Improving the National Blend of Models (NBM) for Aviation Decision Support

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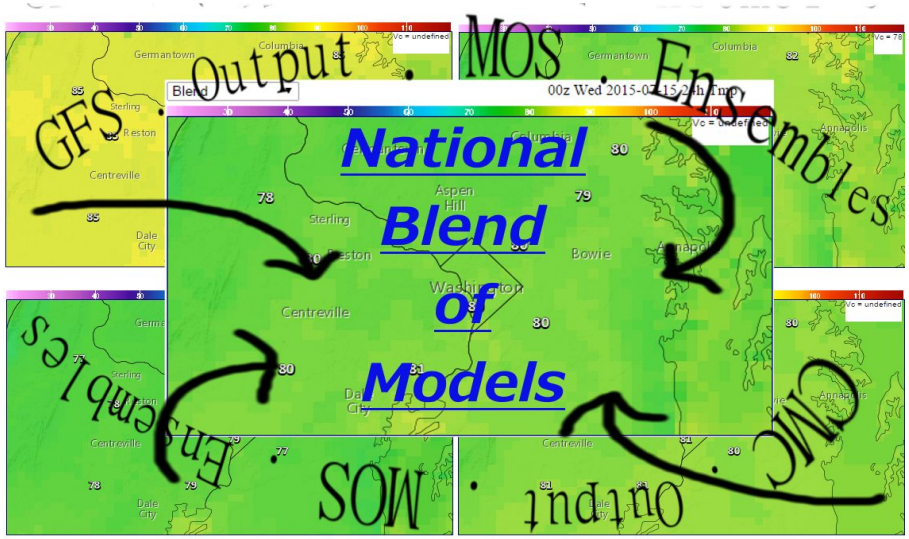



Pulling it all together to build a Weather-Ready Nation and to accomplish our mission to save lives and property
Ready, Responsive, Resilient
Saving Lives and Property
4100+ WRN Ambassadors
Multi-faceted Communication Strategy
Deep Relationships
Core Partners
NWS Employees Providing Impact-Based Decision Support Services (IDSS)
Accurate & Consistent Forecasts/Warnings
Social Science
Fully-Integrated Field Structure through a Collaborative Forecast Process
National Blend of Models: Forecast starting point
One NWS, One Dissemination Network
Observations and Numerical Weather Prediction
DRAFT/PRE-DECISIONAL

NBM v4.0 Aviation Highlights

Ceiling height and visibility (C&V) guidance update

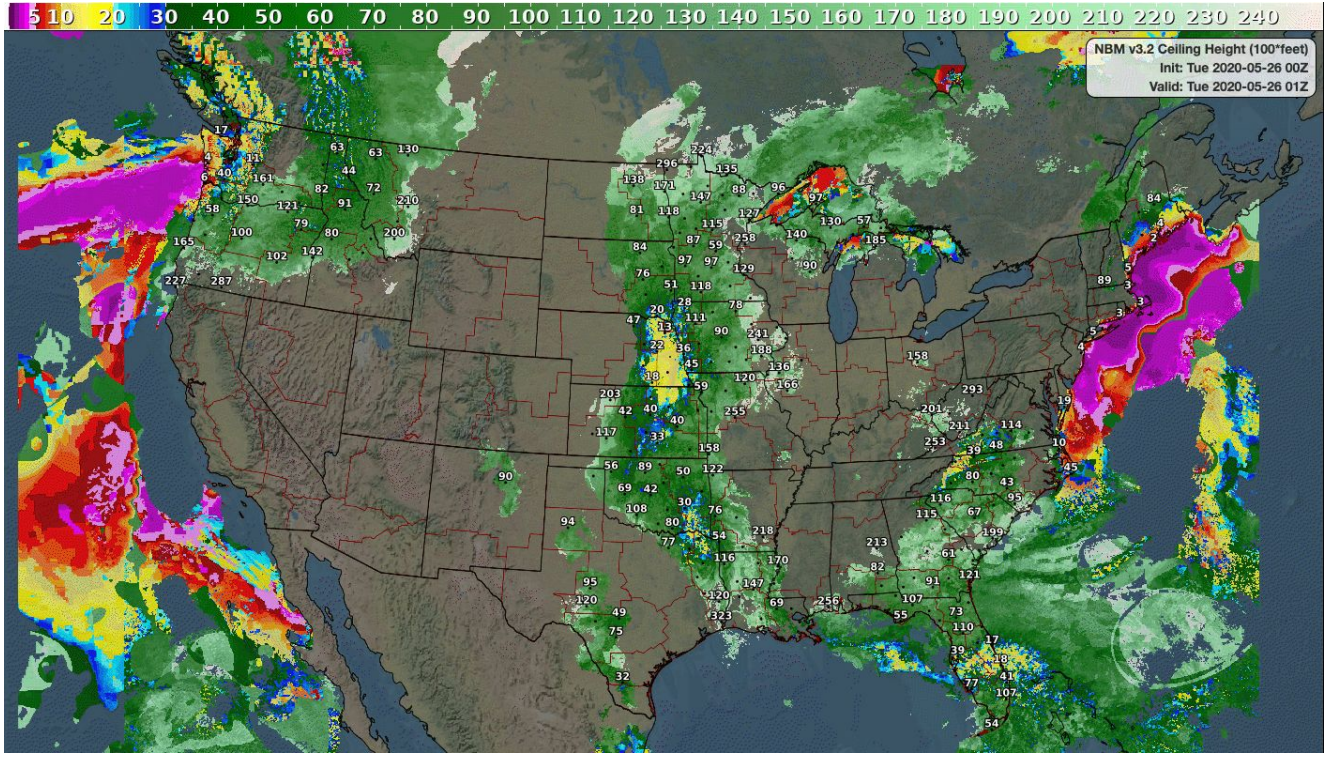
- Gridded LAMP selected to be the NBM C&V guidance for the 1-36 hour forecast period, hourly time steps

- GFS and NAM-MOS combined using LAMP techniques to make the 37-78 hour forecasts, three-hourly time steps

- Sky cover improvements from HRRR upgrade and bias correction of inputs based on URMA

NBM v3.2 Ceiling Height and Visibility

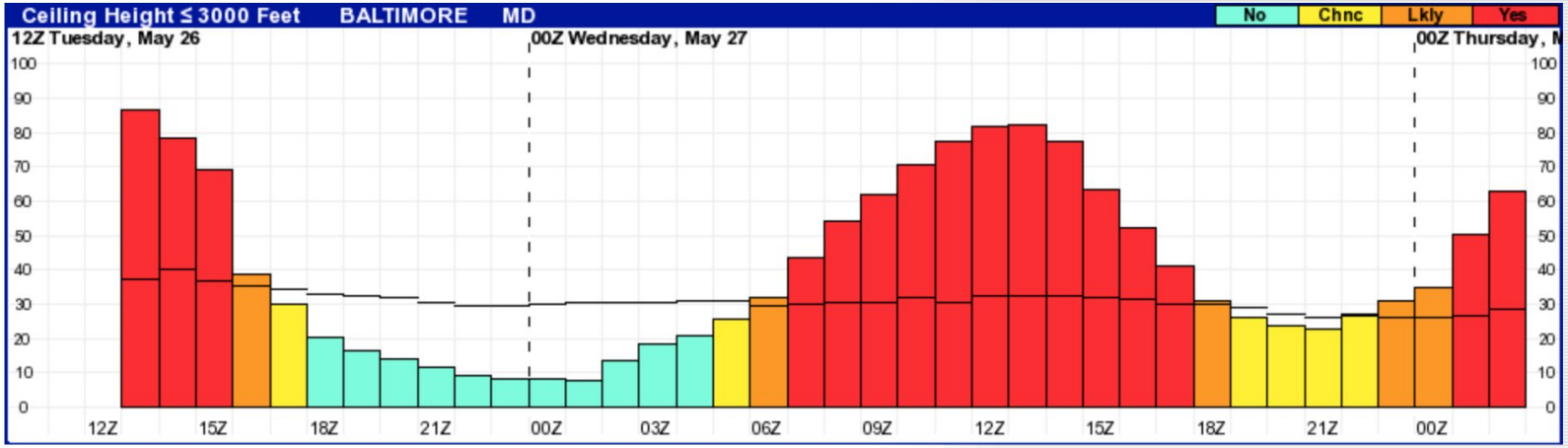
Created by averaging direct model output from numerous NWP models.



NBM v4.0 Ceiling Height and Visibility

Created by selecting a ceiling height or visibility value based on forecast probabilities of events occuring (Gridded LAMP technique)

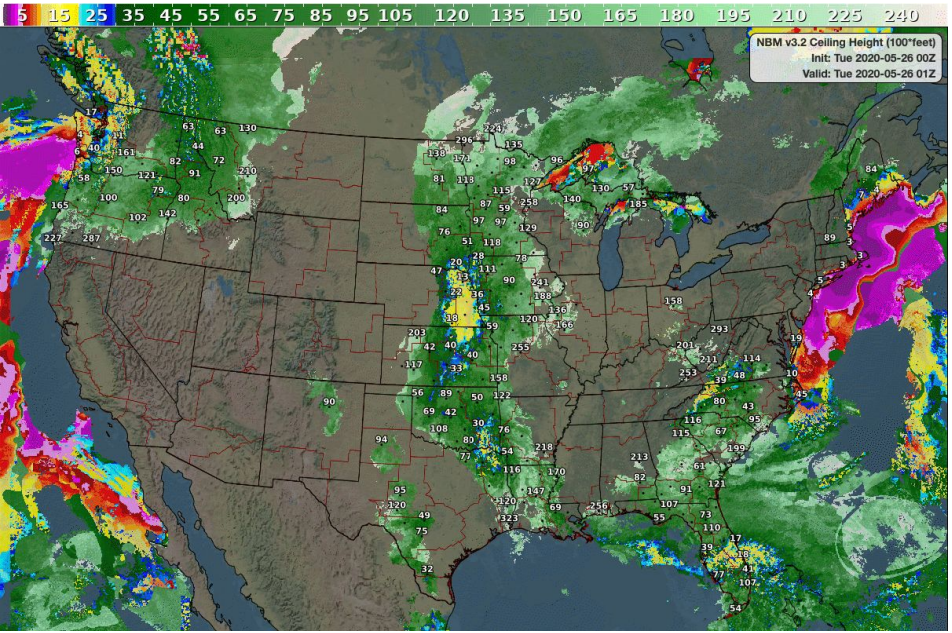
- Probabilities created with regression equations (equations developed on multi-year training samples)



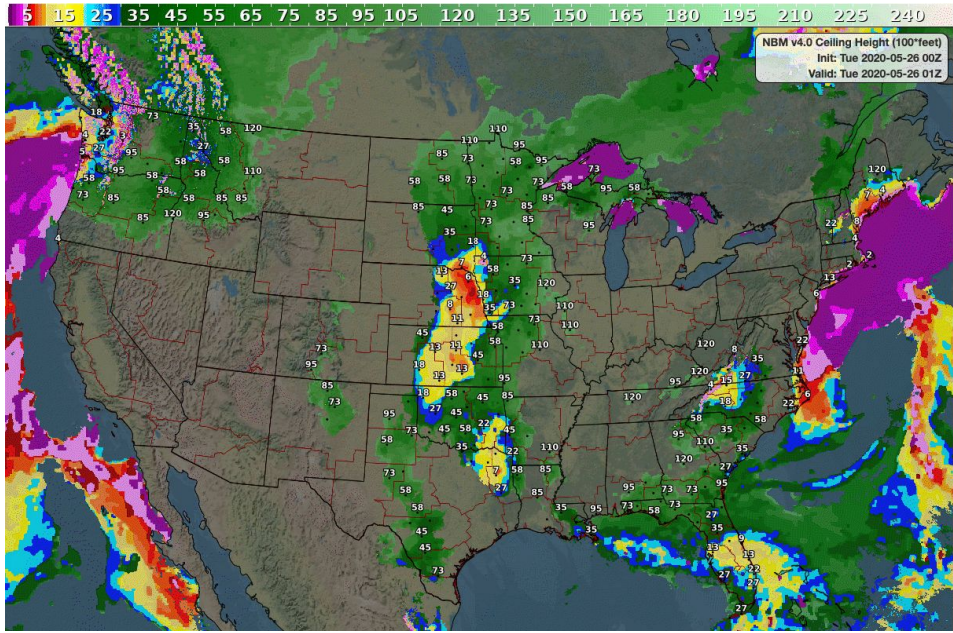
Bar graphs indicate the probability of selected flight category element. The color represents the *difference* (using 10% thresholds between categories) between the probability and the threshold required to make a categorical forecast. Solid black lines indicate the threshold value at each hour.

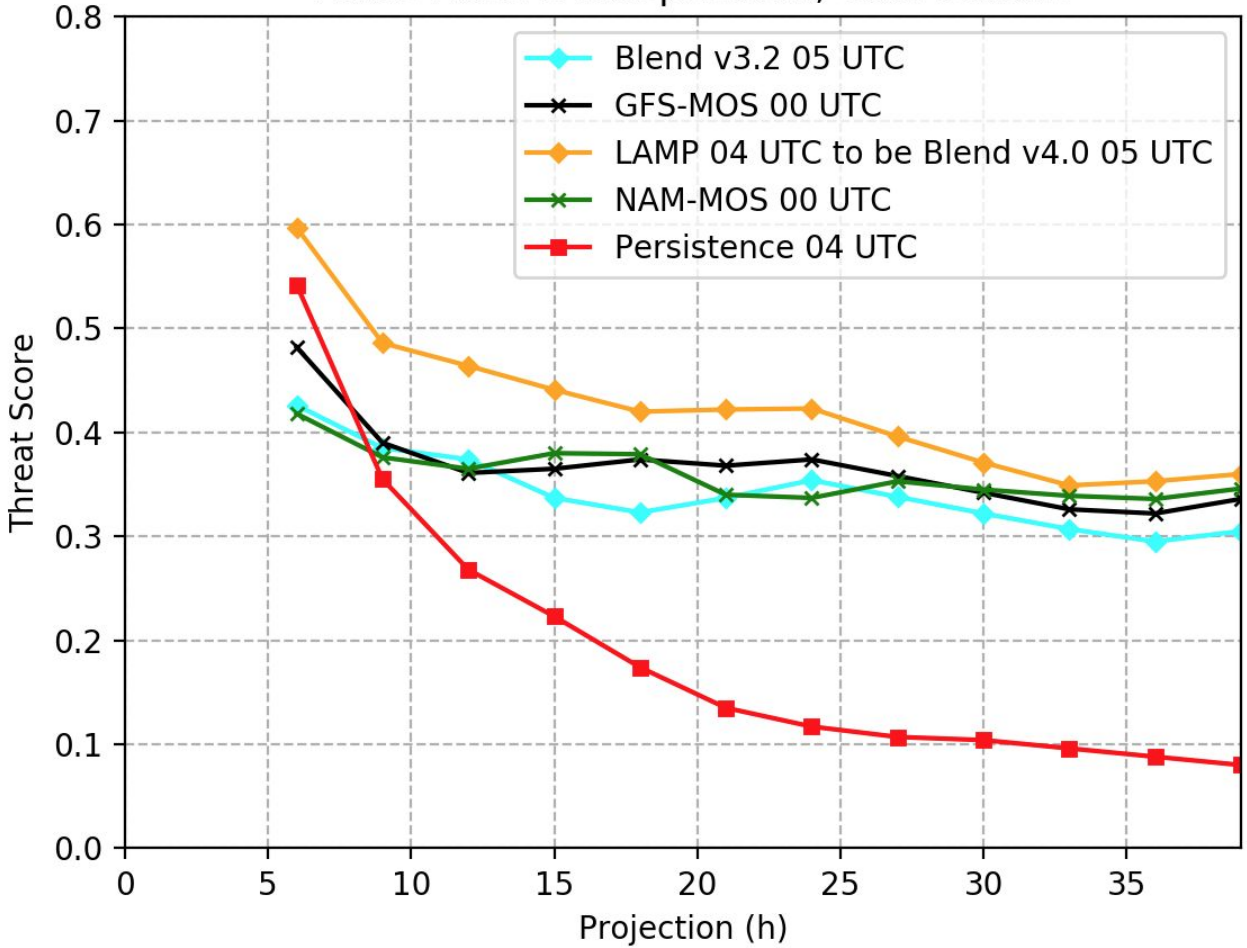
Blend ceiling height forecast from 00 UTC on May 26, 2020

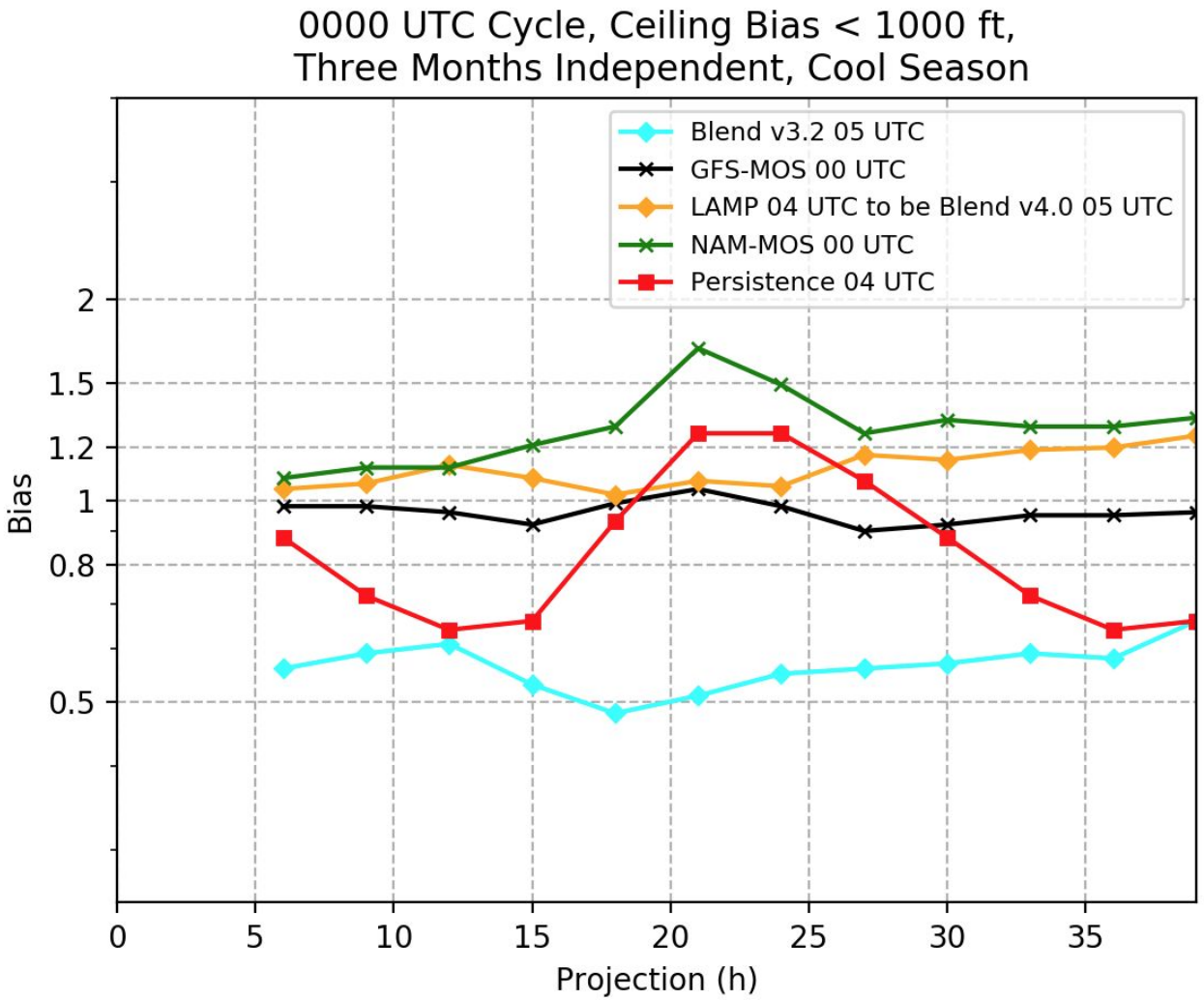
V3.2 (prod)

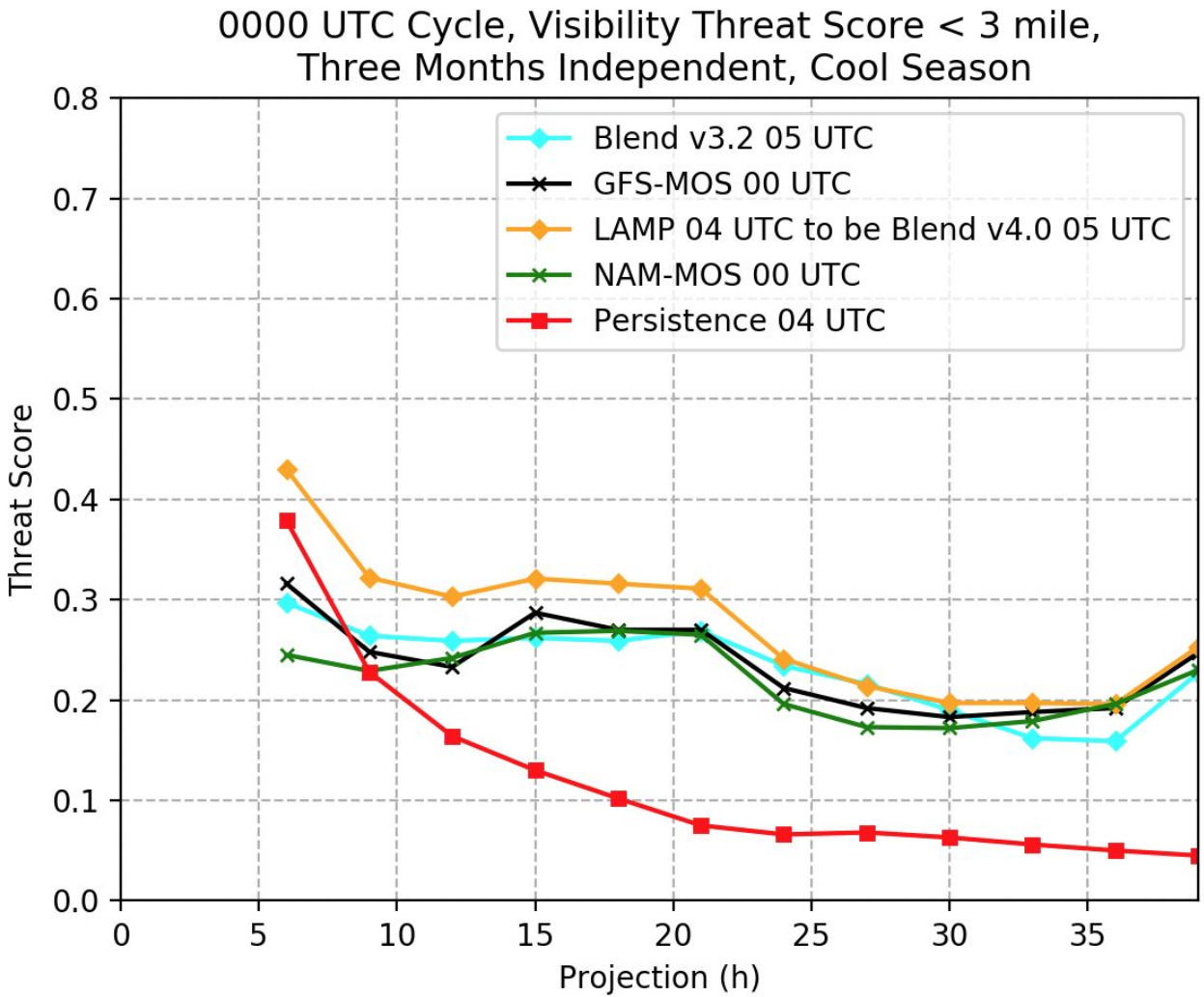


V4.0 (expr)




0000 UTC Cycle, Ceiling Threat Score < 1000 ft,
Three Months Independent, Cool Season
Blend v3.2 05 UTC
GFS-MOS 00 UTC
LAMP 04 UTC to be Blend v4.0 05 UTC
NAM-MOS 00 UTC
Persistence 04 UTC
Threat Score
Projection (h)
0.0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0
5
10
15
20
25
30
35


0000 UTC Cycle, Ceiling Bias < 1000 ft,
Three Months Independent, Cool Season
Blend v3.2 05 UTC
GFS-MOS 00 UTC
LAMP 04 UTC to be Blend v4.0 05 UTC
NAM-MOS 00 UTC
Persistence 04 UTC
Bias
2
1.5
1.2
1
0.8
0.5
0
5
10
15
20
25
30
35
Projection (h)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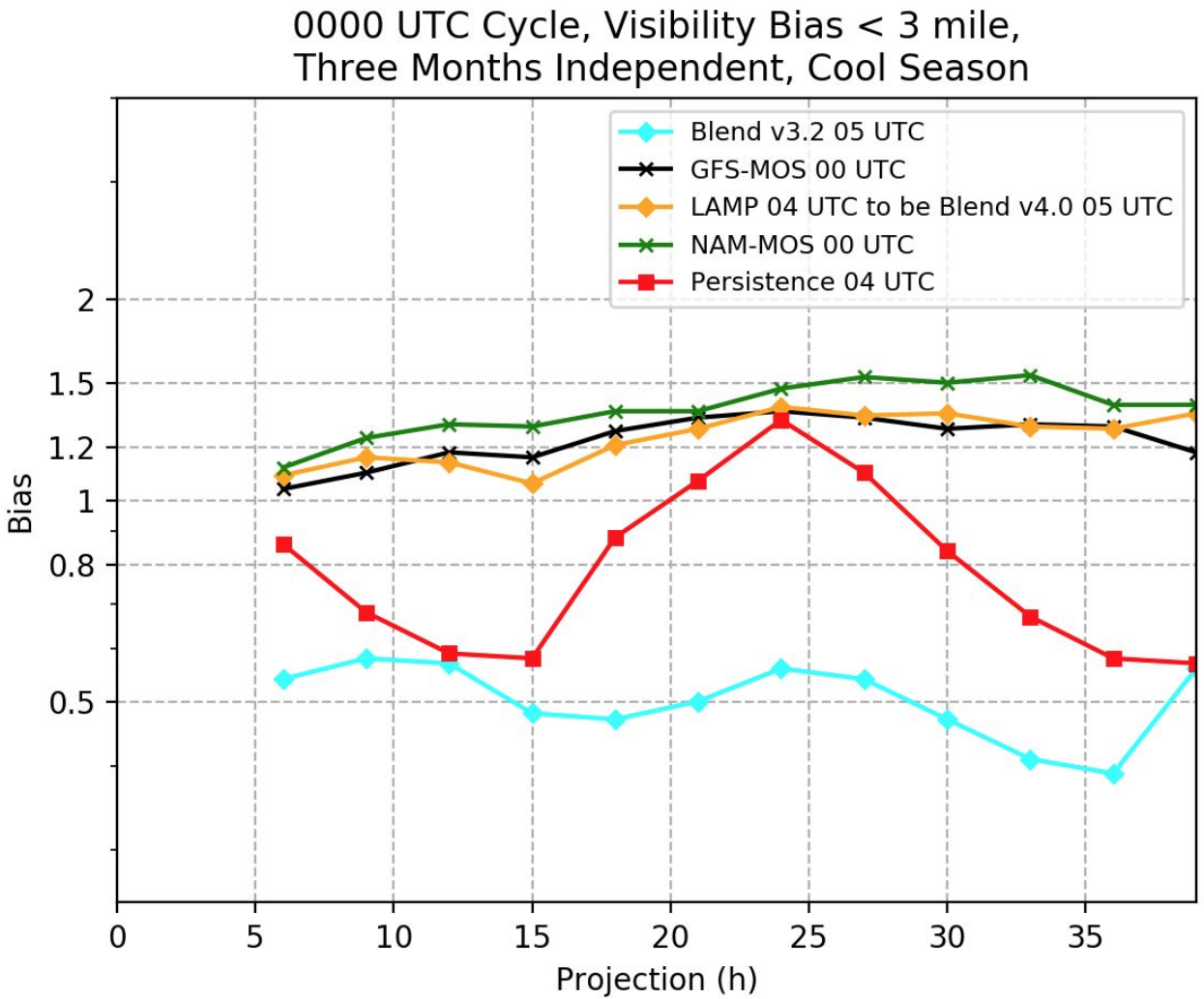
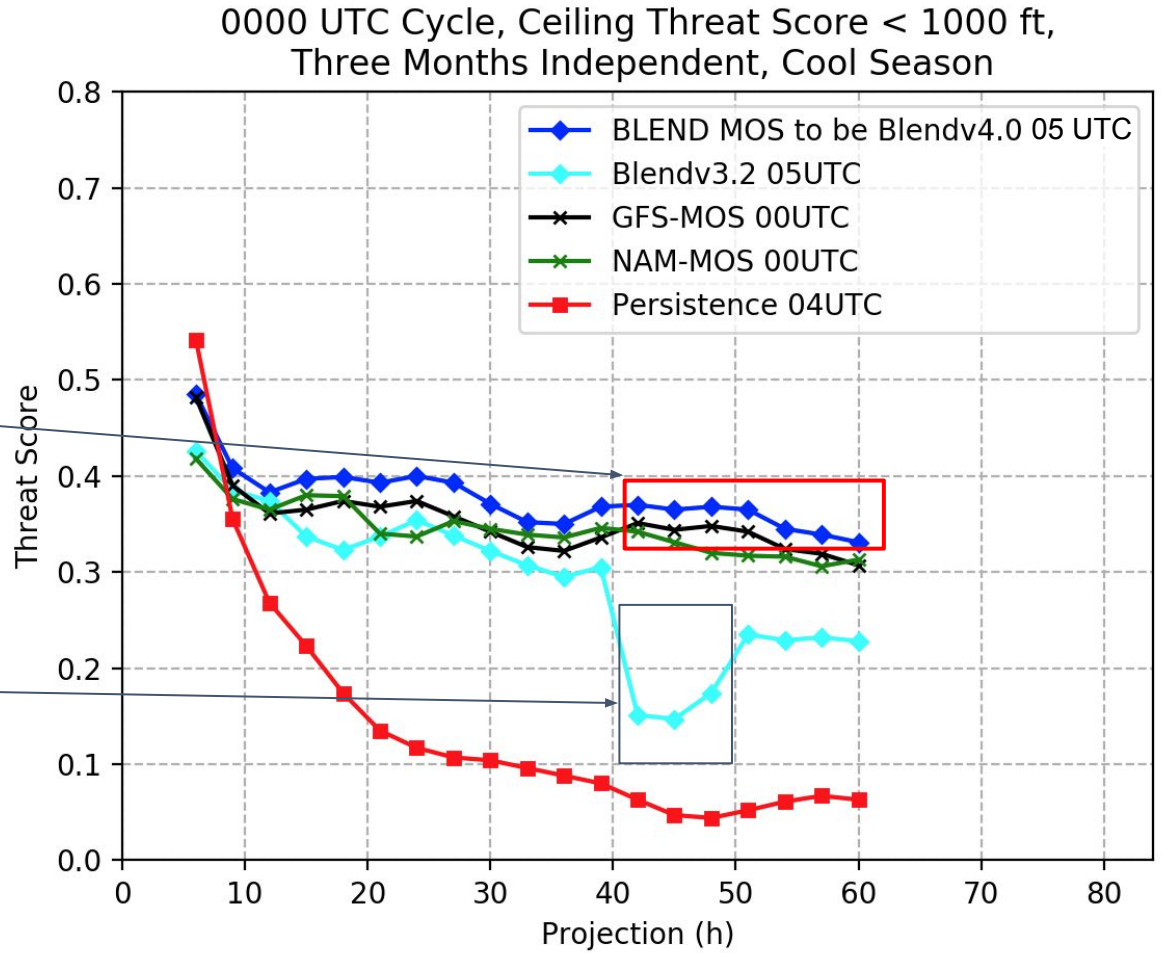
Three Months Independent, Cool Season
Blend v3.2 05 UTC
GFS-MOS 00 UTC
LAMP 04 UTC to be Blend v4.0 05 UTC
NAM-MOS 00 UTC
Persistence 04 UTC
Threat Score
Projection (h)
0.0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0
5
10
15
20
25
30
35


0000 UTC Cycle, Visibility Bias < 3 mile,
Three Months Independent, Cool Season
Blend v3.2 05 UTC
GFS-MOS 00 UTC
LAMP 04 UTC to be Blend v4.0 05 UTC
NAM-MOS 00 UTC
Persistence 04 UTC
Bias
2
1.5
1.2
1
0.8
0.5
0
5
10
15
20
25
30
35
Projection (h)

BLEND MOS ceiling heights pre cloud-cover check

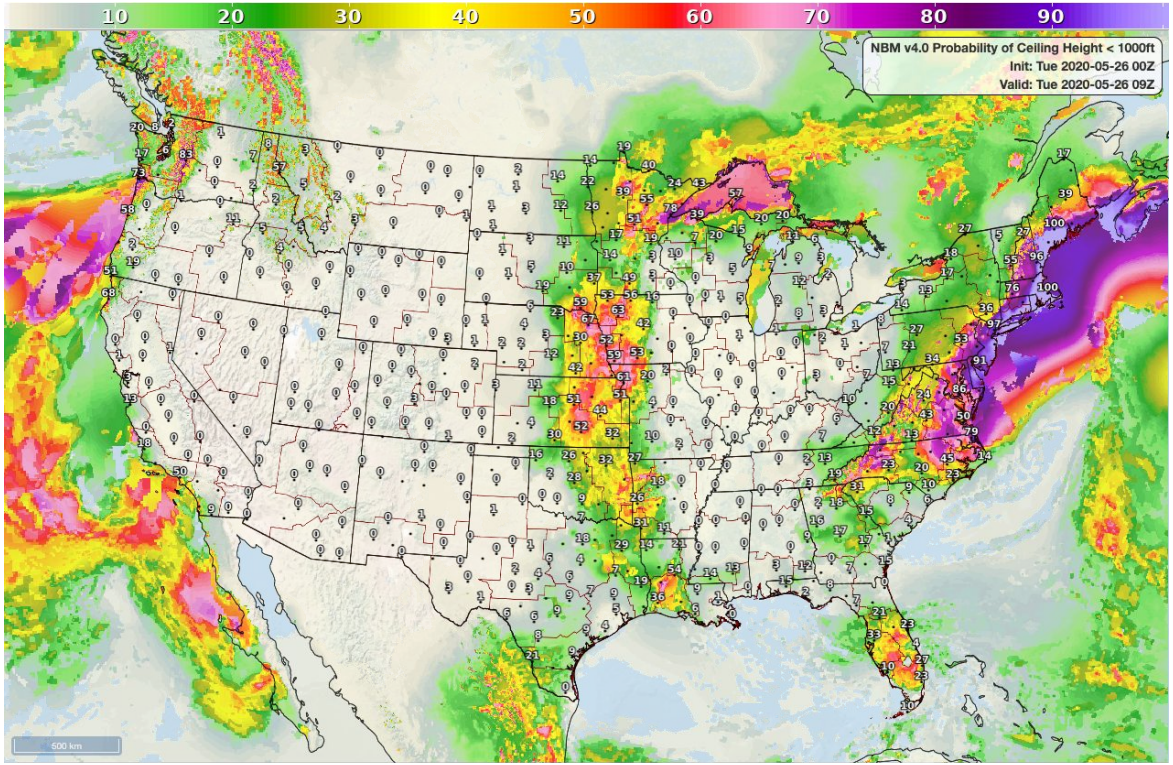
Blend v4.0 based on GFS and NAM MOS inputs

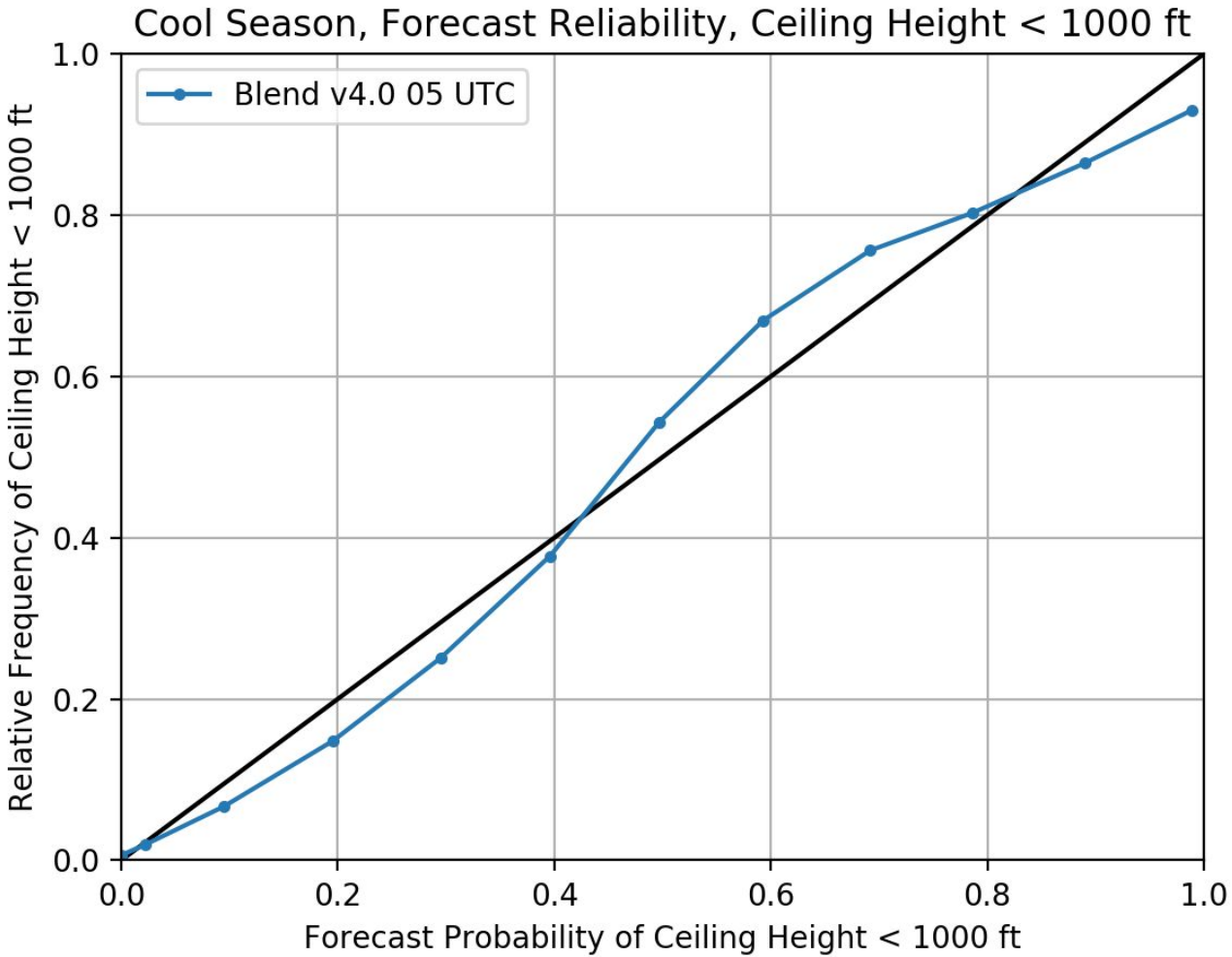
10% 'wrf_arw'
10% 'nems_nmmb'
10% 'wrf_mem2'
15% 'namh'
27% 'gmos'
28% 'gmos_naml'



Forecast Probabilities new in Blend v4.0

Probability of ceiling height < 1000ft from Blend 00 UTC on May 26, 2020





Forecast hours 37-78

```
KBWI    NBM V4.0 NBH GUIDANCE    5/25/2020  1300 UTC
UTC  14 15 16 17 18 19 20 21 22 23 00 01 02 03 04 05 06 07 08 09 10 11 12 13 14
TMP  64 66 68 71 72 74 74 75 75 74 72 69 68 66 65 63 62 61 61 61 61 61 63 65 67
TSD   2  2  2  2  2  2  2  2  2  2  1  1  1  2  2  2  2  2  2  2  2  2  2  2  2
DPT  57 57 57 58 58 58 58 59 59 58 59 59 59 60 59 59 59 58 58 58 58 59 59 60 60
DSD   1  1  1  1  1  1  1  1  1  1  1  1  1  1  1  1  1  2  2  2  1  1  1  1  1
SKY  71 63 50 34 25 24 23 22 15 12  5  5 11 13 22 24 29 46 64 89 91 81 85 77 78
SSD  33 31 36 36 34 31 28 31 23 14  6  5 12 26 32 28 30 34 33  9  9 19 17 20 20
WDR  10  9  9 10 10 11 10 11 11 12 12 13 13 13 14 14 14 11 11 11 11 11 10  9 10
WSP   4  3  4  4  4  4  4  4  4  4  3  3  2  3  2  2  2  1  1  1  1  1  2  2  3
WSD   1  1  1  1  1  1  2  1  1  1  1  1  1  1  1  1  1  1  1  1  1  1  1  1  1
GST   4  4  5  5  6  5  5  5  5  5  5  4  3  4  4  5  5  3  3  2  2  3  3  3  3
GSD   2  2  2  2  1  1  2  2  2  2  1  2  2  3  3  3  3  2  2  2  2  3  3  3  2
P01   0  0  0  0  0  0  0  0  1  1  1  0  1  1  1  1  1  1  1  1  1  1  2  3  1
P06                                  0                    0                 1
Q01   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
T01   0  0  0  0  0  0  0  0  0  1  1  1  0  0  0  0  0  0  0  0  0  0  0  0  0
PZR   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
PSN   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
PPL   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
PRA 100100100100100100100100100100100100100100100100100100100100100100100100
S01   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
SLV 100110100100100 98 97 98100100100110110110110100100100100110110110110110110
I01   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
CIG  13 13-88-88-88-88-88-88-88-88-88-88-88-88-88-88-88-88-88  9  7  4  3  3  5  9
MVC 100 98 88 60 46 30 23 17 13  9  7  7  9 10 16 24 32 39 44 47 57 62 67 65 59
IFC  22 10  7  0  0  0  0  0  0  0  0  0  1  1  6 11 16 21 25 28 36 43 48 42 26
LIC   3  0  0  0  0  0  0  0  0  0  0  0  0  1  3  5  8 11 14 17 22 25 26 19 10
LCB  13 13 16 29 28 50160160160210250250270100110100 29 24  9  6  4  3  3  5  6
VIS 100100100100100100100100100100100100100100 90 70 70 60 50 50 40 40 70100100
MVV   6  3  1  0  0  0  0  0  0  0  1  2  5  5  9 15 18 22 24 25 32 34 26 16  9
IFV   2  0  0  0  0  0  0  0  0  0  0  0  1  1  3  6  7  9 11 11 14 16 12  7  3
LIV   0  0  0  0  0  0  0  0  0  0  0  0  0  0  1  2  3  4  5  5  6  7  4  2  0
MHT  19 22 26 27 28 28 27 27 25 22 12  8  7  6  5  6  6  7  8  8  8  9  9 12 14
TWD   9  8  8  8  9  9 10 14 10 10 10  9 14 14 14 17 14 15 13 14 13  8  8  9  9
TWS   3  2  2  2  2  2  2  2  3  3  3  3  3  2  2  5  3  2  2  2  2  2  2  2  2
HID                                  3                    3                 3
SOL  31 43 57 66 69 77 64 53 34 23 11  0  0  0  0  0  0  0  0  0  1  3  8 22 30
```

MVC = Prob(ceiling height <= 3000 ft)
"**M**arginal **V**isual **C**eiling"

IFC = Prob(ceiling height < 1000 ft)
"**I**nstrument **F**light **C**eiling"

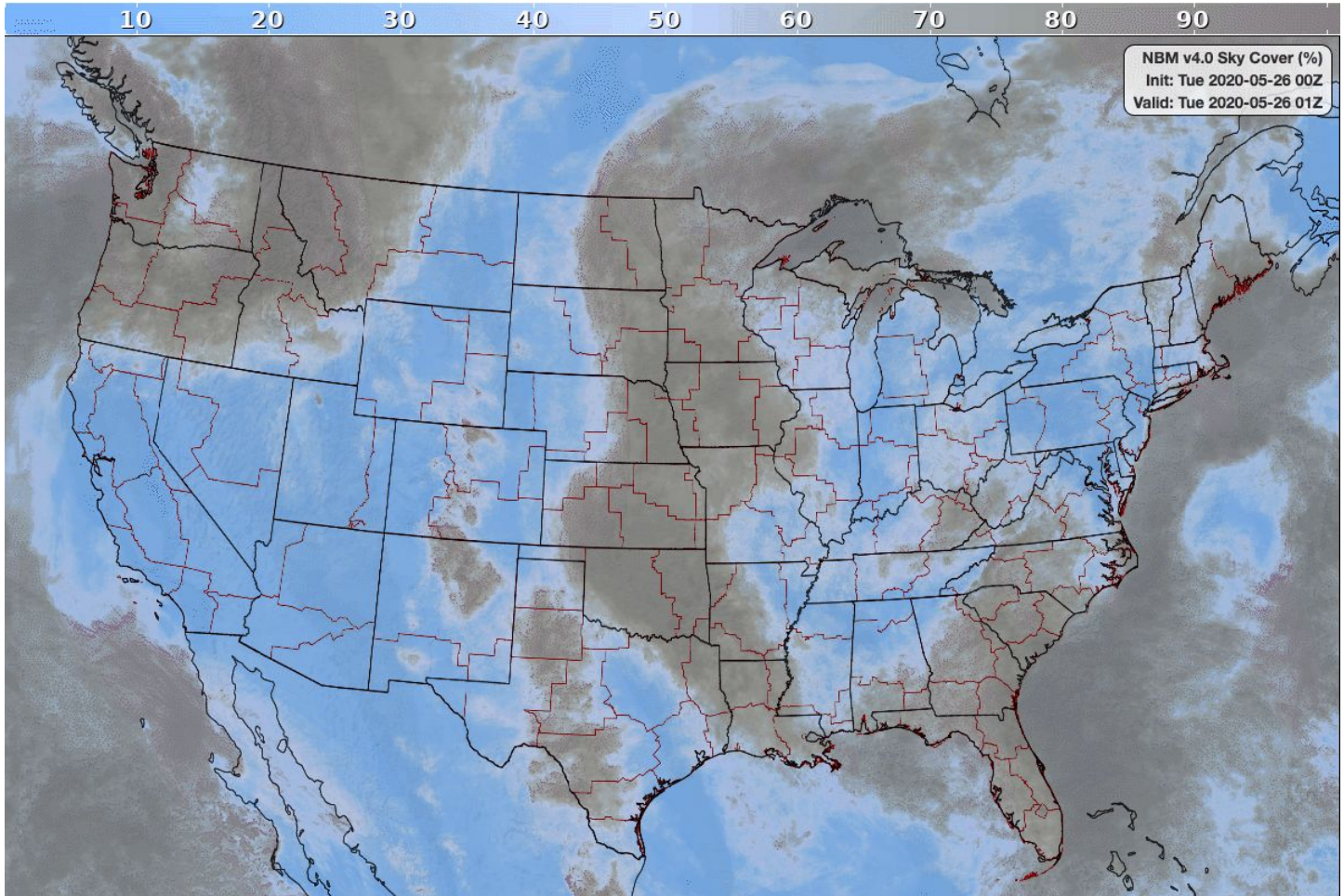
LIC = Prob(ceiling height < 500 ft)
"**L**ow **I**nstrument **C**eiling"

MVV = Prob(ceiling height <= 5 mi)
"**M**arginal **V**isual **V**isibility"

IFV = Prob(ceiling height < 3 mi)
"**I**nstrument **F**light **V**isibility"

LIV = Prob(ceiling height < 1 mi)
"**L**ow **I**nstrument **V**isibility"

Blend v4.0 sky cover forecast from 00 UTC on May 26, 2020



Thank You

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See website for NBM documentation and data.

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