NOAA

National Weather Service

Wind Updates to The National Blend of Models v4.1

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The opinions expressed in this presentation are the author's and are not necessarily the view of any federal office or agency.

The National Blend of Models (NBM) is a nationally consistent and skillful suite of calibrated forecast guidance based on a blend of both NWS and non-NWS numerical weather prediction model data and post-processed model guidance.

The goal of the NBM is to create a highly accurate, skillful and consistent starting point for the gridded forecast.

https://journals.ametsoc.org/view/journals/bams/100/10/bams-d-18-0159.1.xml

Citation: Bulletin of the American Meteorological Society 100, 10; 10.1175/BAMS-D-18-0159.1

Topics

New 24-hour probabilistic wind forecasts in NBM v4.1

Additional postprocessing added to NBM v4.1 hourly winds to address low bias

NBM v4.1 Introduces Probabilistic Maximum Daily Wind

Inputs:

~200 direct model output solutions/members from GFS, HREF, SREF, FNMOC, ECMWF, CMC, ACCESS

Bias correction and downscaling:

Quantile mapping based on fitted gamma distribution from previous 120 days of forecasts and observations

If a model forecast is at the 90th percentile of the fit model distribution, it gets bias corrected to the 90th percentile of the fit observation distribution

Output

Percentiles from 1-99 and probabilities of exceeding numerous thresholds (wind: 11, 17, 22, 34, 48, 64 kts; gust: 22, 34, 41, 48, 56, 64 kts)

Gridded 24-hour Max Winds?

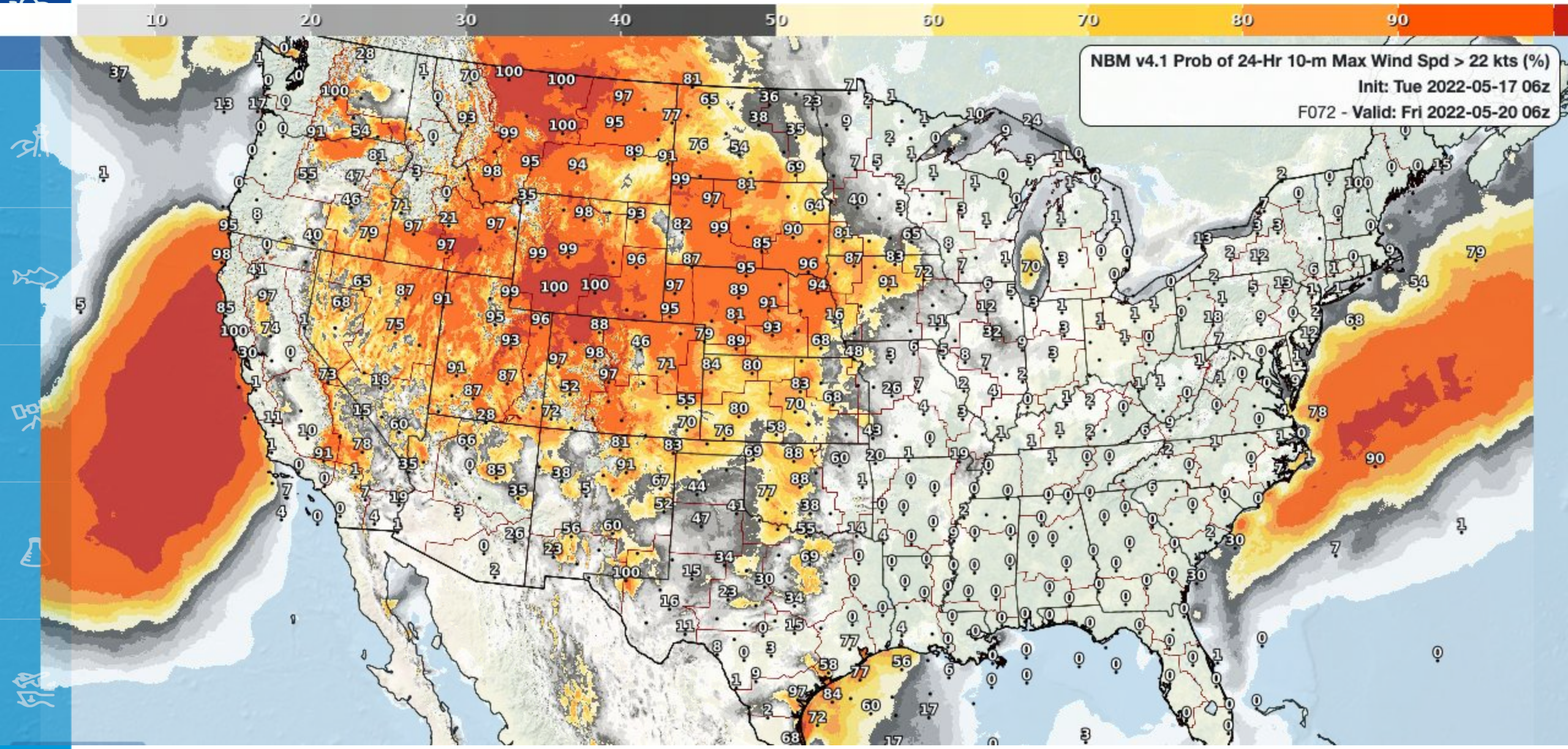
We have top of the hour wind speed and gust analysis from RTMA/URMA, but these miss large swaths of the hour (from METAR) and the 24-hour max is usually higher.

We determined a factor for estimating the 24-hour max winds by examining historical relationships at 44 of the biggest airports between 2010 and 2020.

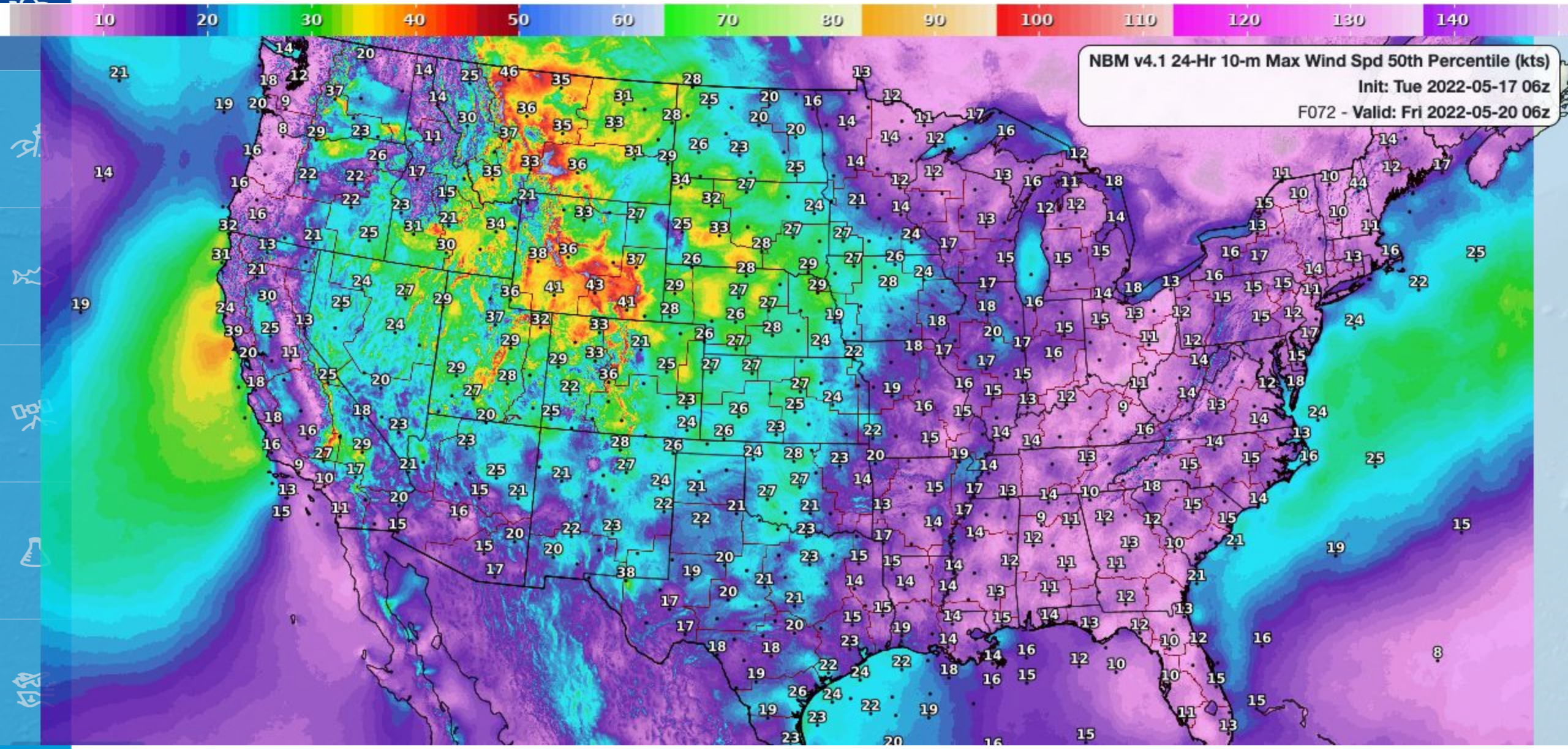
24 hour max **wind** = maximum hourly ob/analysis * **1.09**

24 hour max **wind gust** = maximum hourly on/analysis * **1.10**

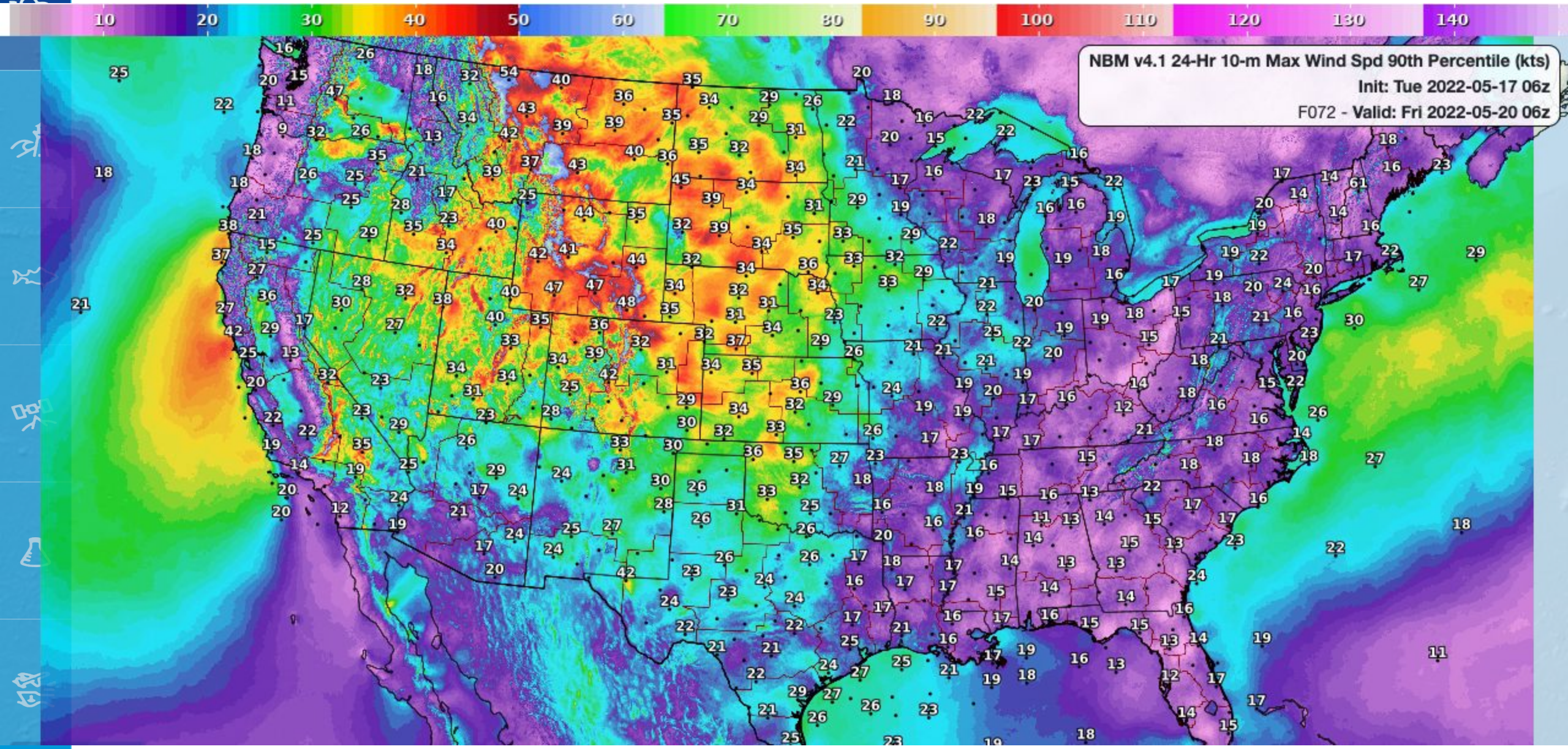
Probability of wind exceeding 22 knots



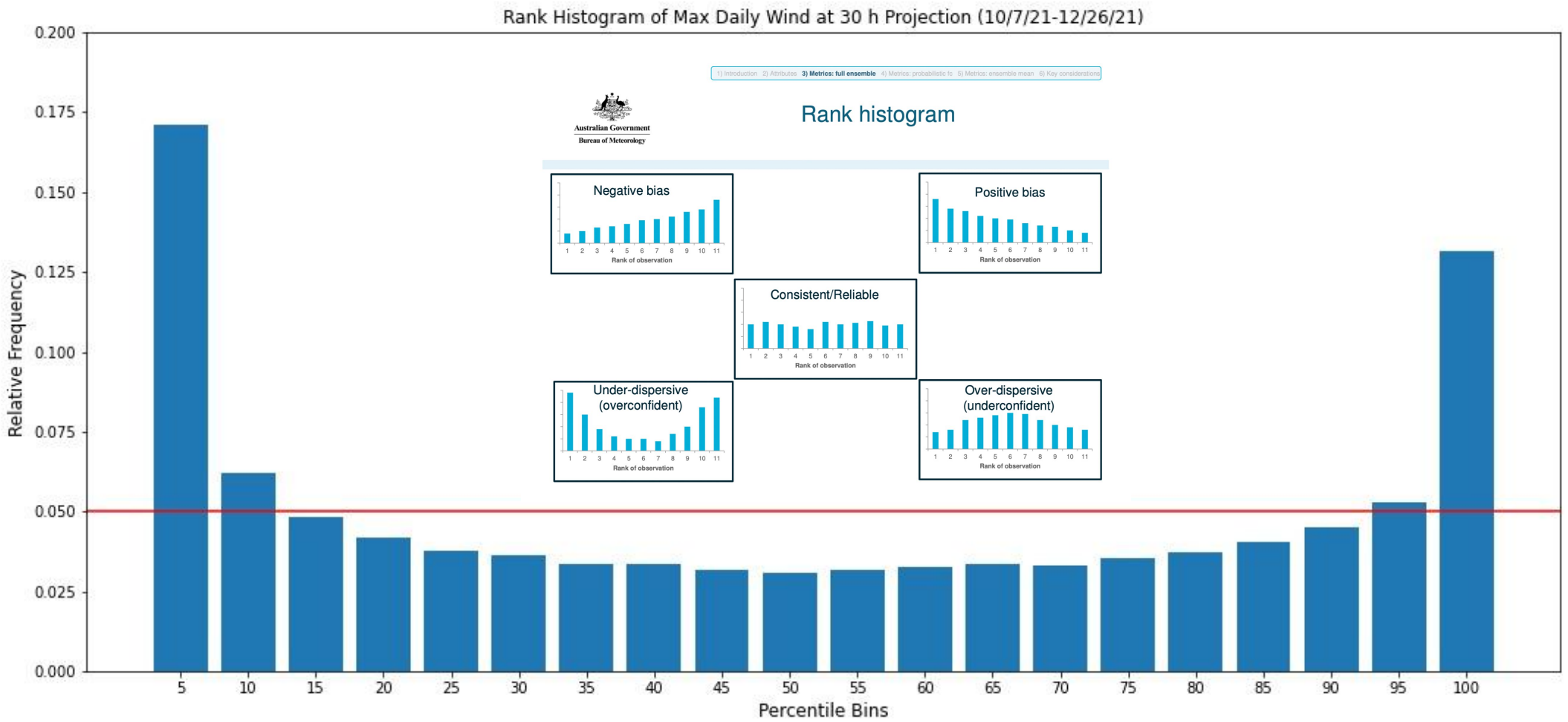
50th Percentile (Median)



90th Percentile

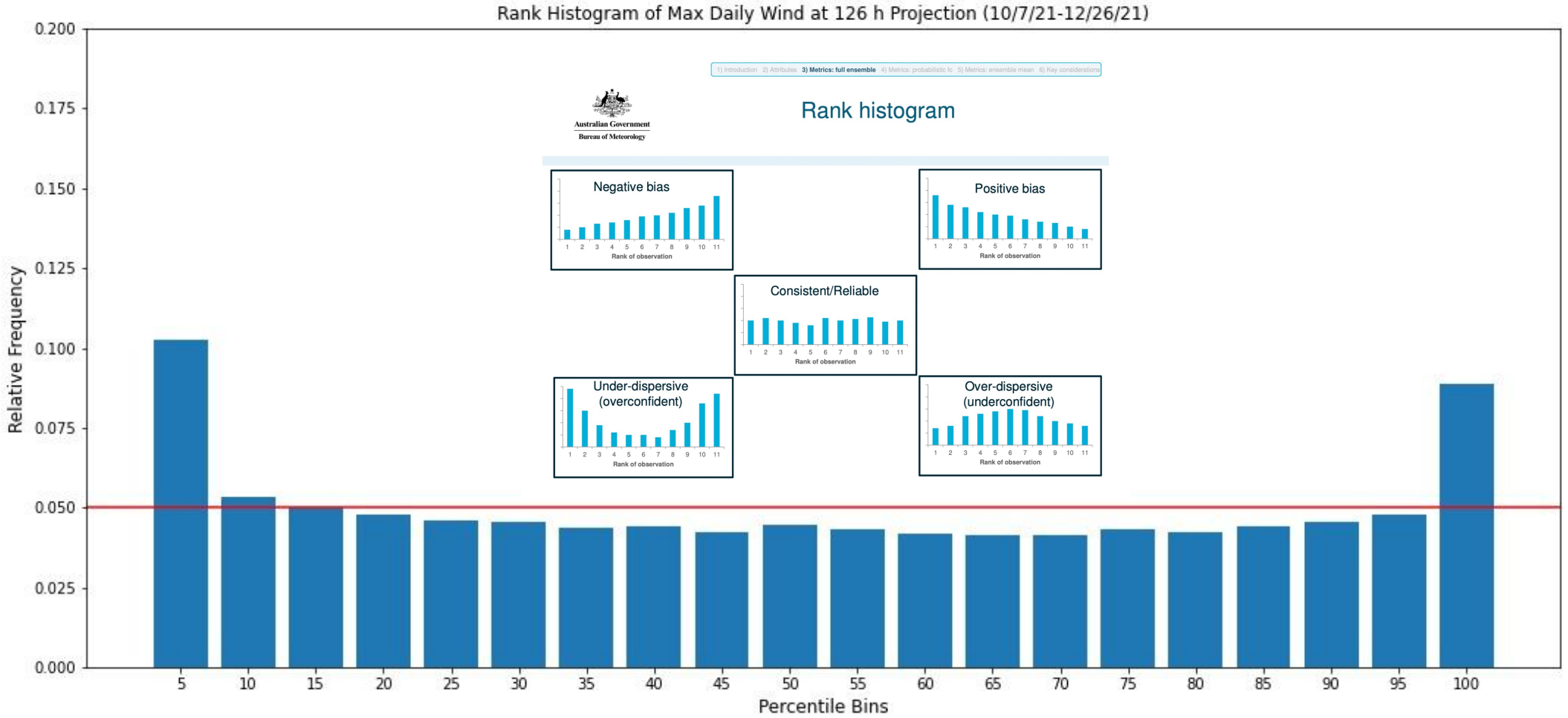


Wind Forecast Reliability Day 1



https://www.ecmwf.int/sites/default/files/elibrary/2017/17626-ensemble-verification-metrics.pdf

Wind Forecast Reliability Day 5



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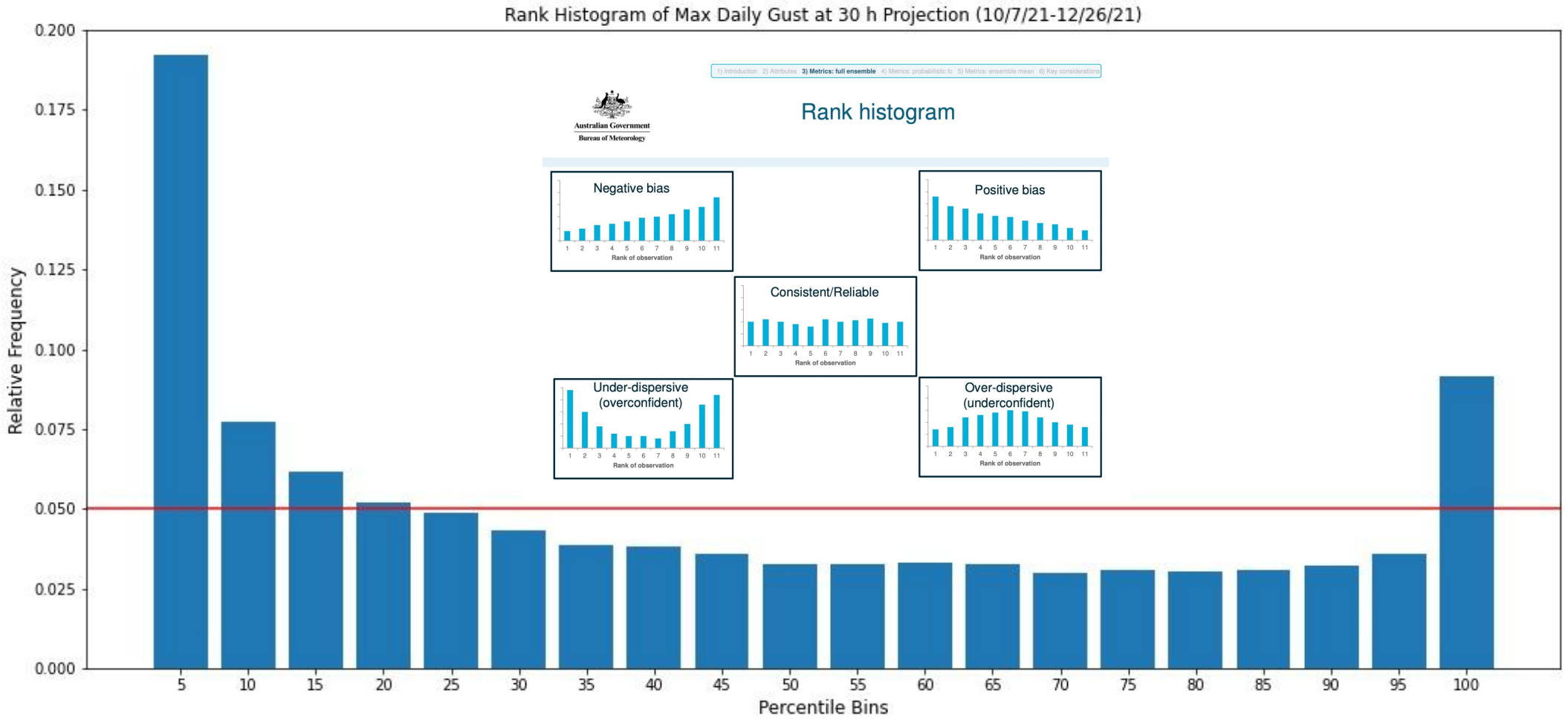
Gust Forecast Reliability Day 1



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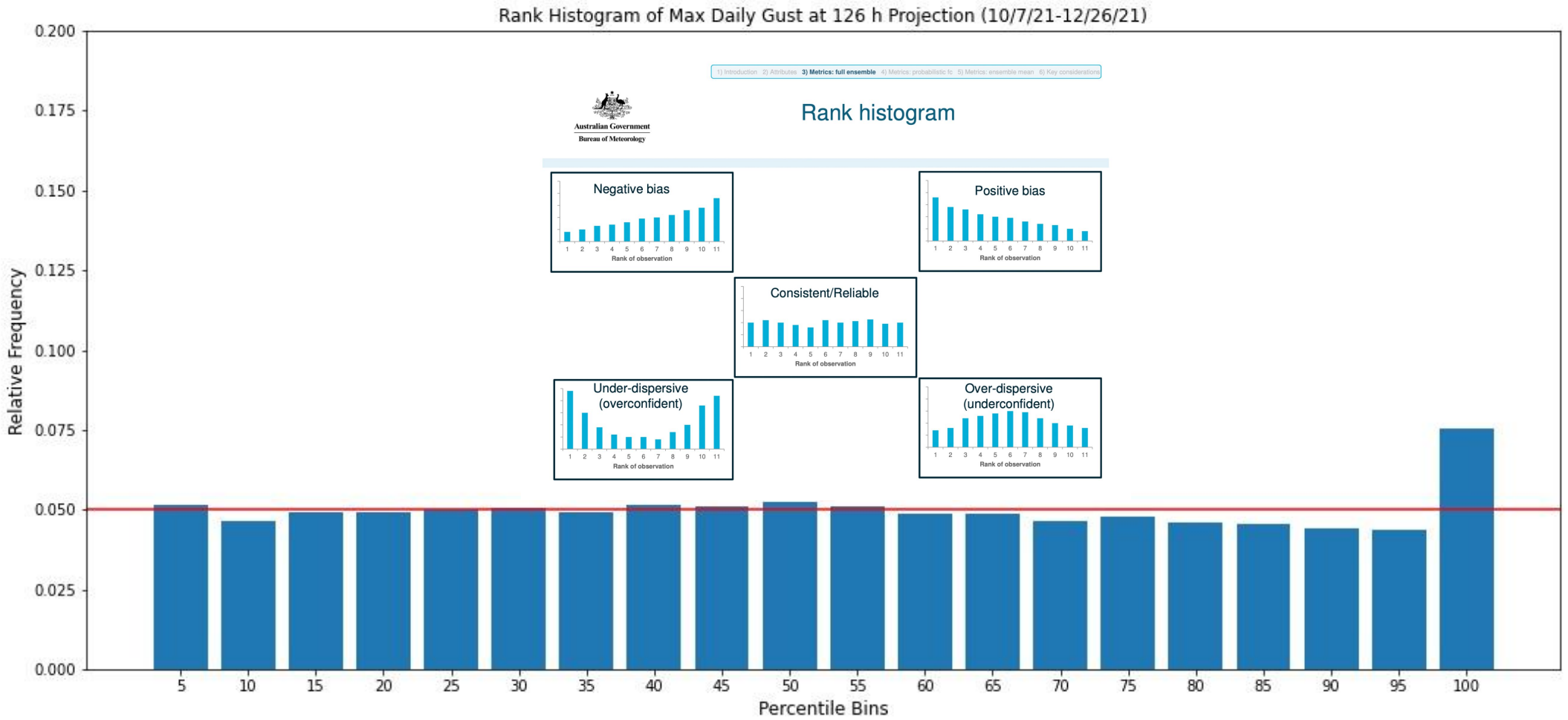
Gust Forecast Reliability Day 5



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Hourly Winds blend v4.0 (operational)

1. Bias correct the model solutions based on analyzed truth (URMA)
2. Create weighted average, where models that had lower mean absolute error (MAE) over recent period have higher weight.

Called MAE weighted forecasts

NBM v4.0 has low bias for wind speeds and gusts, especially for events above 20 knots

NBM v4.1 MOS postprocessor

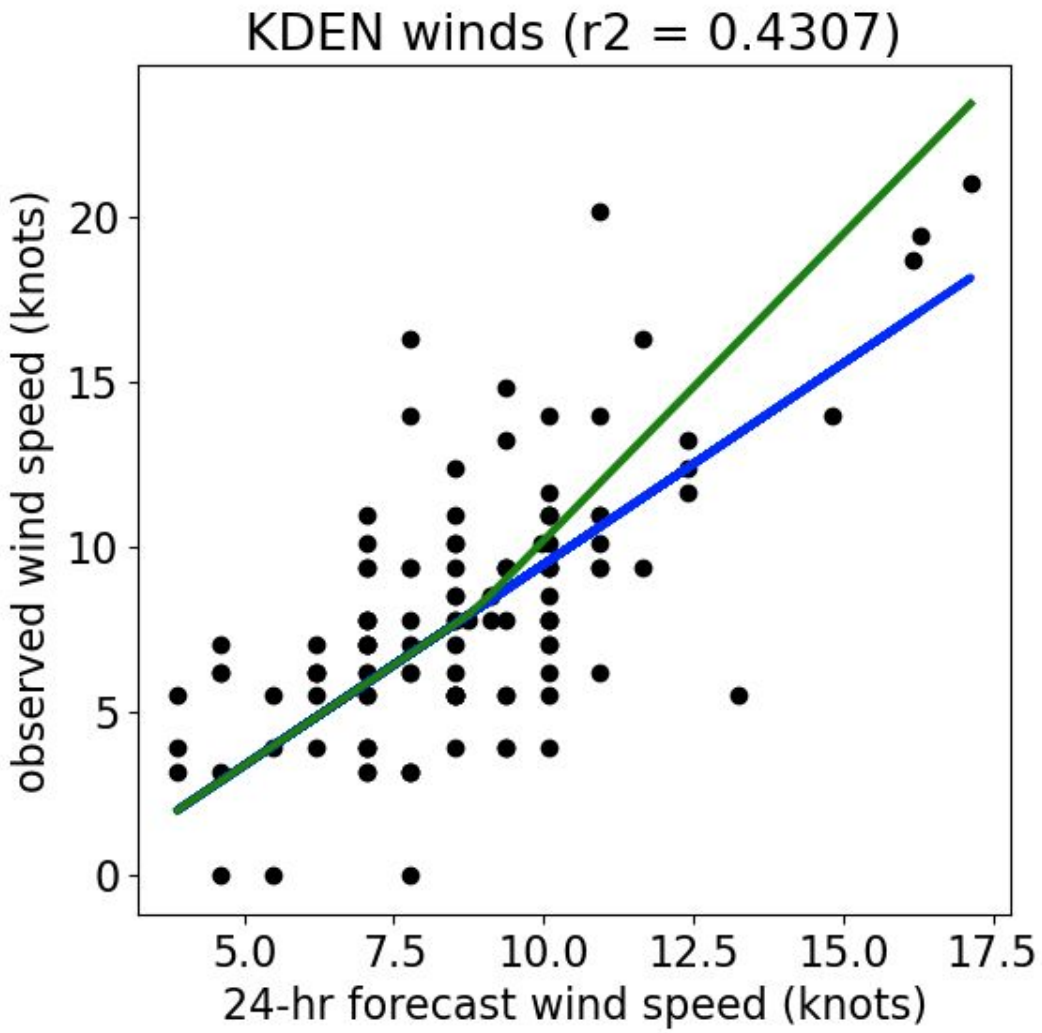
Add the same postprocessing step that has been used in GFS-MOS

Techniques

Linear regression: leverage static training period to develop relationship between v4.0 MAE forecasts and observations.

Partial inflation: Increase forecasts above the mean observation.

NBM v4.1 MOS postprocessor on winds



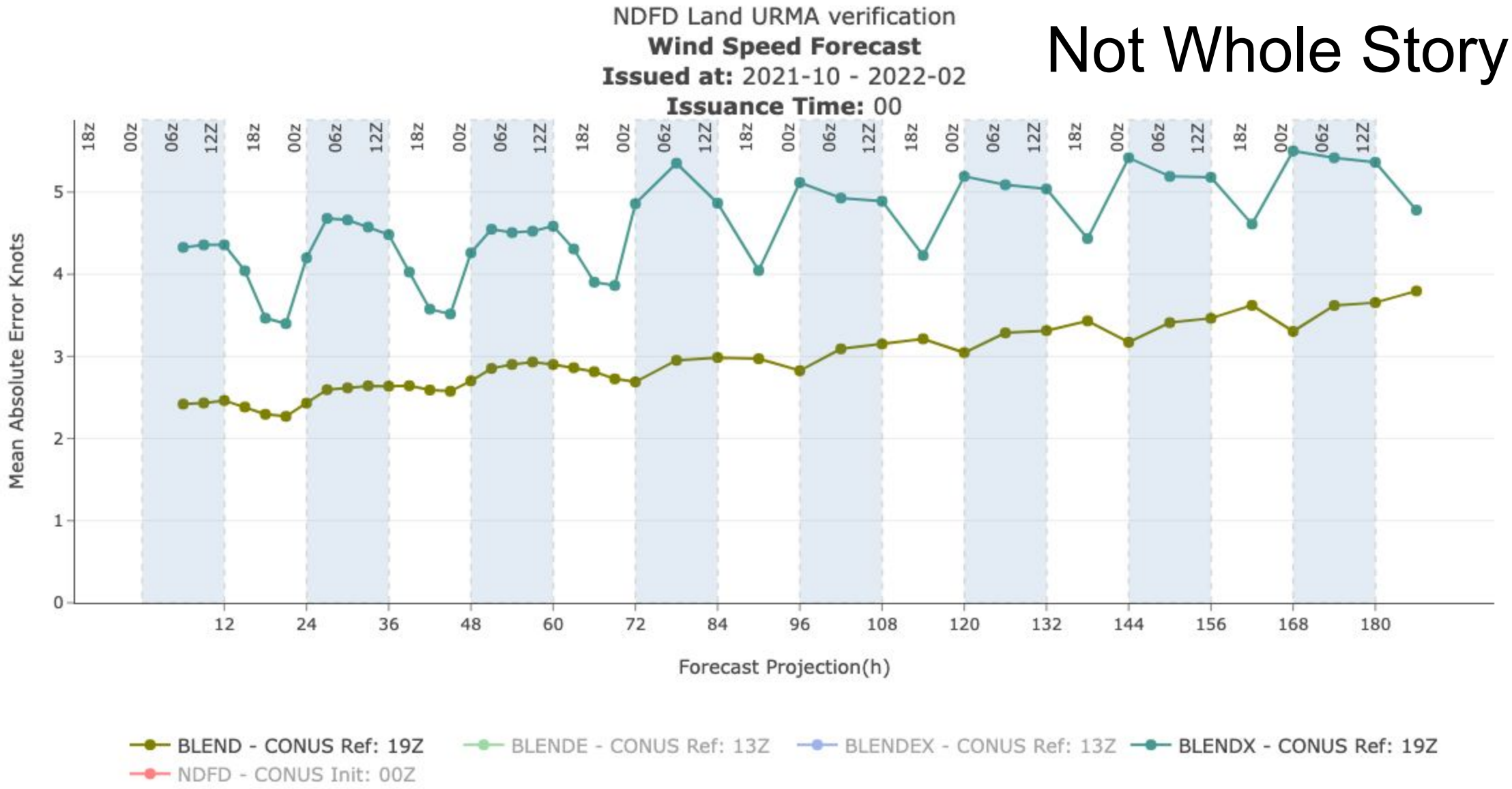
blue: linear regression model

green: linear regression model + partial inflation

partial inflation based on correlation and mean observations

Verification

https://veritas.mdl.nws.noaa.gov/ndfd-stats/comparative/verification.php



Not Whole Story

Verification

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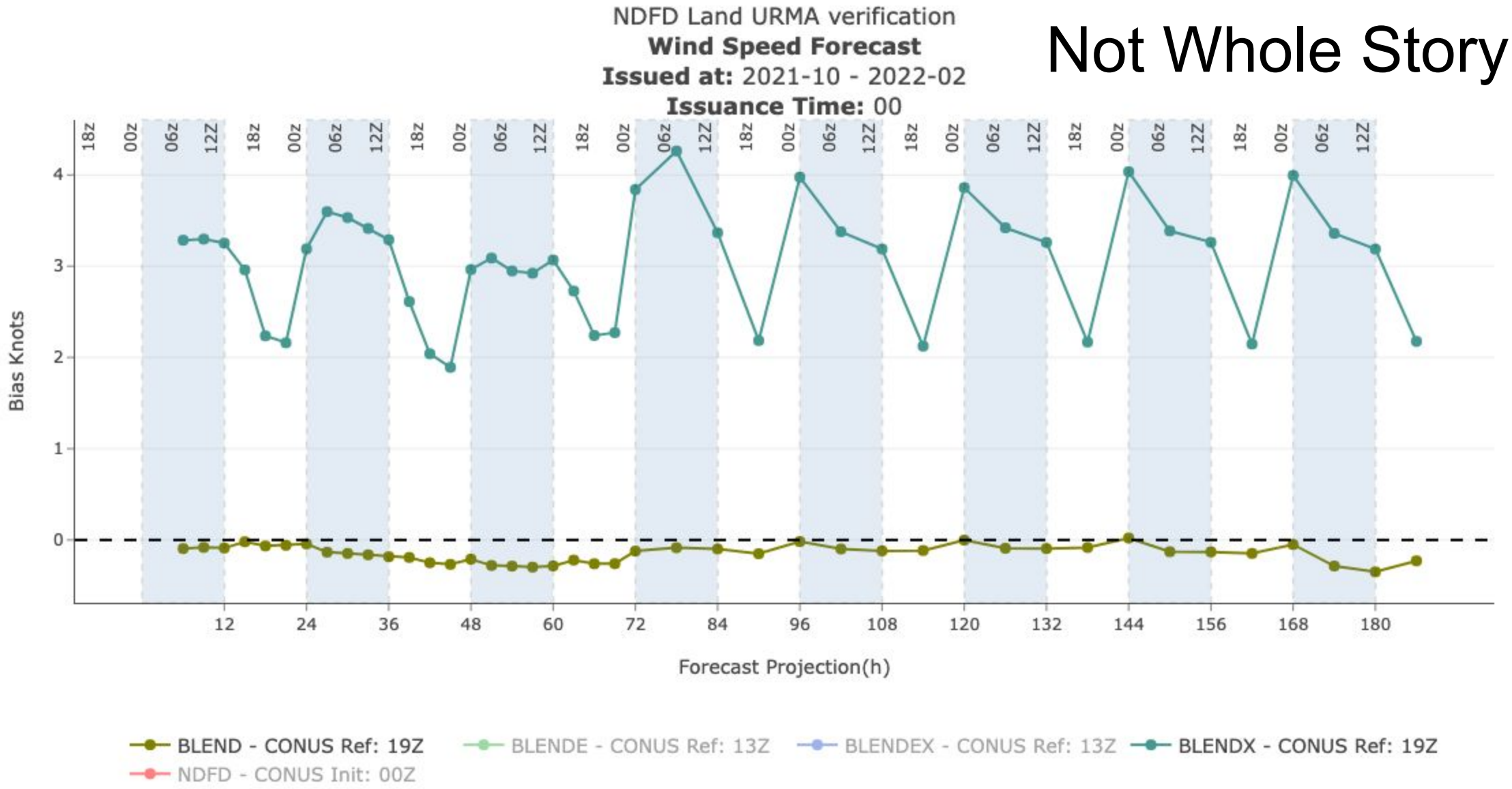
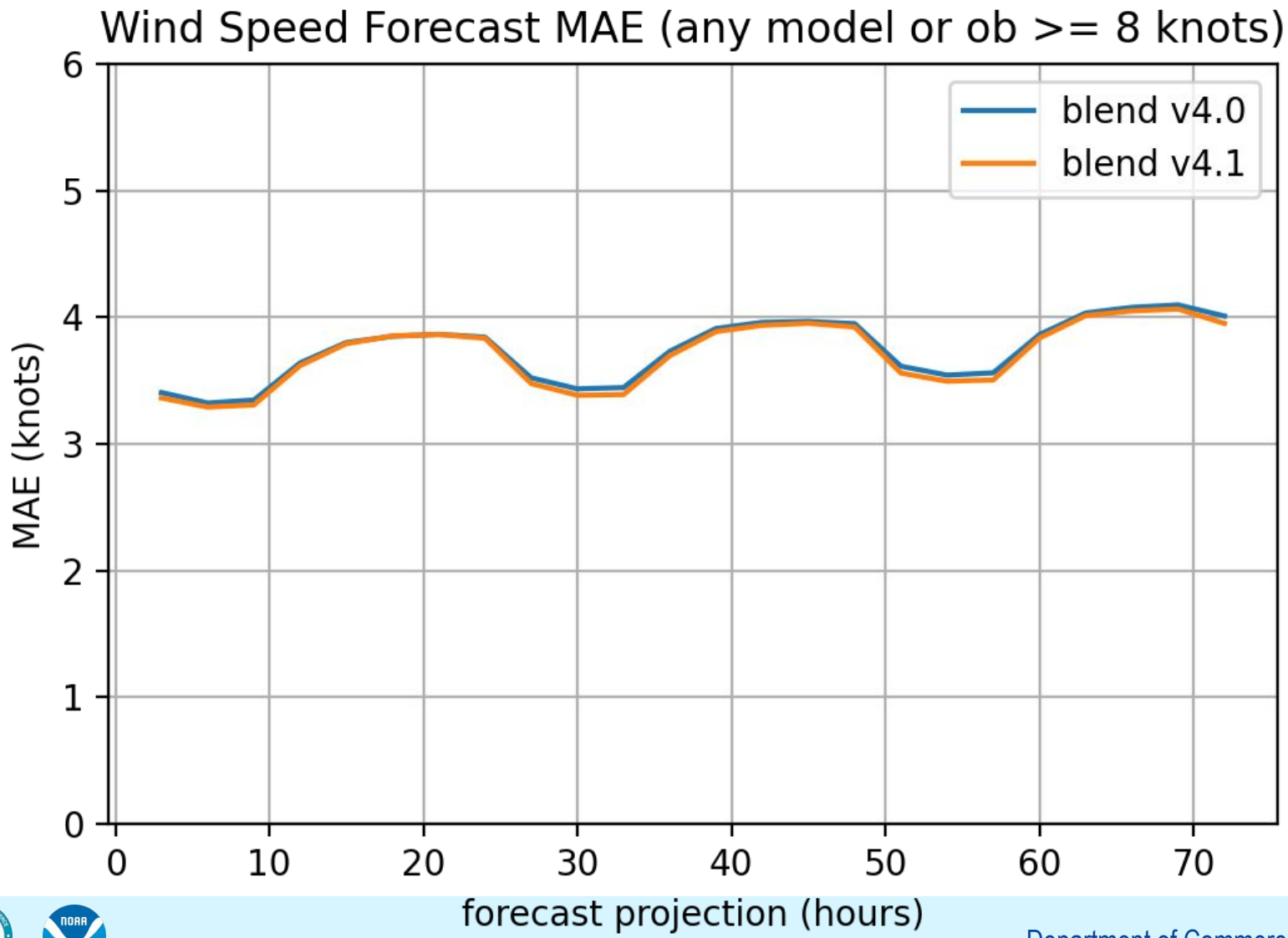


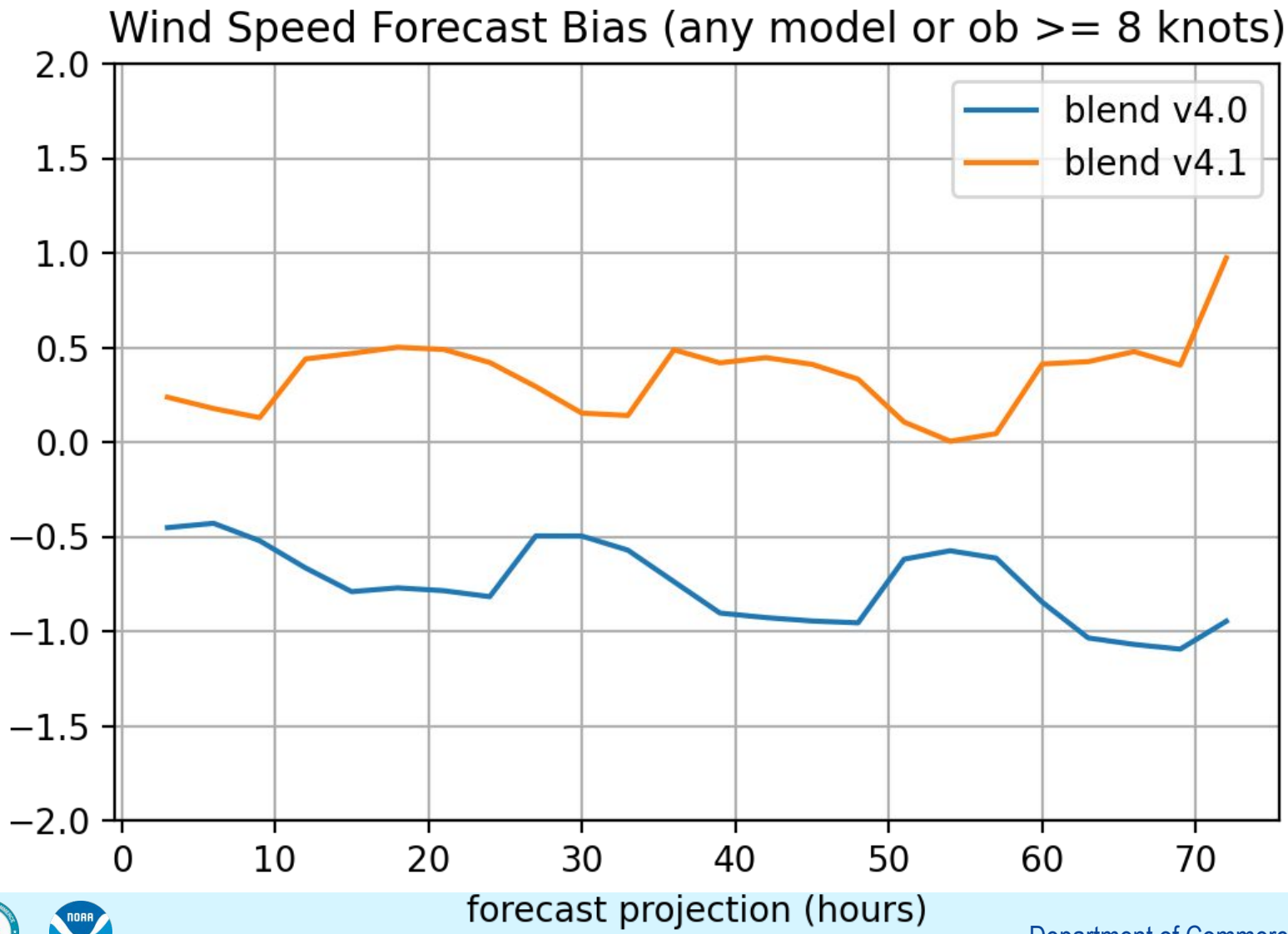
Not Whole Story

2 Model Verification



Number of models influences the verification technique and metrics

2 Model Verification



Number of models influences the verification technique and metrics

Verification - Contingency Tables

v4.1	ob < 10	10 <= ob < 20	20 <= ob < 30	30 <= ob < 40	40 <= ob < 50	ob >= 50			v4.0	ob < 10	10 <= ob < 20	20 <= ob < 30	30 <= ob < 40	40 <= ob < 50	ob >= 50	
fcst < 10	179967	14271	155	24	2	0	194419		fcst < 10	184710	18127	252	37	2	0	203128
10 <= fcst < 20	12310	27798	2192	68	4	0	42372		10 <= fcst < 20	7720	25682	3540	163	11	2	37118
20 <= fcst < 30	181	1966	2004	221	12	0	4384		20 <= fcst < 30	55	267	708	282	46	10	1368
30 <= fcst < 40	13	35	141	138	25	1	353		30 <= fcst < 40	1	3	7	16	11	21	59
40 <= fcst < 50	10	7	9	35	14	4	79		40 <= fcst < 50	0	0	0	0	0	6	6
fcst >= 50	5	2	6	12	13	34	72		fcst >= 50	0	0	0	0	0	0	0
	192486	44079	4507	498	70	39	241679			192486	44079	4507	498	70	39	241679

Take Away

NBM v4.1 hourly winds are stronger than 4.0

New max 24-hour probabilistic winds

NBM v4.1 planned for implementation in early CY 2023

Thank You

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Thanks to David Rudack and Robby James for development

See website for NBM documentation and data.
https://vlab.noaa.gov/web/mdl/nbm