility (VIS) Categories

1 < 1/2 miles
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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
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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

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LAV Visibility (VIS) Categories

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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
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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
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4	1000 - 1900 feet
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LAV Visibility (VIS) Categories

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

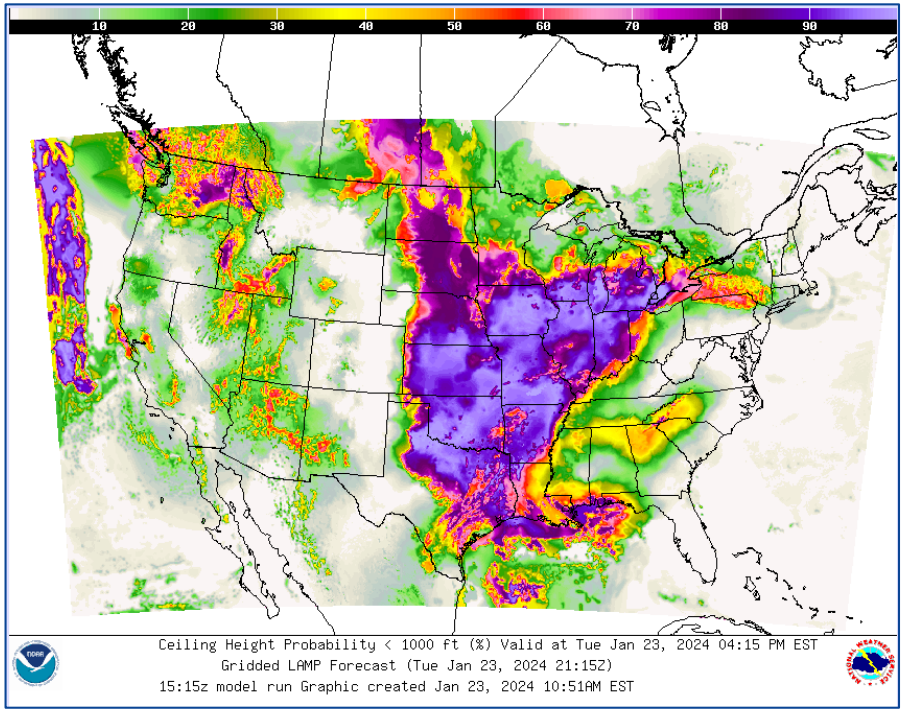
LAMP/GLMP V2.6 Upgrades:
Gridded LAMP HIW C&V

Gridded LAMP 15-min HIW C&V

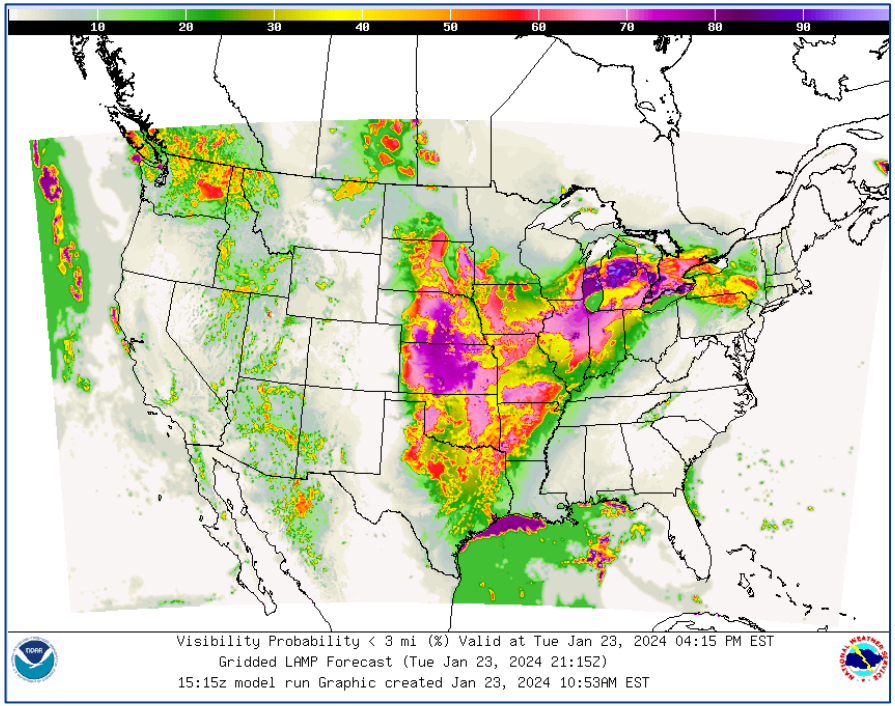
- Gridded 15-min Meld = Gridded 15-min Base LAMP + Gridded HRRR MOS + Gridded Observations
- 3-step process to make Gridded 15-min Meld C&V:
  1. 15-min Base LAMP C&V probabilities at stations are analyzed to 2.5-km NBM CONUS grid
  2. 15-min HRRR MOS equations are evaluated at each 2.5-km grid point
  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

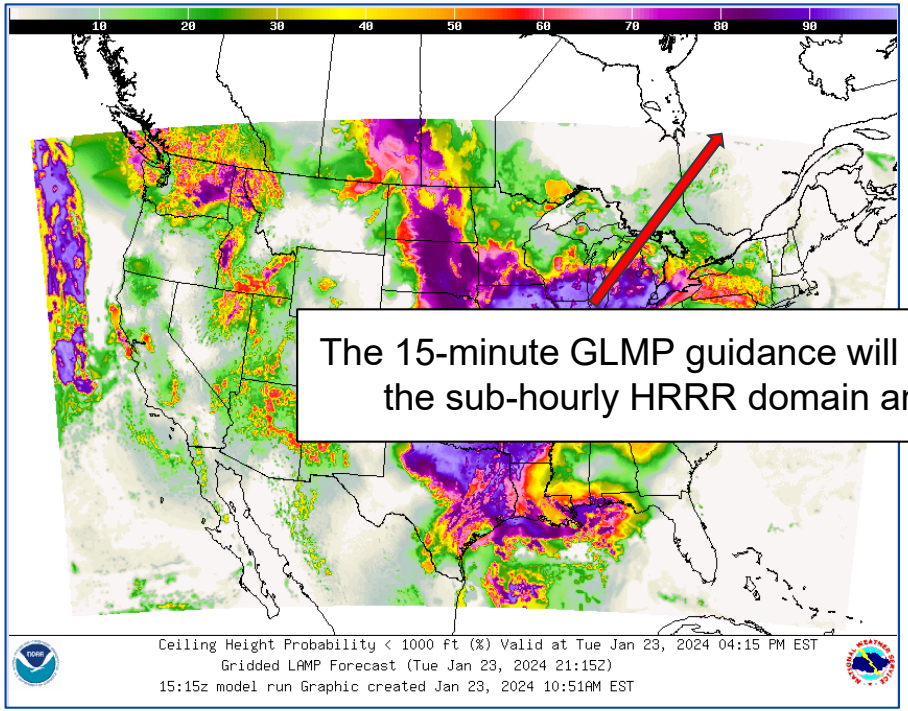


Prob Vis < 3 miles

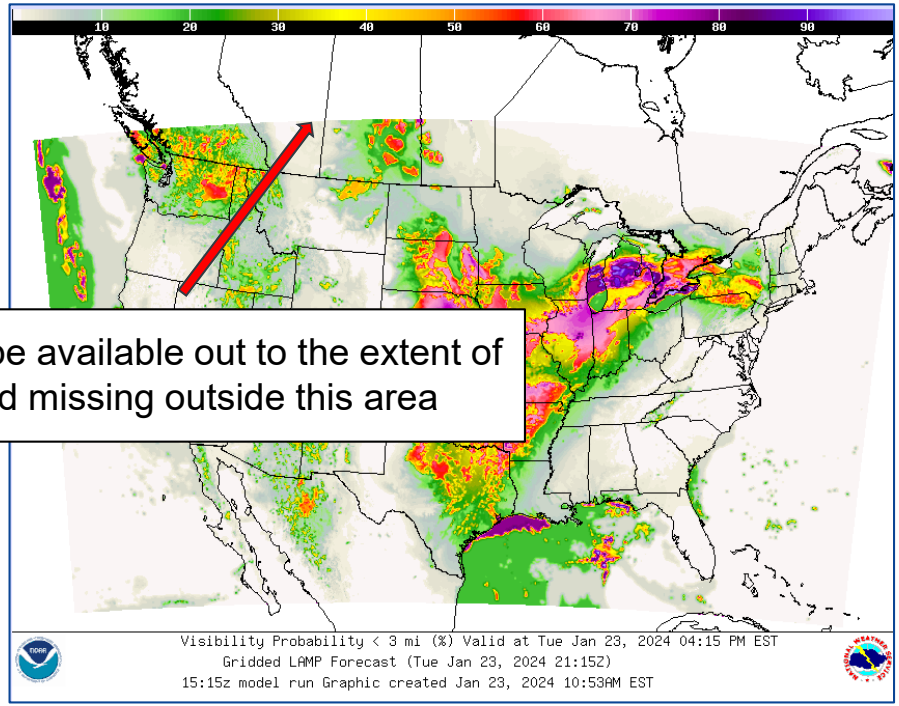


Gridded LAMP 15-min HIW C&V

Prob Cig < 1,000 ft



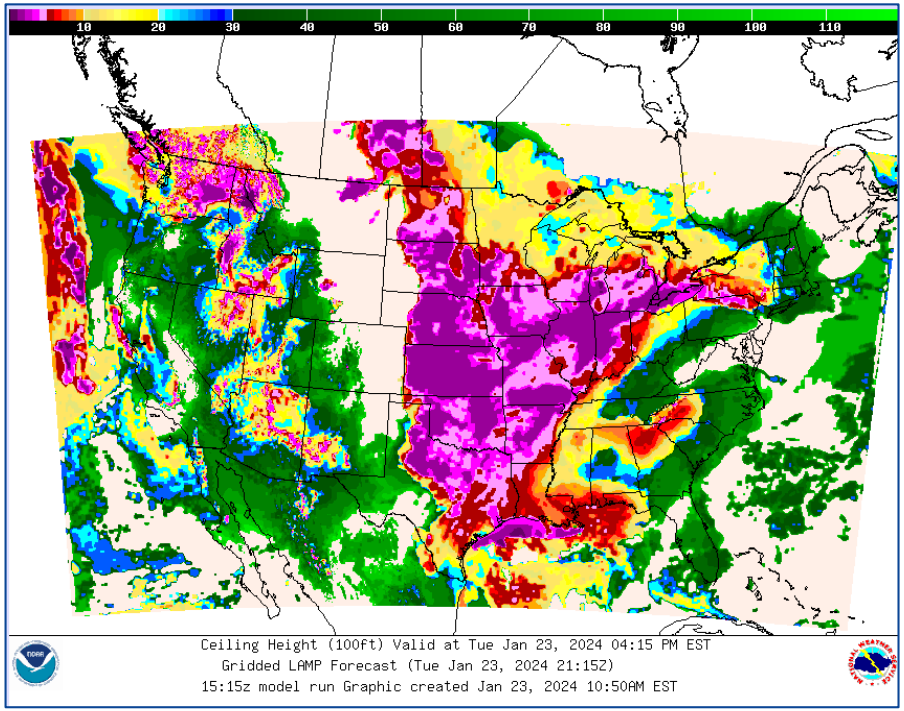
Prob Vis < 3 miles



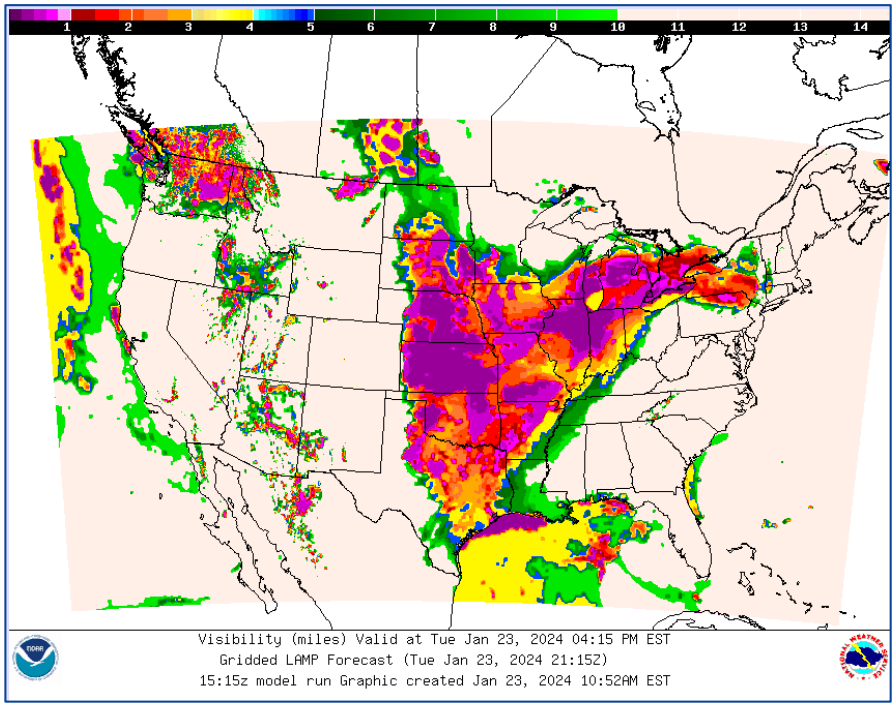
The 15-minute GLMP guidance will be available out to the extent of the sub-hourly HRRR domain and missing outside this area

Gridded LAMP 15-min HIW C&V

Ceiling Height

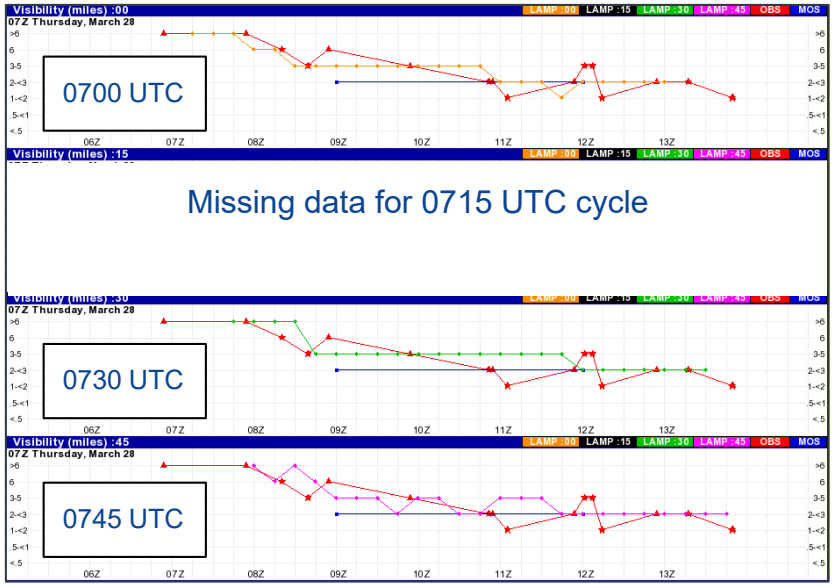


Visibility

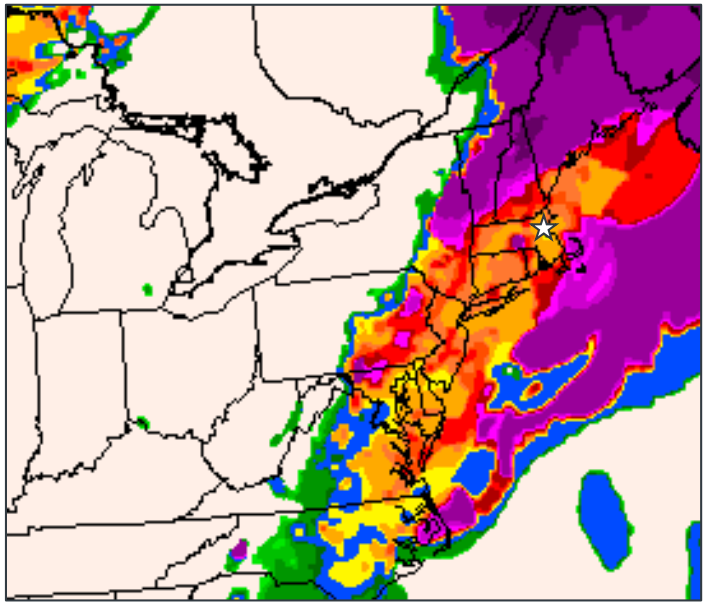


LAMP/GLMP HIW C&V:
Example Case

KBOS Visibility Case: 03/28/2024



LAMP visibility meteogram for KBOS, 0700-0745 UTC cycles



GLMP visibility, 0715 UTC cycle, valid 1000 UTC

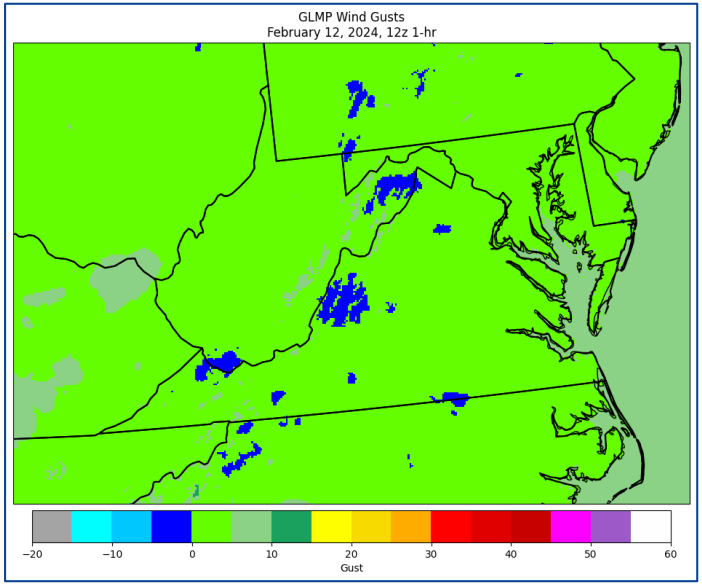
LAMP 15-minute visibility guidance captures reduced visibility from East Coast rain event

LAMP/GLMP V2.6 Upgrades:
Bug Fixes

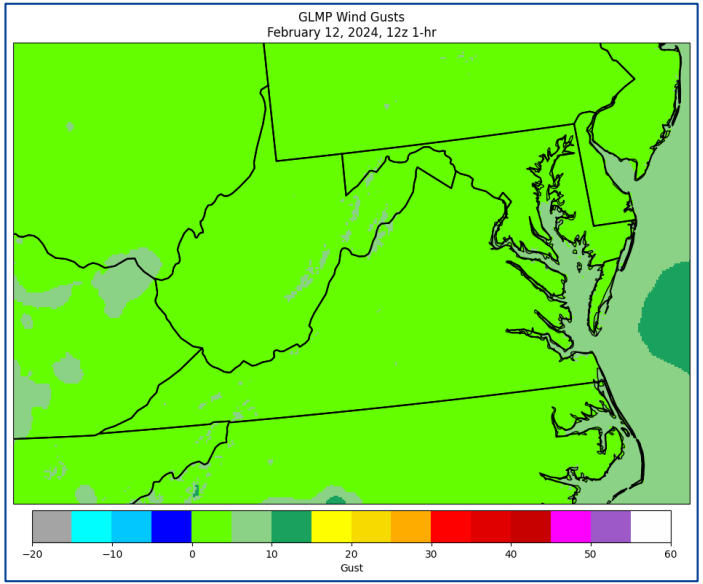
Bug Fixes

1. Addition of a post-processing check for GLMP wind gusts to prevent negative values from occurring on the grid.

v2.5



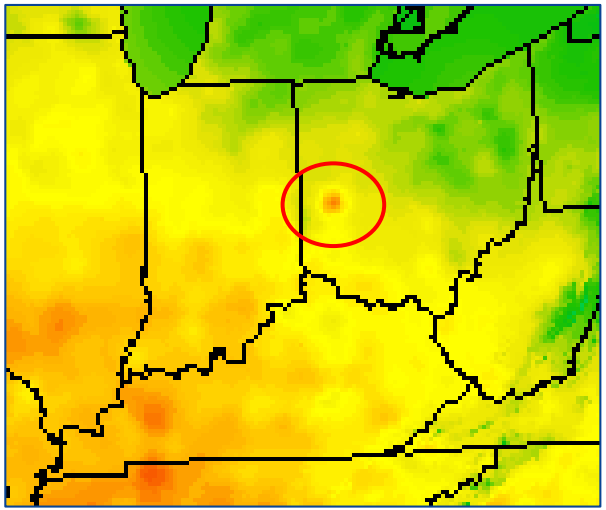
v2.6



Bug Fixes

2. Removal of a problematic mesonet station (TRJHS) from the GLMP temperature analysis.

This is an example of a bullseye in our GLMP Temperature analyses/forecasts which was caused by a bad observation at TRJHS. While the GLMP software can quality control (qc) out bad observations, at times it may be possible for a bad observation to pass the qc checks, which is what happened in this case.



Example from November 6, 2023 16:30 UTC GLMP, 3-h projection

Bug Fixes

3. An adjustment to the LAMP advection model (used as a predictor in LAMP guidance) to prevent outer edge of grid from advecting over the station in rare cases of high winds.

- This occurred with the 2130 UTC LAMP run on August 8, 2023 (high winds due to the proximity of Hurricane Dora) which resulted in erroneous LAMP temperature forecasts for several stations in Hawaii (PHOG, PHSF, PHTO).
- This change to the advection model is intended to prevent the visibility predictor from getting out of bounds and causing an unreasonable temperature/dewpoint forecast (we plan to redevelop the T/Td equations to remove this visibility advection predictor in a future upgrade).

Additional Bug Fixes

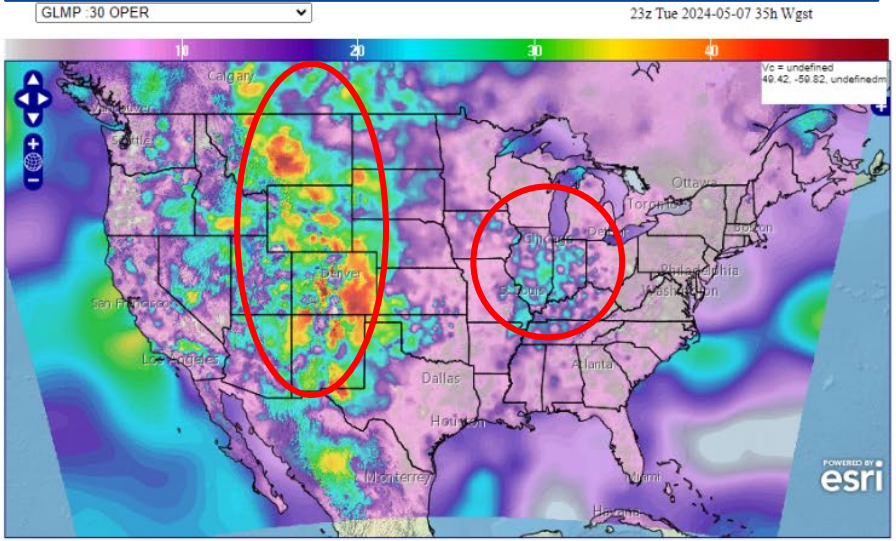
The following additional bugs were discovered during or after completion of the user evaluation and will be fixed with this upgrade:

1) Bug Fix to operational code: An incorrect setting in the analysis software that controls augmentation of LAMP station forecasts with observations and MOS, which was impacting GLMP wind gust grids beyond 35 hours. The fix restores the original intended weighting of observations and MOS in the wind gust analysis for the 36-38 hour projections.
2) Bug Fix to upgraded-, handed-off code (this was discovered and fixed after the evaluation period ended): The HRRR-based climatology used as a predictor in the new 15-minute GLMP ceiling height and visibility guidance was being miscalculated. This issue was impacting the HRRR MOS component of the GLMP guidance only, with a minor impact on the final gridded Meld forecasts. This fix restores the correct climatology predictor calculation.

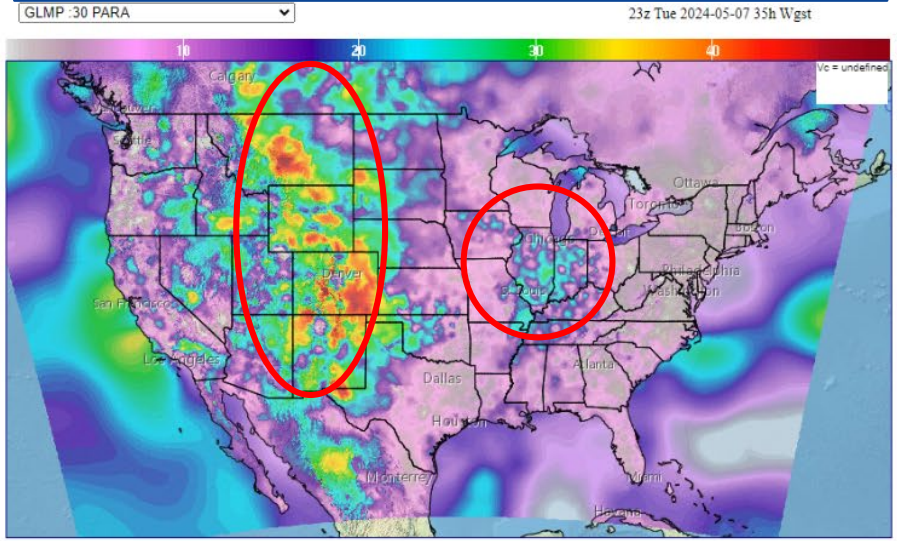
Additional Bug Fixes

1) Correction to GLMP analysis augmentation setting for wind gusts

Operational Wind Gust Projection 35



v2.6 Wind Gust Projection 35

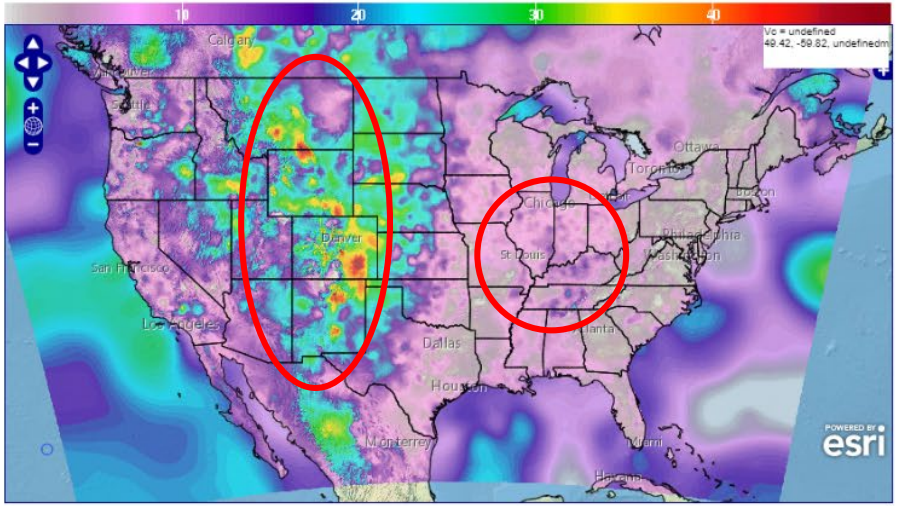


Little or no difference - projections up to 35 not impacted

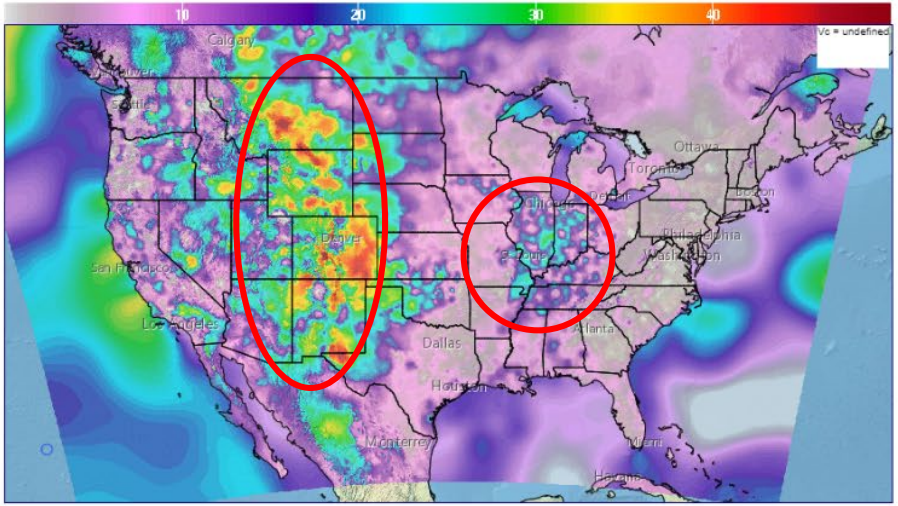
Additional Bug Fixes

1) Correction to GLMP analysis augmentation setting for wind gusts

Operational Wind Gust Projection 36



v2.6 Wind Gust Projection 36

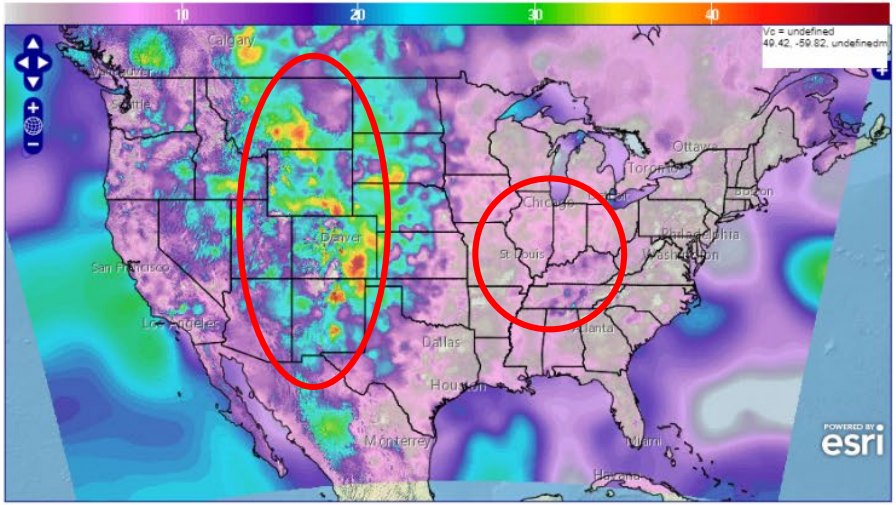


Operational gusts decrease in magnitude from previous projection when they should not have. Corrected gust has increased weighting of MOS and observations in areas with few or no LAMP stations - quality improvement in most areas

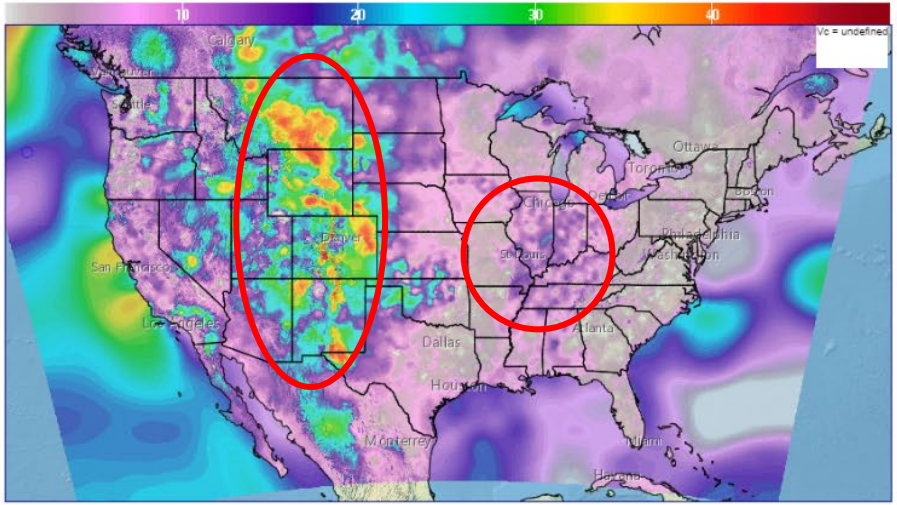
Additional Bug Fixes

1) Correction to GLMP analysis augmentation setting for wind gusts

Operational Wind Gust Projection 37



v2.6 Wind Gust Projection 37

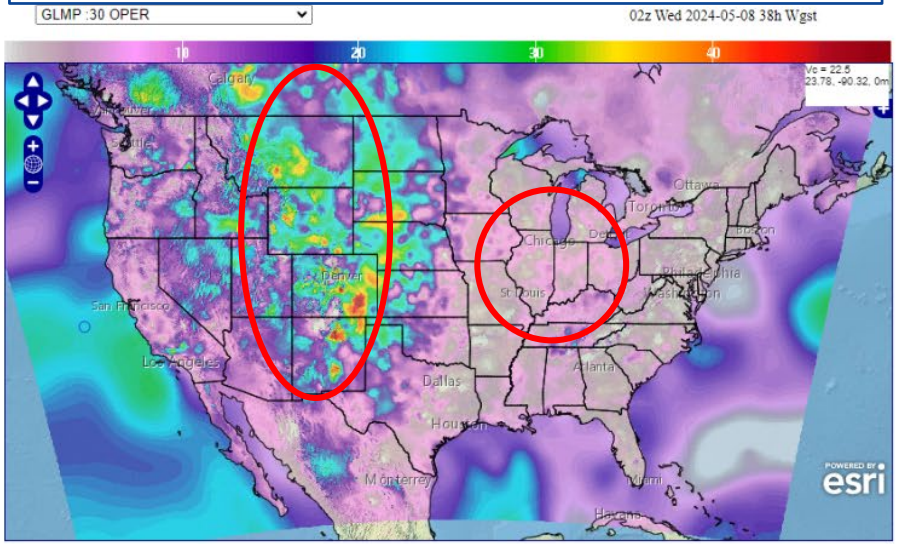


Corrected gust has increased weighting of MOS and observations in areas with few or no LAMP stations - quality improvement in most areas

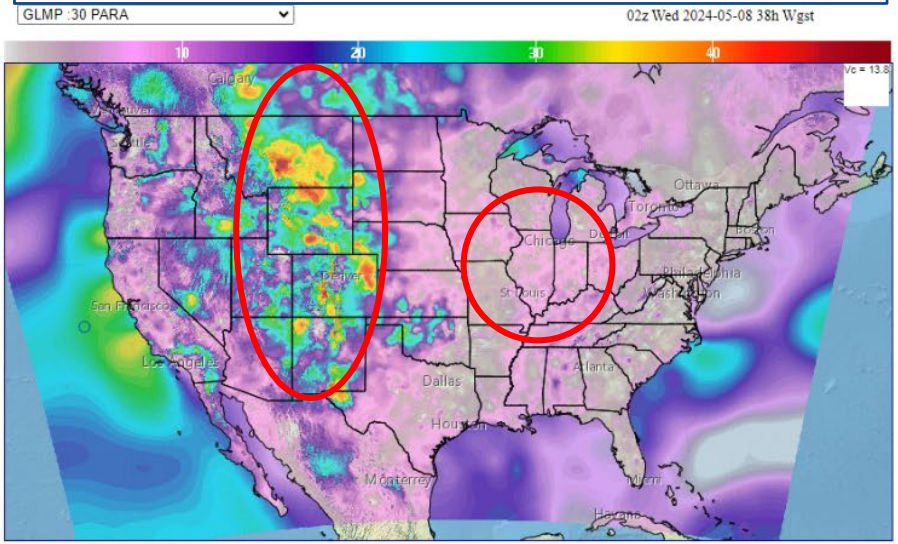
Additional Bug Fixes

1) Correction to GLMP analysis augmentation setting for wind gusts

Operational Wind Gust Projection 38



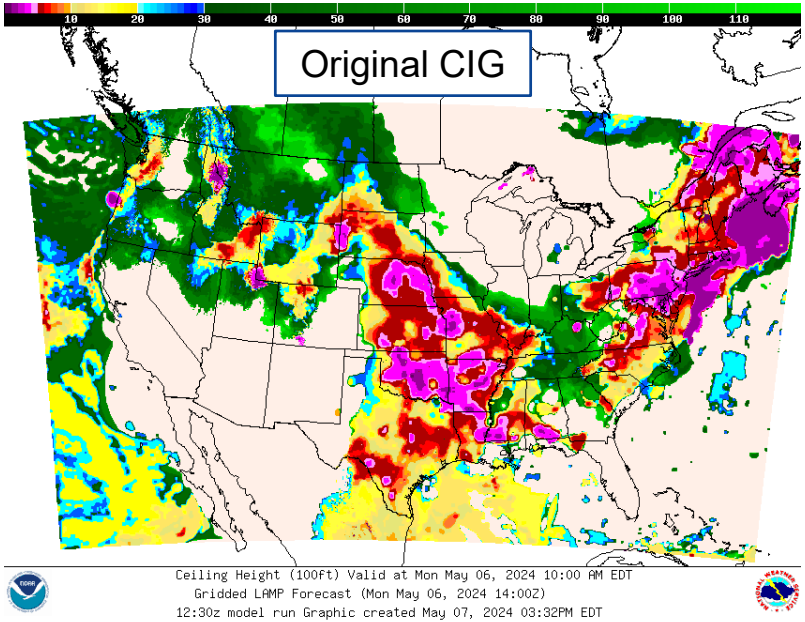
v2.6 Wind Gust Projection 38

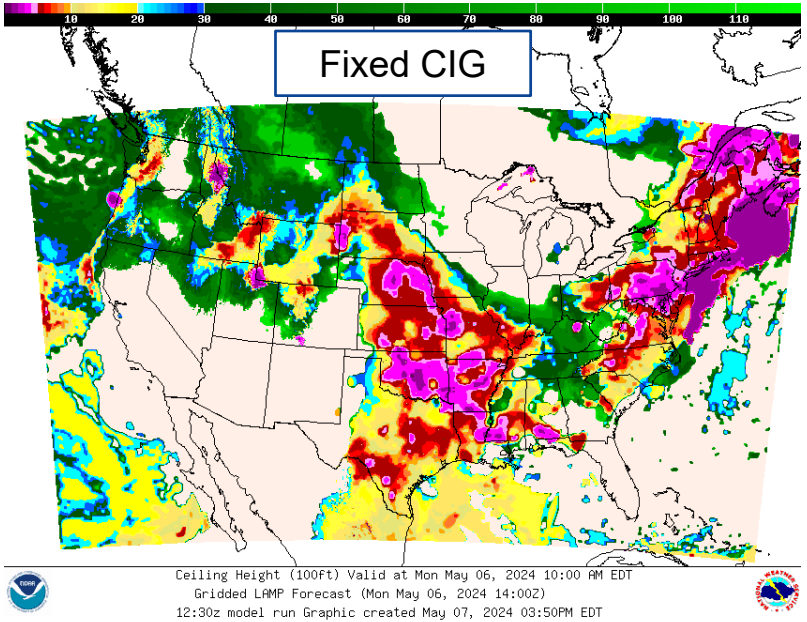


Corrected gust has increased weighting of MOS and observations in areas with few or no LAMP stations - quality improvement in most areas

Additional Bug Fixes

2. Correction to HRRR-based climatology calculation in 15-min GLMP Ceiling

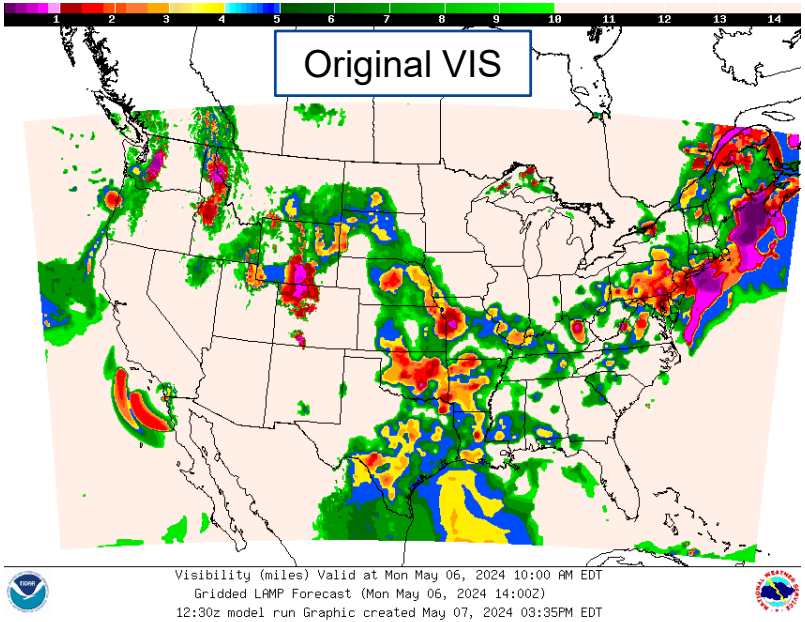


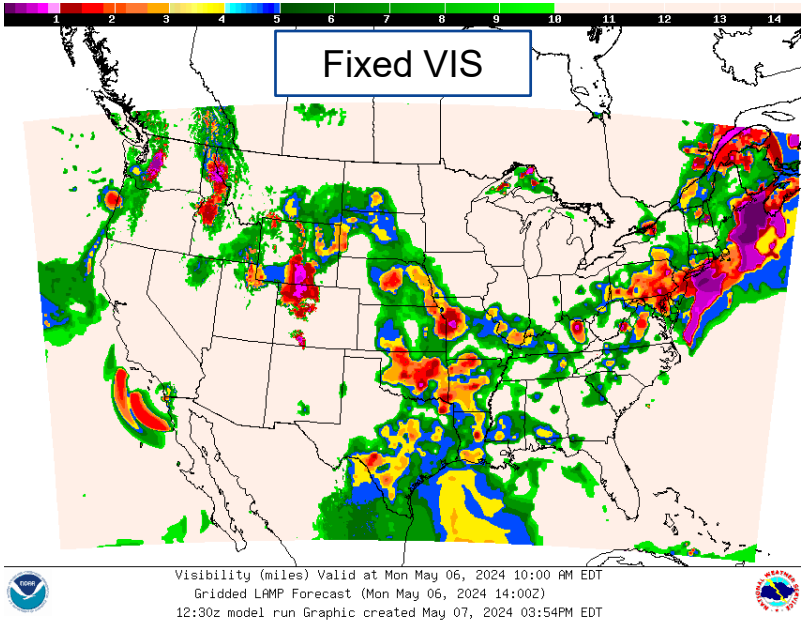


Minor differences between original and fixed

Additional Bug Fixes

2. Correction to HRRR-based climatology calculation in 15-min GLMP Visibility





Minor differences between original and fixed

LAMP/GLMP V2.6 Upgrades:
Product Changes

Product Availability

- When implemented, the 15-minute text bulletin containing categorical C&V guidance out to six hours will be available on NCEP Web Services / NOMADS (there are no plans to disseminate the text bulletins over the Satellite Broadcast Network at this time)
- When implemented, the 15-minute Gridded LAMP C&V guidance in GRIB2 format will be available on NCEP Web Services / NOMADS (there are no plans to disseminate the 15-minute GLMP guidance over the Satellite Broadcast Network at this time)
  - 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
- 15-minute text and gridded guidance will update every 15 minutes (96 cycles per day)
- AWC is receiving experimental data feed - AWC plans to evaluate these products further for inclusion in the GFA-LA.

LAMP/GLMP V2.6 Upgrades:
Upgrade Benefits

LAMP/GLMP V2.6 Upgrade Benefits

1. The addition of station-based and gridded guidance for ceiling and visibility valid for 15-minute periods out to six hours, updating every 15 minutes (96 cycles per day), will provide higher temporal resolution guidance for ceiling height and visibility to aviation users.

1. The addition of a post-processing check for GLMP wind gusts and the removal of the problematic station from the GLMP temperature and dewpoint analyses will improve the quality of the gridded guidance for users.

1. The adjustment to the LAMP advection model will limit unreasonable temperature/dewpoint LAMP station forecasts, particularly for stations in Hawaii.

1. Correcting the location of station KGVW will improve the LAMP advection model output.

Feedback and Schedule

LAMP/GLMP V2.6 - Feedback

- User Evaluation: February 23, 2024 – March 25, 2024
- Public and Internal feedback requested
- Overall positive feedback received

LAMP/GLMP V2.6 - Public Feedback

5 responses:

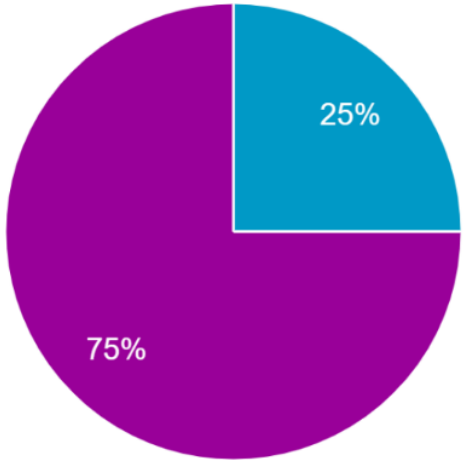
1. Public feedback:
   a. “I think that these changes to the LAMP/gridded LAMP guidance should be applied”
   b. “Looks great”
   c. “Looks very good What an upgrade”
2. Internal feedback:
   a. “My WFO is very, very foggy. It is a struggle to forecast for Dense Fog Advisories. Will probabilistic visibilities for 1/4 mi and 1/5 mi ever be developed. Or even further, the probability of visibility of zero?”
      Response: Due to rarity of the event the probabilities for < ¼ mile will be very low, so the lowest probability category we disseminate is for probabilities of visibility < ½ mile. Also there are SBN bandwidth limitations.
   b. “I have no issues with the changes proposed above. It would be nice to have the 15-minute updates for stations in Alaska, especially PANC, as we have a lot of flights through this airport. We use the Lamp output often here at FPI, and the data provided is invaluable. Is there any thought to perhaps making the web site faster?”
      Response: This user’s request is valid however meeting such a request will be challenging since there is presently no model that provides sub-hourly information over Alaska.

LAMP/GLMP V2.6 – Internal Feedback

Optional: Affiliation (Submission of your affiliation is voluntary. If you choose to provide this information, it will be used only to indicate the af... of this implementation in the summary of feedback.)

4 responses

4 responses from internal reviewers

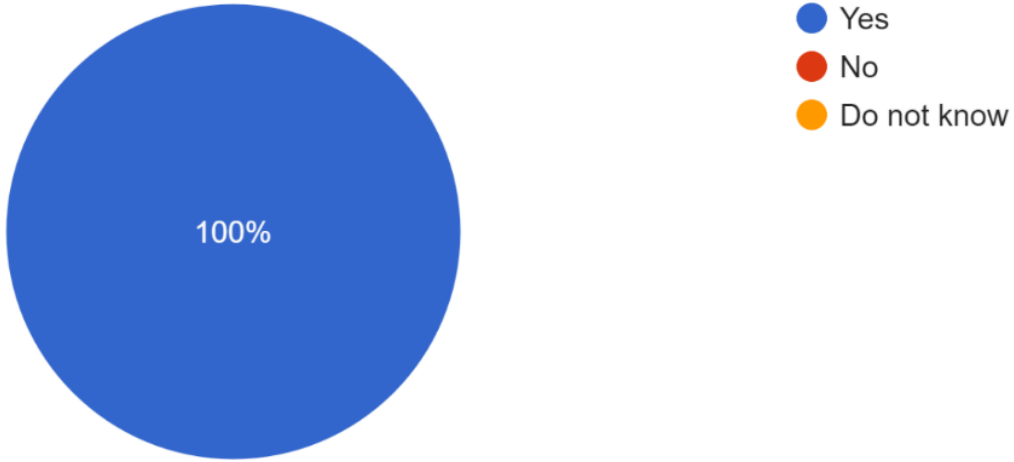


- NWS Headquarters
- NWS Regional HQ
- NWS WFO
- CWSU
- FAA
- AWC
- NOAA Other
- Other Federal Government

LAMP/GLMP V2.6 – Internal Feedback

Is the new 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) a beneficial change to the LAMP system?

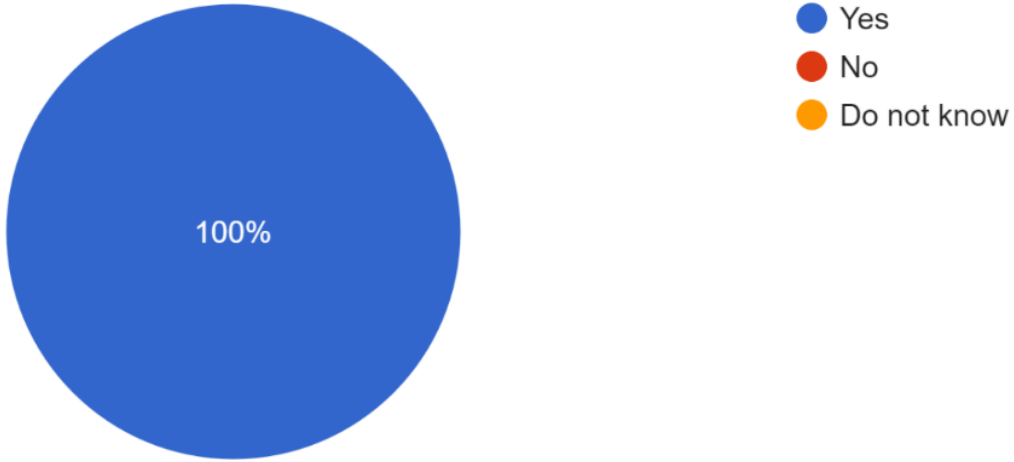
4 responses



LAMP/GLMP V2.6 – Internal Feedback

Is the new Gridded LAMP guidance for ceiling height and visibility valid for 15-minute periods out to six hours, updated every 15 minutes (96 cycles per... a beneficial change to the Gridded LAMP system?

4 responses



LAMP/GLMP V2.6 – Internal Feedback

Do you have any comments about the proposed bug fixes for LAMP and Gridded LAMP?

4 responses

The bug fixes sound necessary and beneficial. Future work should consider additional observation quality control checks to avoid bad data being assimilated into LAMP.

No

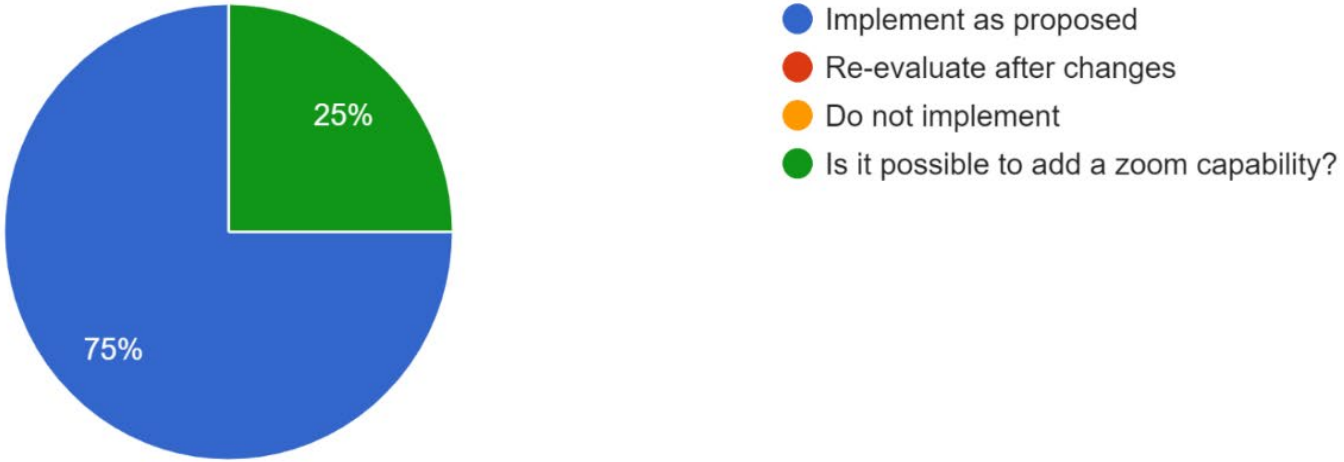
N/A

NA

LAMP/GLMP V2.6 – Internal Feedback

Recommendation

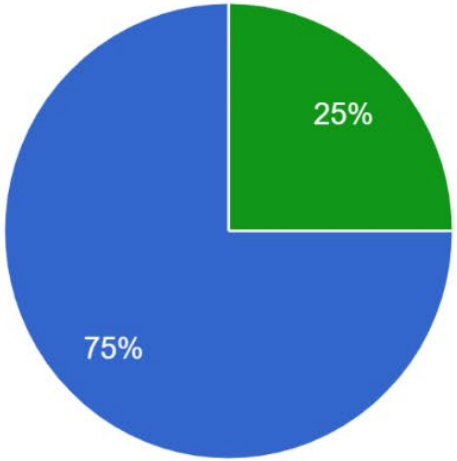
4 responses



LAMP/GLMP V2.6 – Internal Feedback

Recommendation

4 responses



- Implement as proposed
- Re-evaluate after changes
- Do not implement
- Is it possible to add a zoom capability?

We attempted to get clarification from this user on what product they were referring to but did not receive a response. We have no plans to continue providing the experimental 15-minute GLMP **images** beyond the implementation unless there is a requirement for us to do so.

LAMP/GLMP V2.6 – Internal Feedback

Do you have any comments about the proposed bug fixes for LAMP and Gridded LAMP? *

LKN (Elko WFO) currently does not have a LAMP/Gridded LAMP and/or MOS guidance available at Battle Mountain Airport (KBAM). Will the proposed changes include KBAM? This will be extremely useful information when preparing TAFs for that airport.

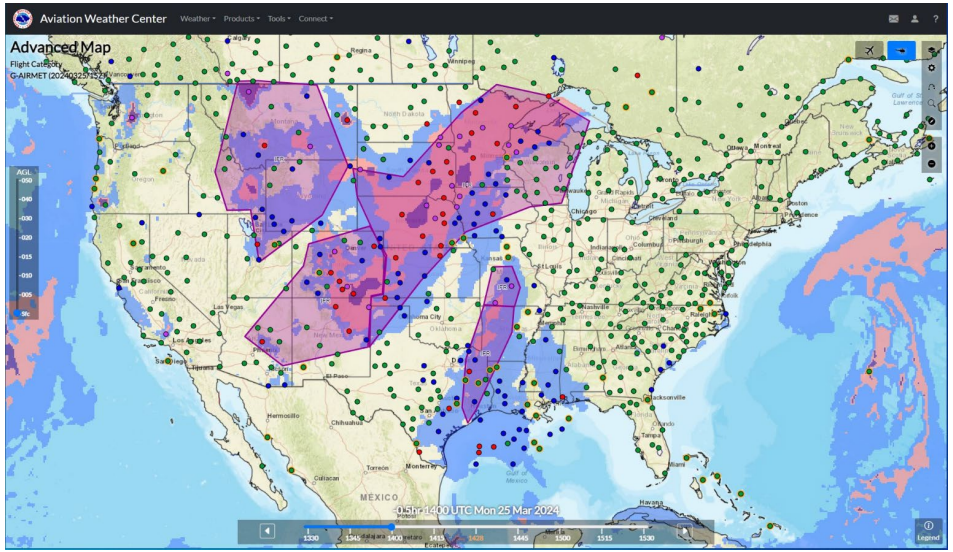
We received a late survey response after the evaluation ended from the Elko WFO requesting LAMP guidance for KBAM. We responded that we plan to add this station to our regional ceiling and visibility equations for the next upgrade, and recommended they use the NBM text bulletins in the meantime. This user replied back with “implement as proposed.”

LAMP v2.6 Upgrade

Aviation Weather Center Feedback

AWC Impacts

- Increased temporal resolution of LAMP/GLMP from 1-hr to 15-min will provide additional inter-hour information for low altitude fliers.
- This was identified as a need specifically for Helicopter Air Ambulance operators who often fly on shorter timescales and are more susceptible to adverse weather conditions due to low ceilings and visibility.



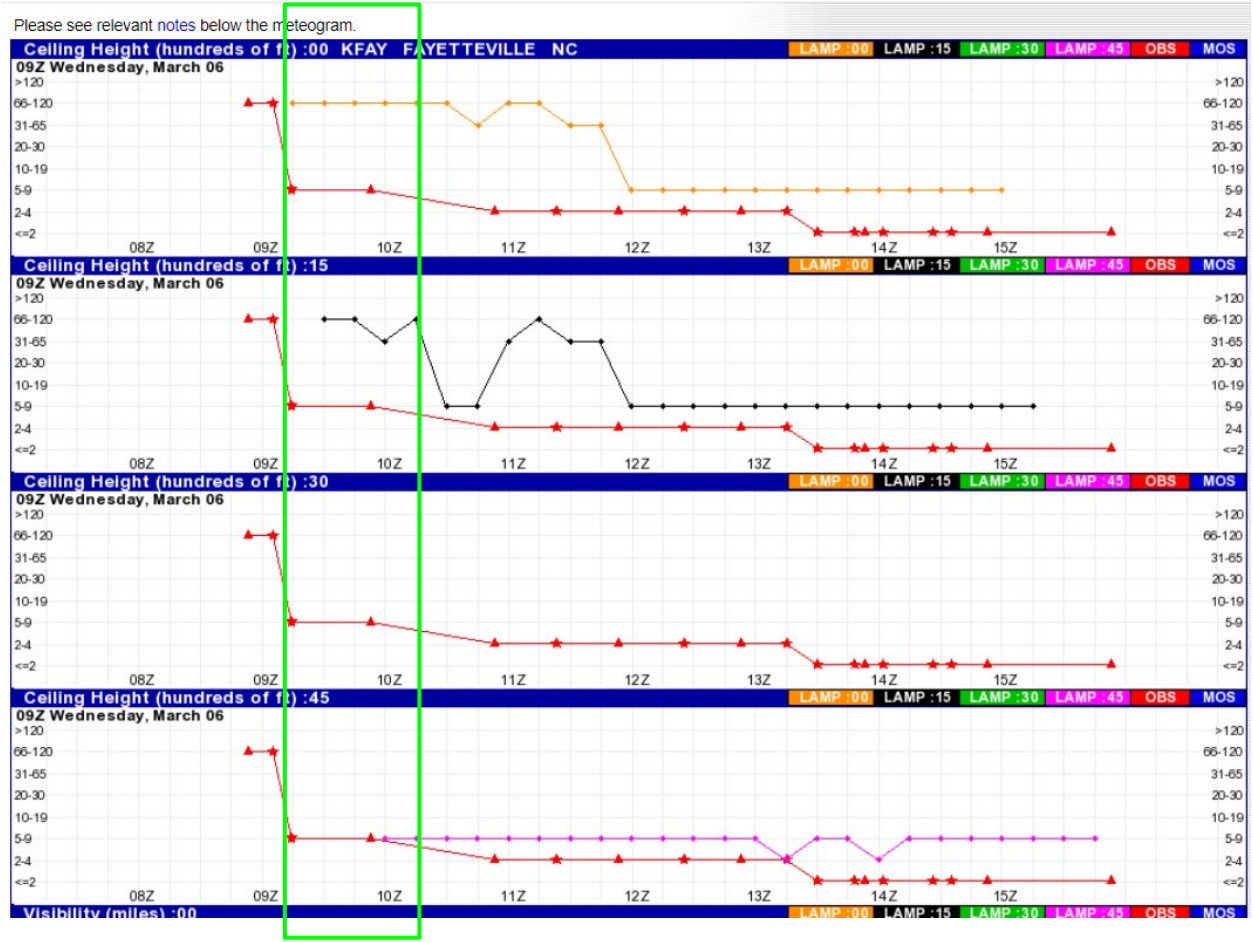
- The GLMP currently provides a 15-min updating analysis which is utilized on the Observation tab and Advanced Map version of the Graphical Forecasts for Aviation at Low Altitudes (GFA-LA), the addition of a 15-min forecast will allow for temporal consistency for the users.

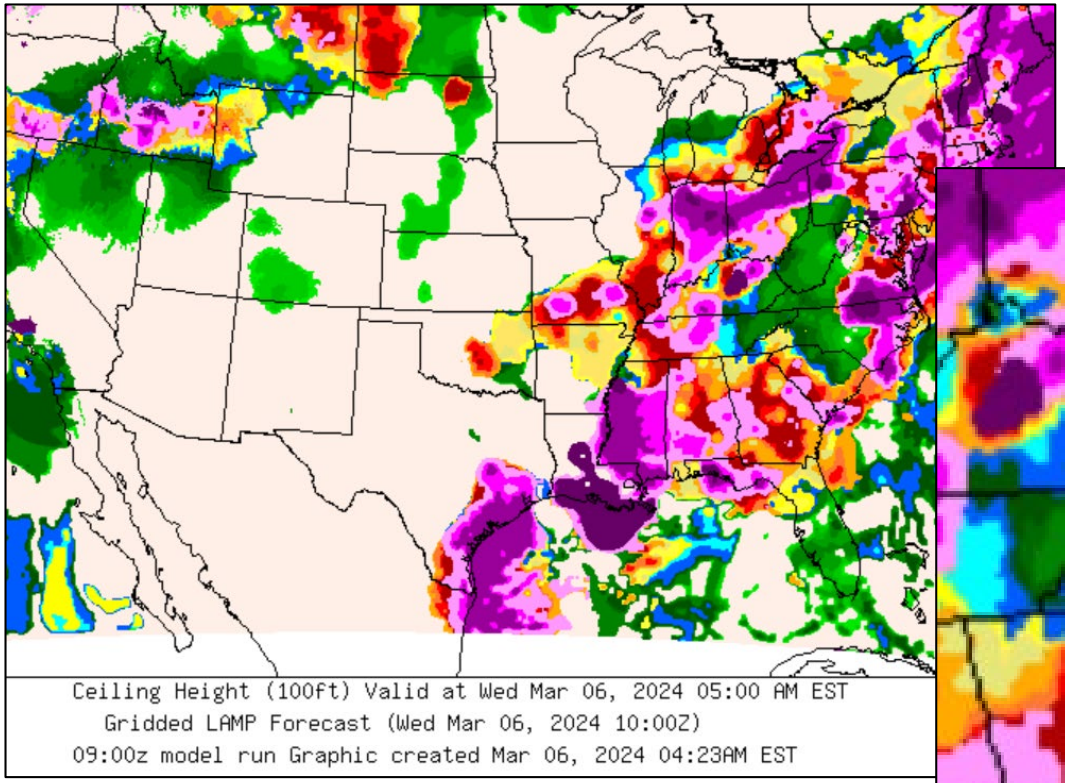
Case Studies

- AWC collected a handful of cases that highlighted the updated GLMP performance.
- Due to limited resources/time constraints, AWC utilized the graphics provided by MDL vs pulling in the data and more rigorously evaluating it internally.
- Prior to implementing the updated GLMP operationally on AWC's website, a much more thorough evaluation (including user input) will need to be completed.
- AWC sought to identify cases where the updated guidance temporal resolution improved the forecast interhourly, and the overall performance was not degraded from the current operational 1-hr GLMP.

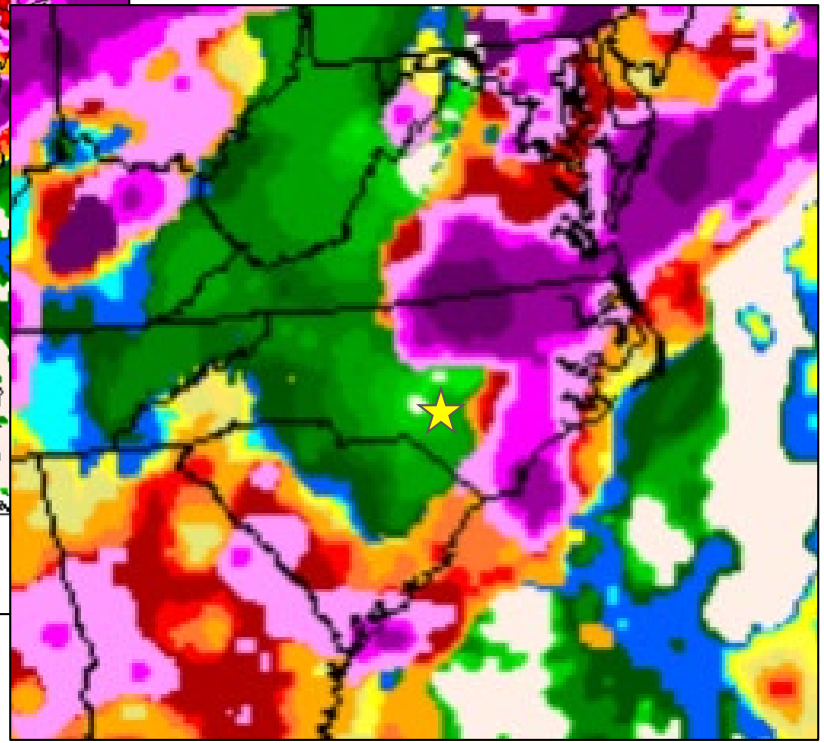
Fayetteville, NC
March 6, 09Z runs

- Obs show low ceilings moved in by 9:15z
- 09z run (top) doesn't indicate lowering ceilings till 12z
- 0945z run (bottom) captures 9:15z ob, and shows continued lower ceilings from 10z on

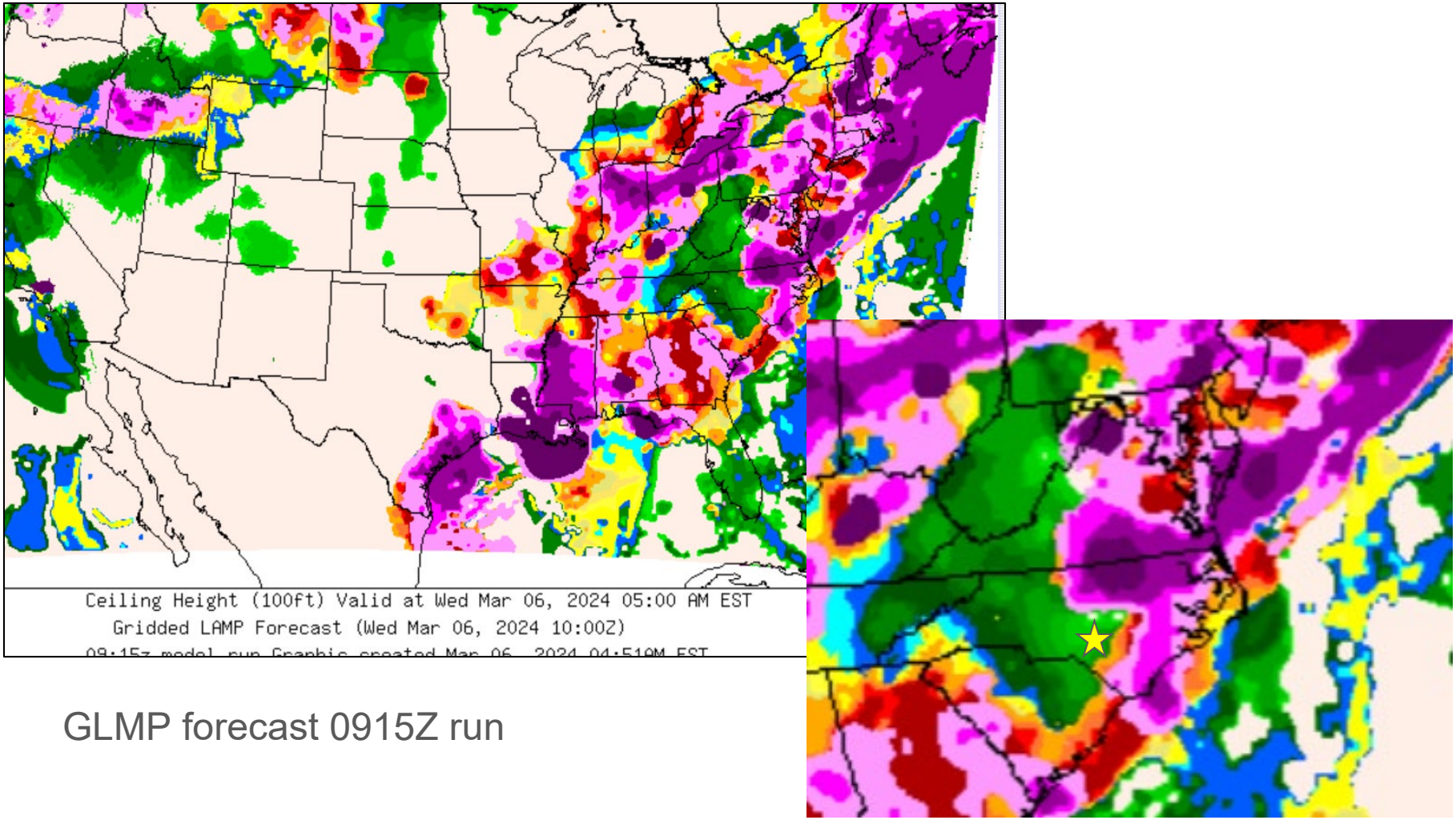




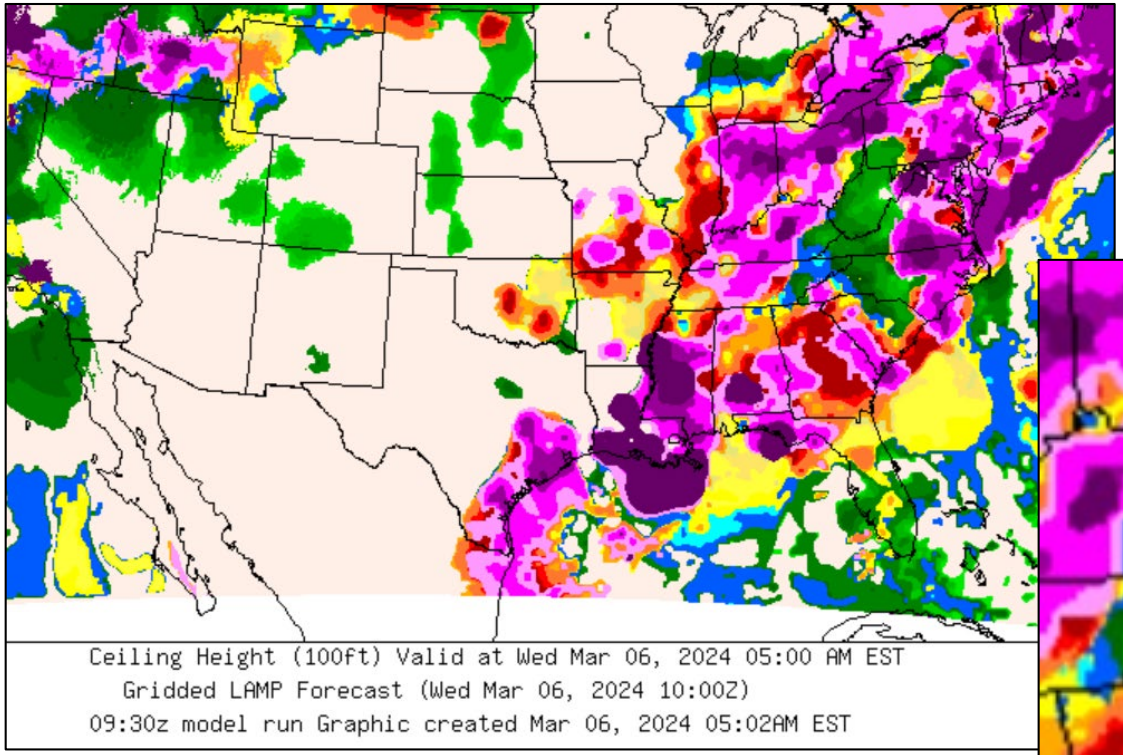
= approximate location of Fayetteville

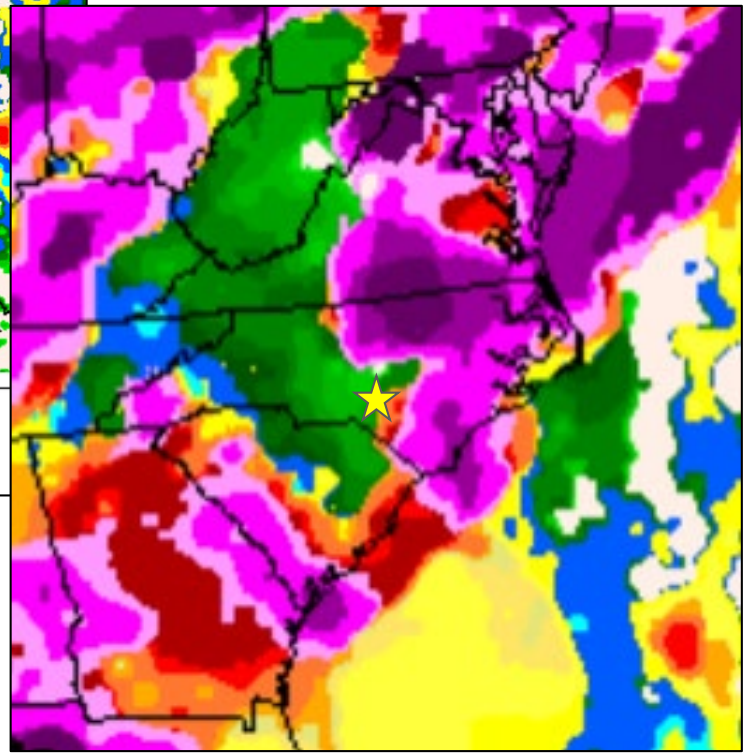


GLMP forecast 0900Z run

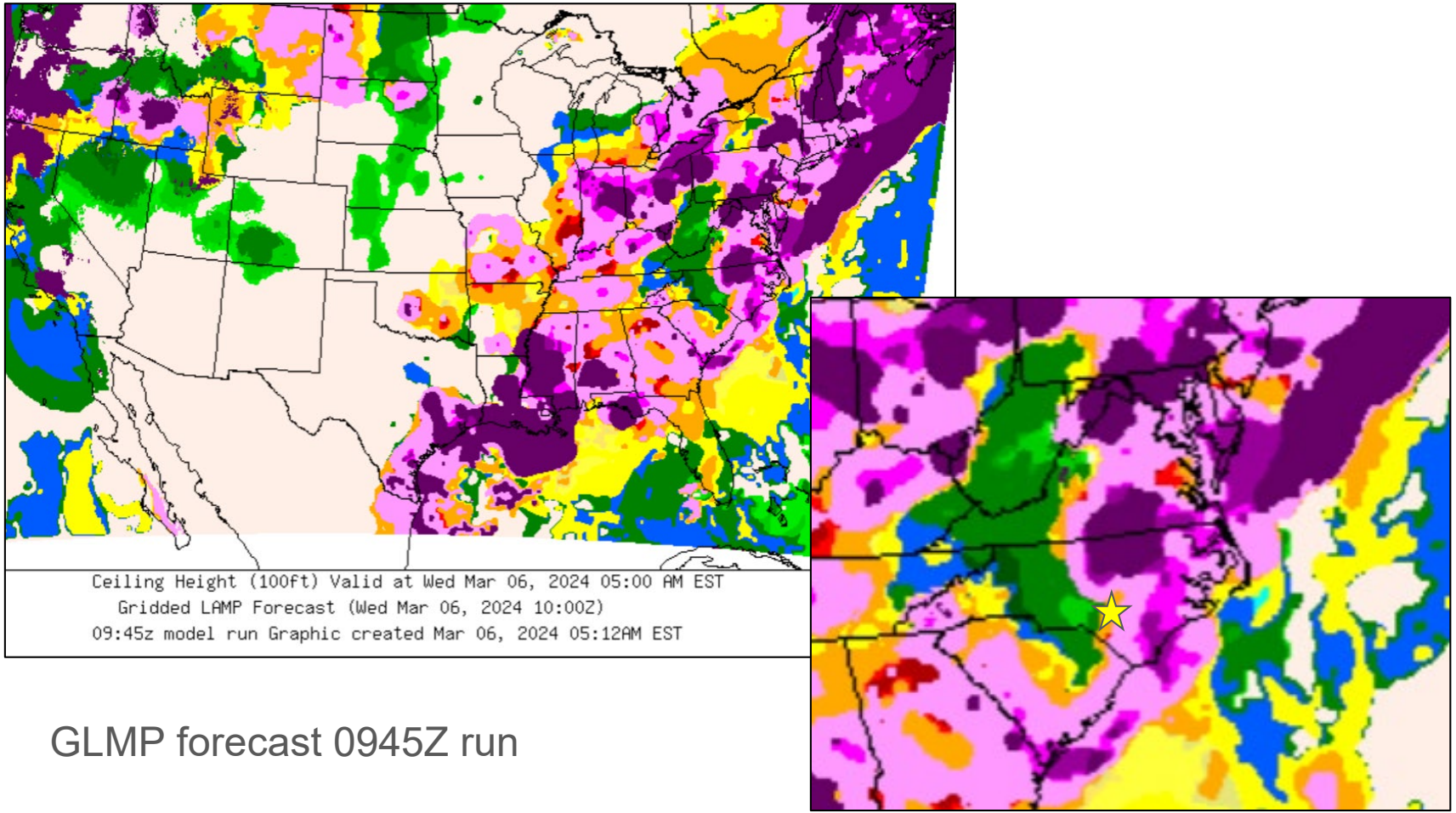


GLMP forecast 0915Z run





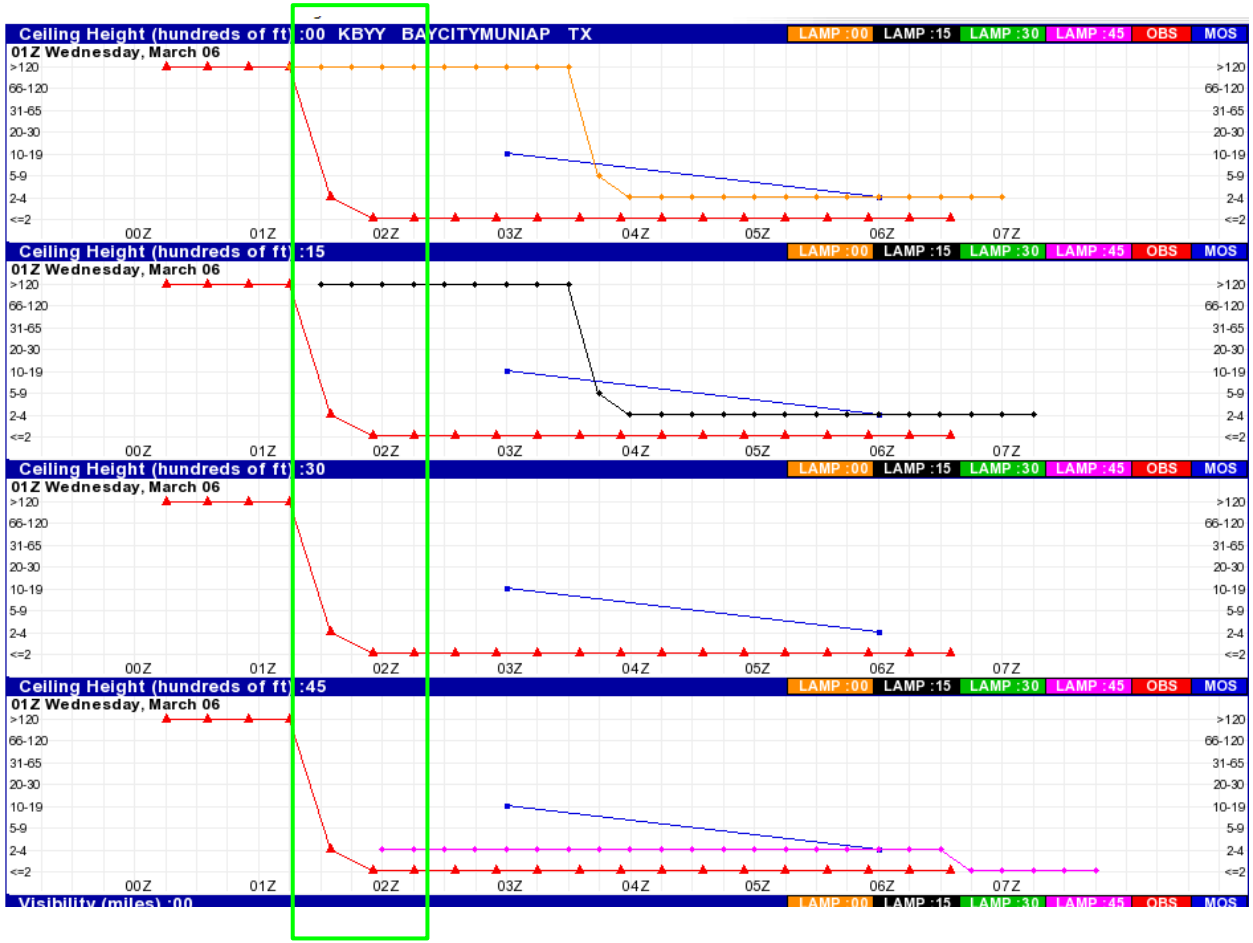
GLMP forecast 0930Z run



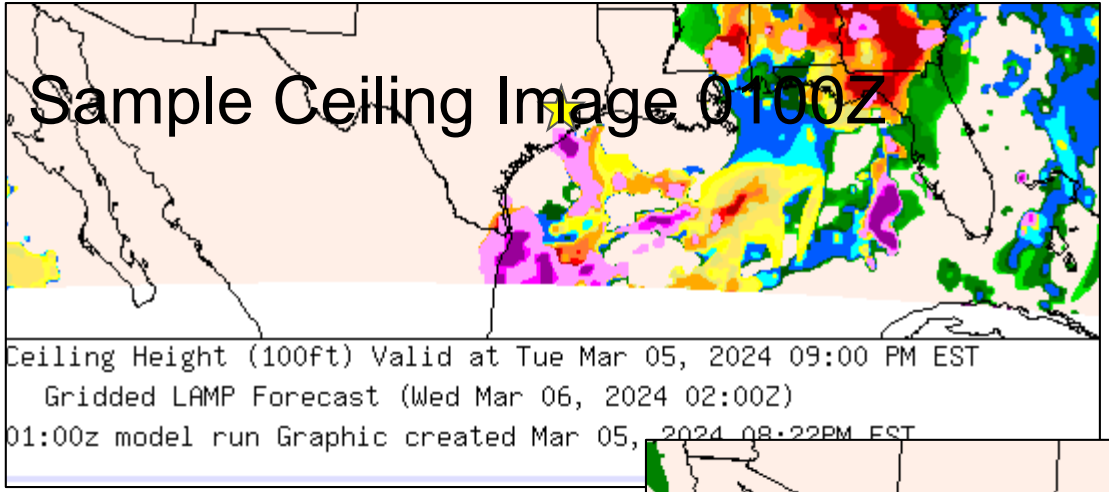
GLMP forecast 0945Z run

Houston, TX
March 6, 01Z runs

- Obs show low ceilings moved onshore between 1:15-2Z
- 0100z run (top) doesn't indicate lowering ceilings until 3:45z
- 0145z run (bottom) lowers ceilings by 02z and carries through the forecast

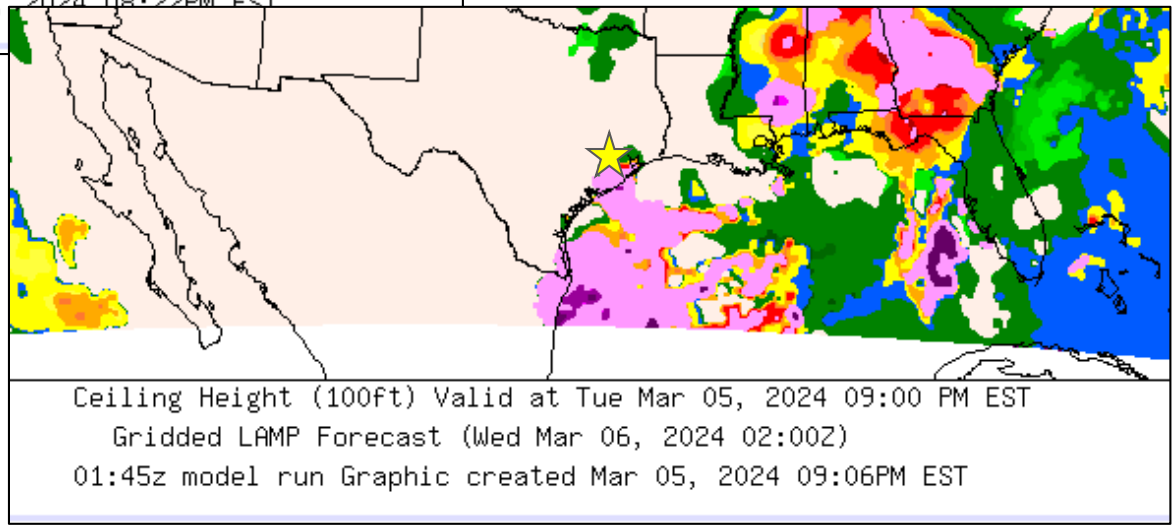


Sample Ceiling Image 0100Z



The :00 run shows an area of low ceiling on the coastline between Texas and the Gulf of Mexico.

The :45 minute run shows this area of lower ceilings further on show compared to the :00 run.



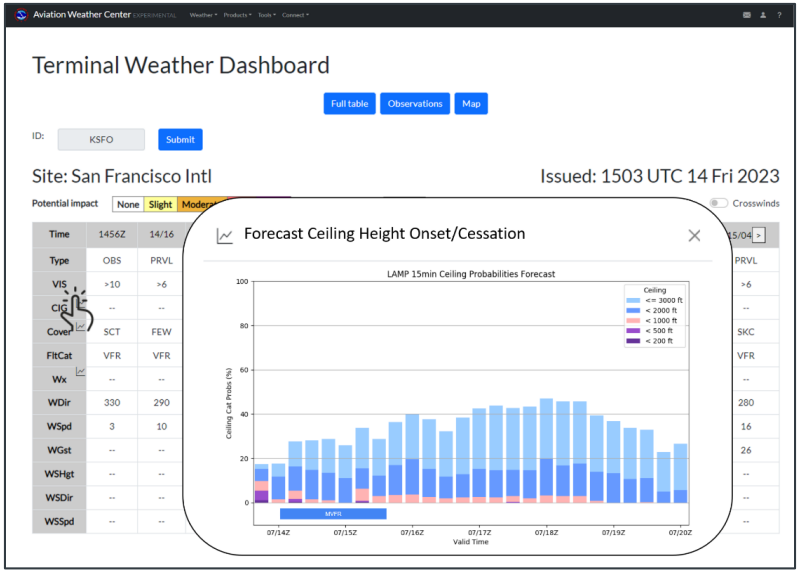
Any Additional Comments or Feedback?

LAMP/GLMP V2.6 - Future Related Work

- 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  2  3  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
```

LAMP onset/cessation text bulletin



Mock-up of AWC onset/cessation dashboard design

LAMP/GLMP V2.6 – Schedule

- Code handoff: ~~April 30, 2024~~ → May 14, 2024
  - Handoff slipping two weeks to consolidate redundant jobs and perform other optimizations
- Planned Implementation: August 2024

Thank you!

phil.shafer@noaa.gov

https://vlab.noaa.gov/web/mdl/lamp