Review of NOAA Air Quality Model Performance for Maine in 2016

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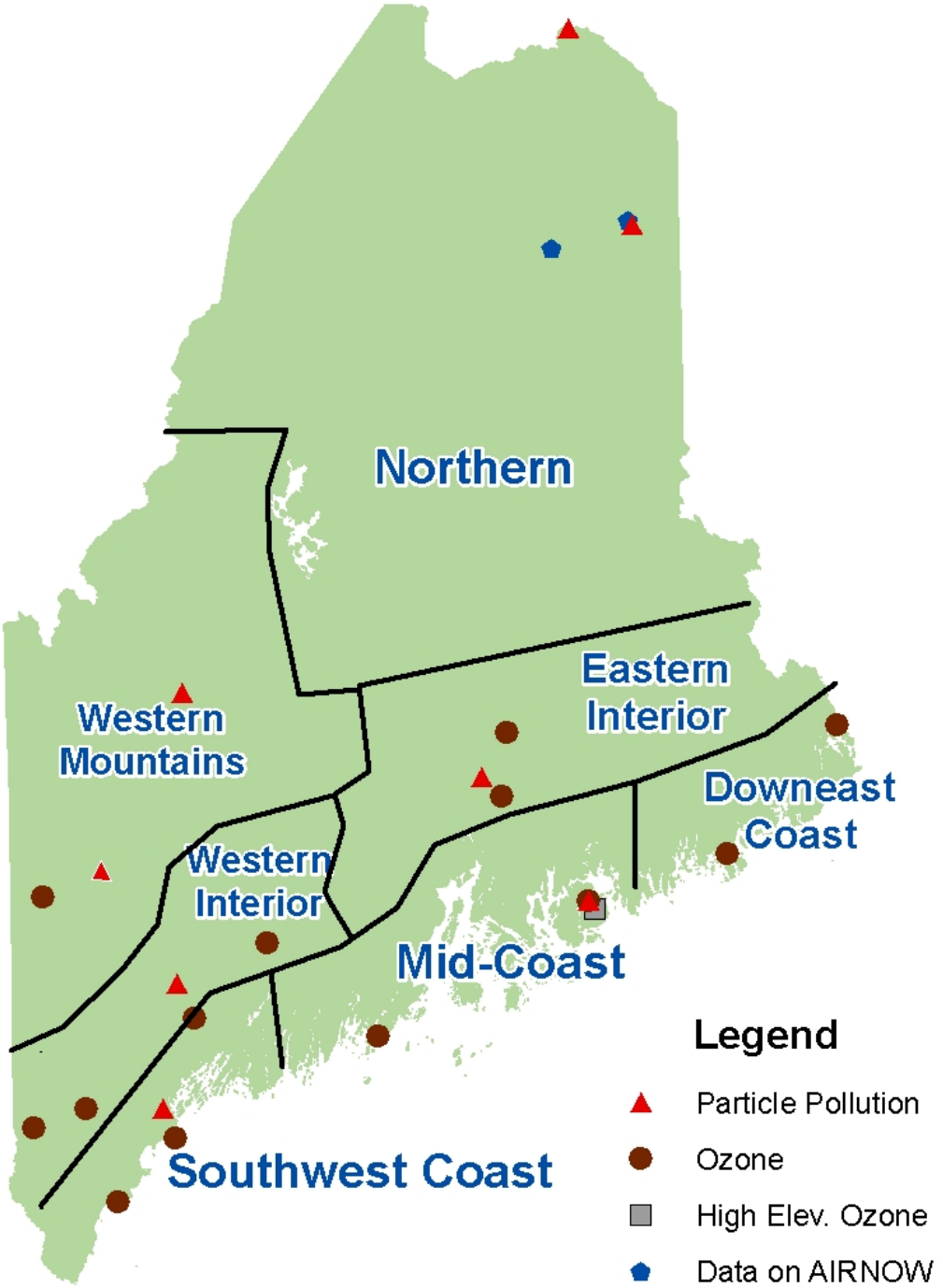
Maine's Air Quality Forecast regions



OZONE

Overview of Model Performance

- 2016 Seasonal performance in general:
  - Winter & early Spring – under predicts
  - Spring & early Summer – transitioning
  - Mid to late Summer – over predicts
- Last few years seemed fairly consistent with a rule-of-thumb being:
  - March through April add 10 ppb
  - July & August subtract 10 ppb
- Not as consistent this year for key sites

2016 Model Performance

- We download the 12z GRIB files for Maine for the analysis.
- When preparing forecasts we use both the GRIB files and the Northeast maps
- For some sites the model is performing fairly well and on occasion the forecast has been perfect in value and spatial coverage. (*Too bad I didn't believe it one day!*)

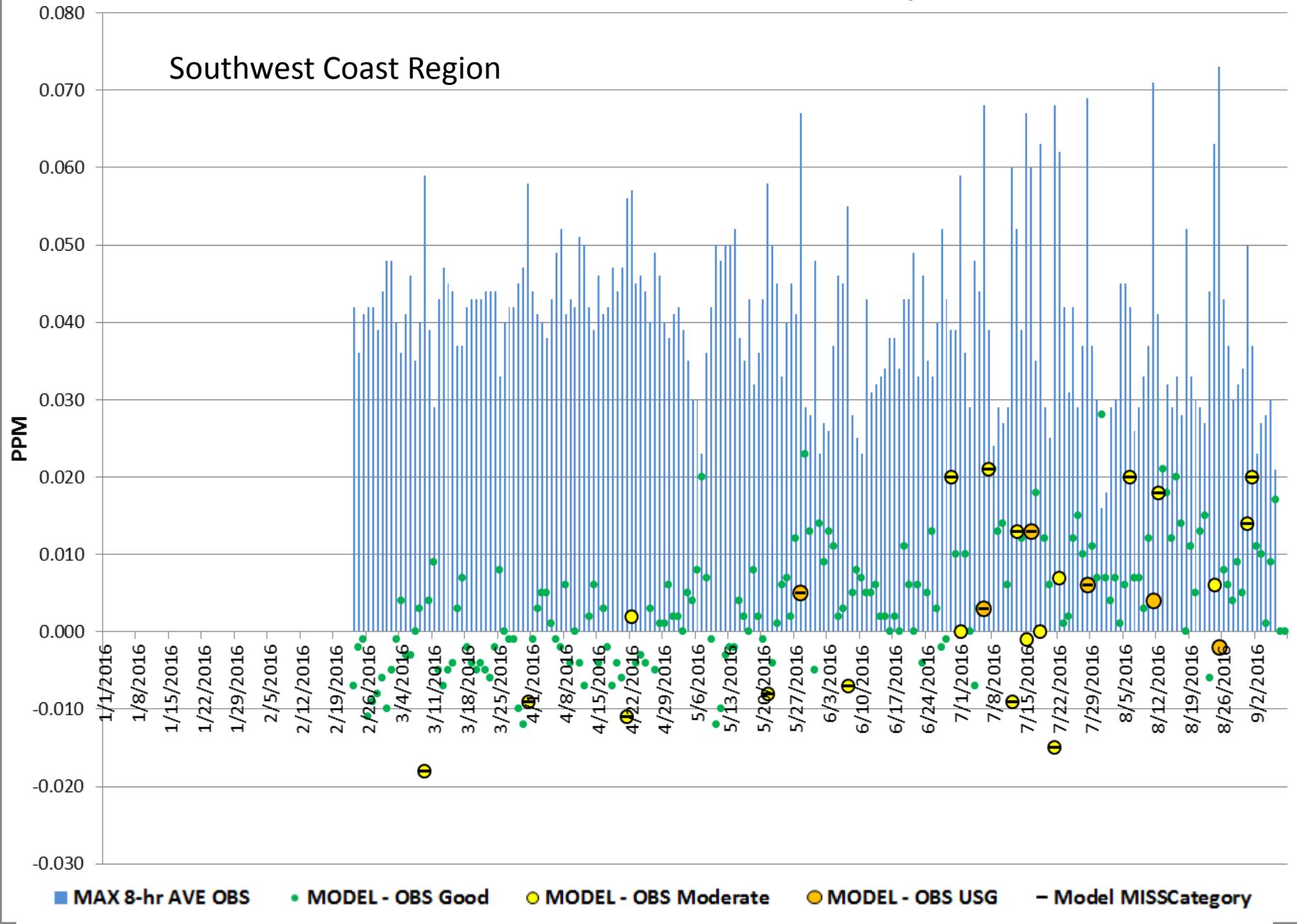
2016 Model Performance cont.

- ‘Very Good’ performance for the Western Interior region
- Inconsistent for the Southwest Coastal region for USG: sometimes it nails it and other times it is over predicting.
- ‘Good’ performance for the Mid-Coast region (still would like high elevation forecast)
- ‘Marginal’ for the Eastern Interior region. This site has been fairly clean this year but moderates not captured well (possibly due to elevation of site)

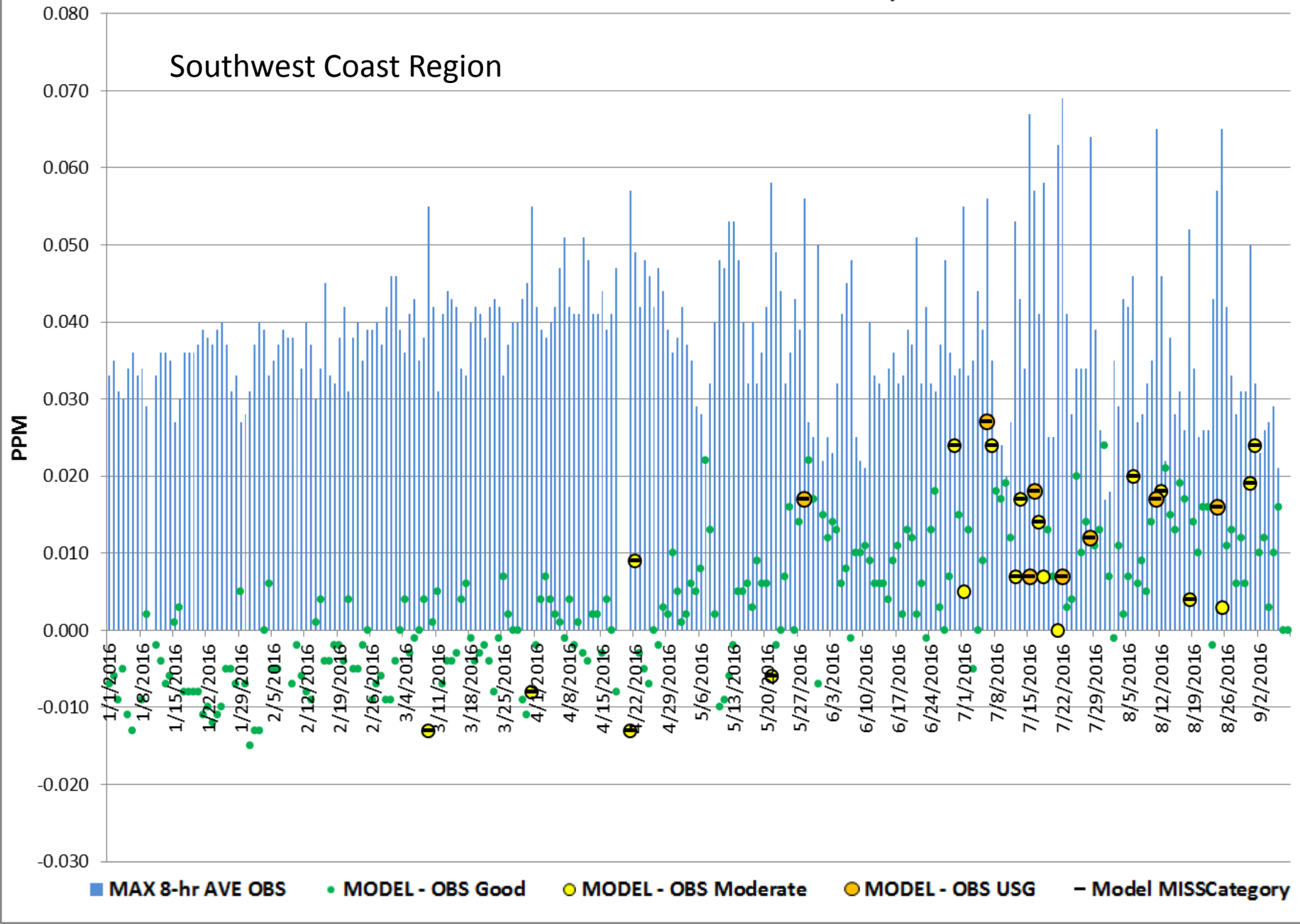
Symbology for upcoming slides

- The color of the dot is the highest category of either the observed or the model.
- If it is above the axis it is an over prediction
- If it is below the axis it is an under prediction
- If the dot has a black hyphen the model forecast category was not correct.
- The columns display the observed 8 hour max for each day.

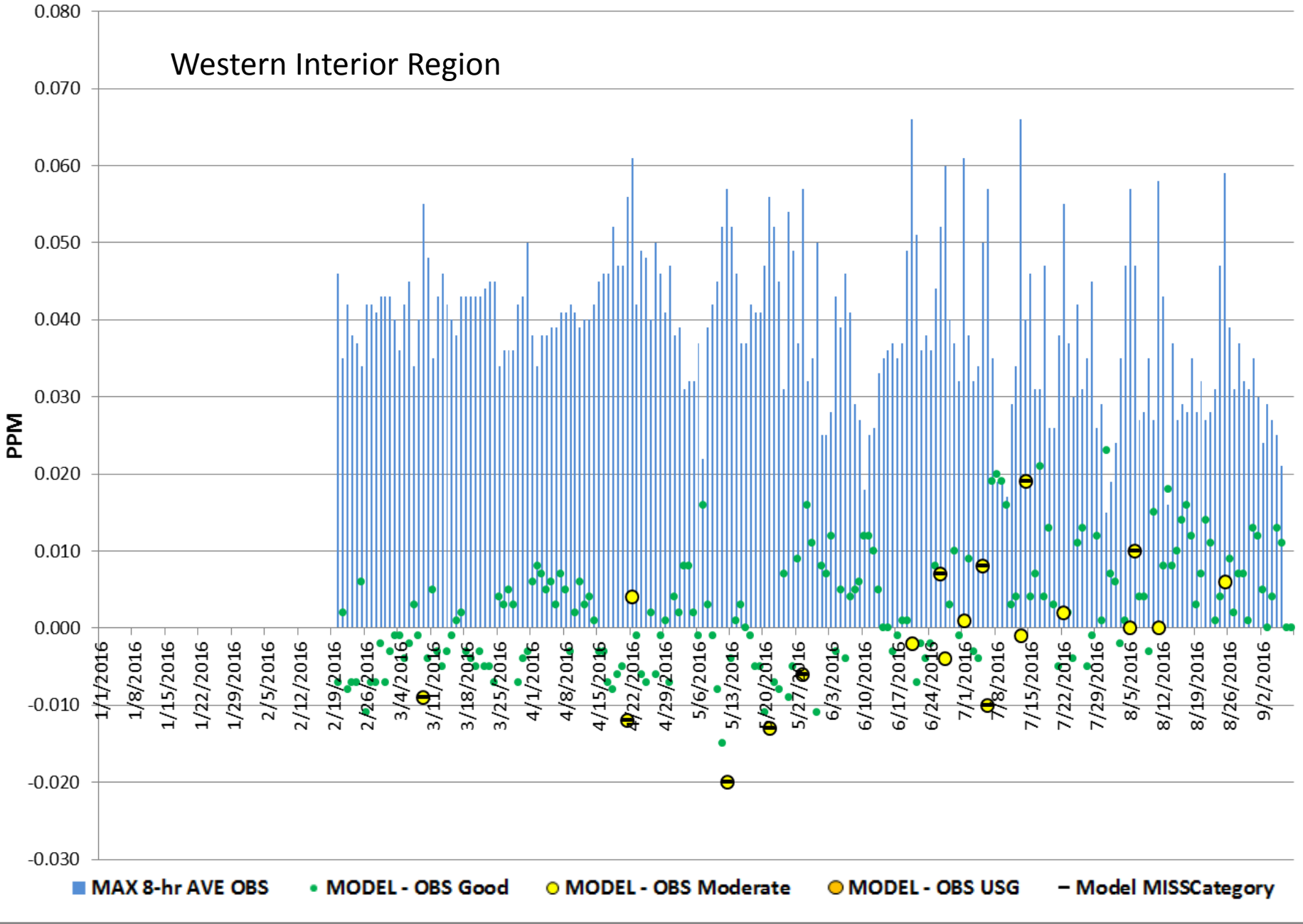
NOAA's AQFS CMAQ V4.6.3 EXPERIMENTAL MODEL OZONE PREDICTIONS vs OBSERVATIONS AT KENNEBUNKPORT, MAINE

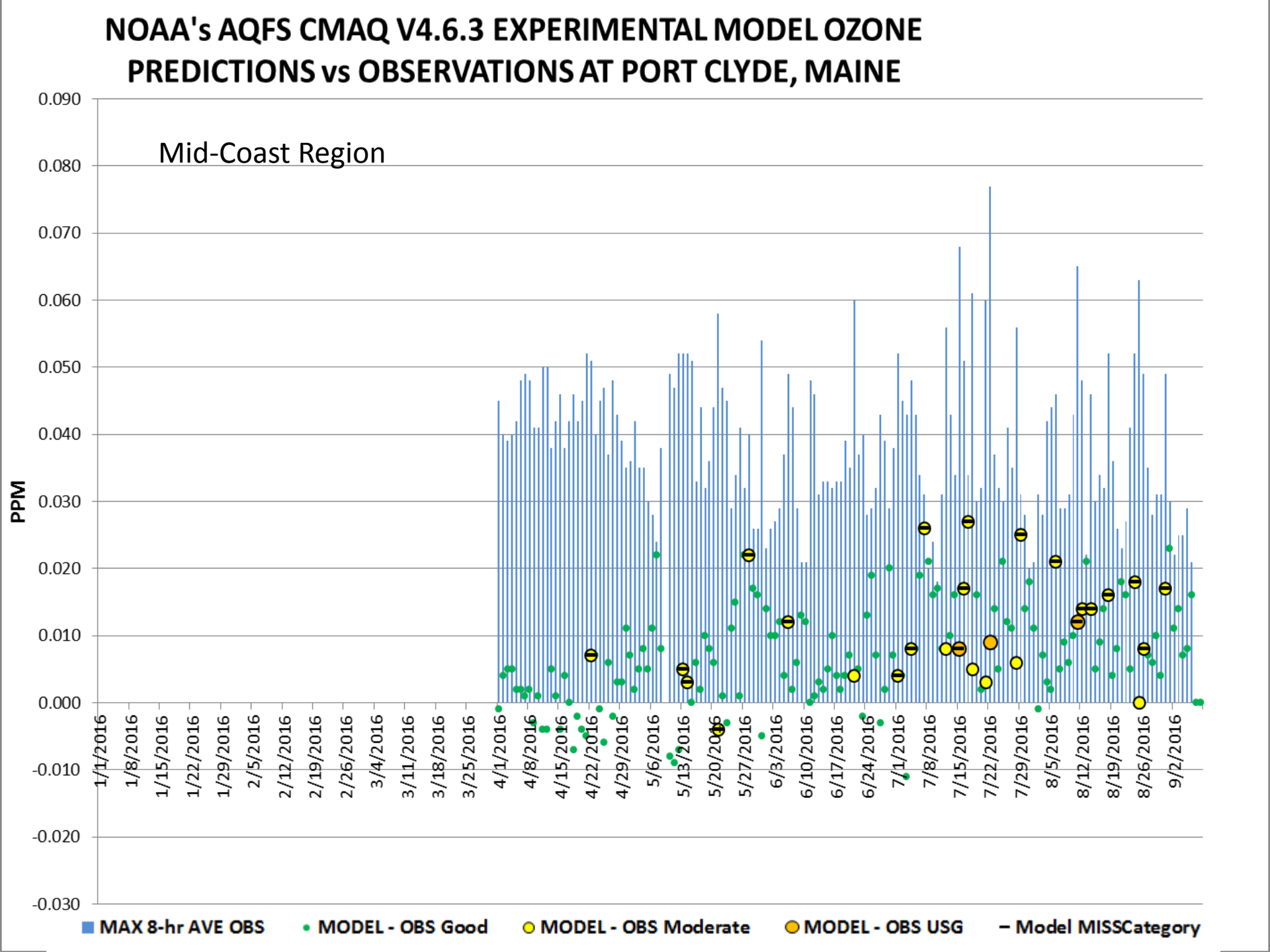


NOAA's AQFS CMAQ V4.6.3 EXPERIMENTAL MODEL OZONE PREDICTIONS vs OBSERVATIONS AT CAPE ELIZABETH, MAINE

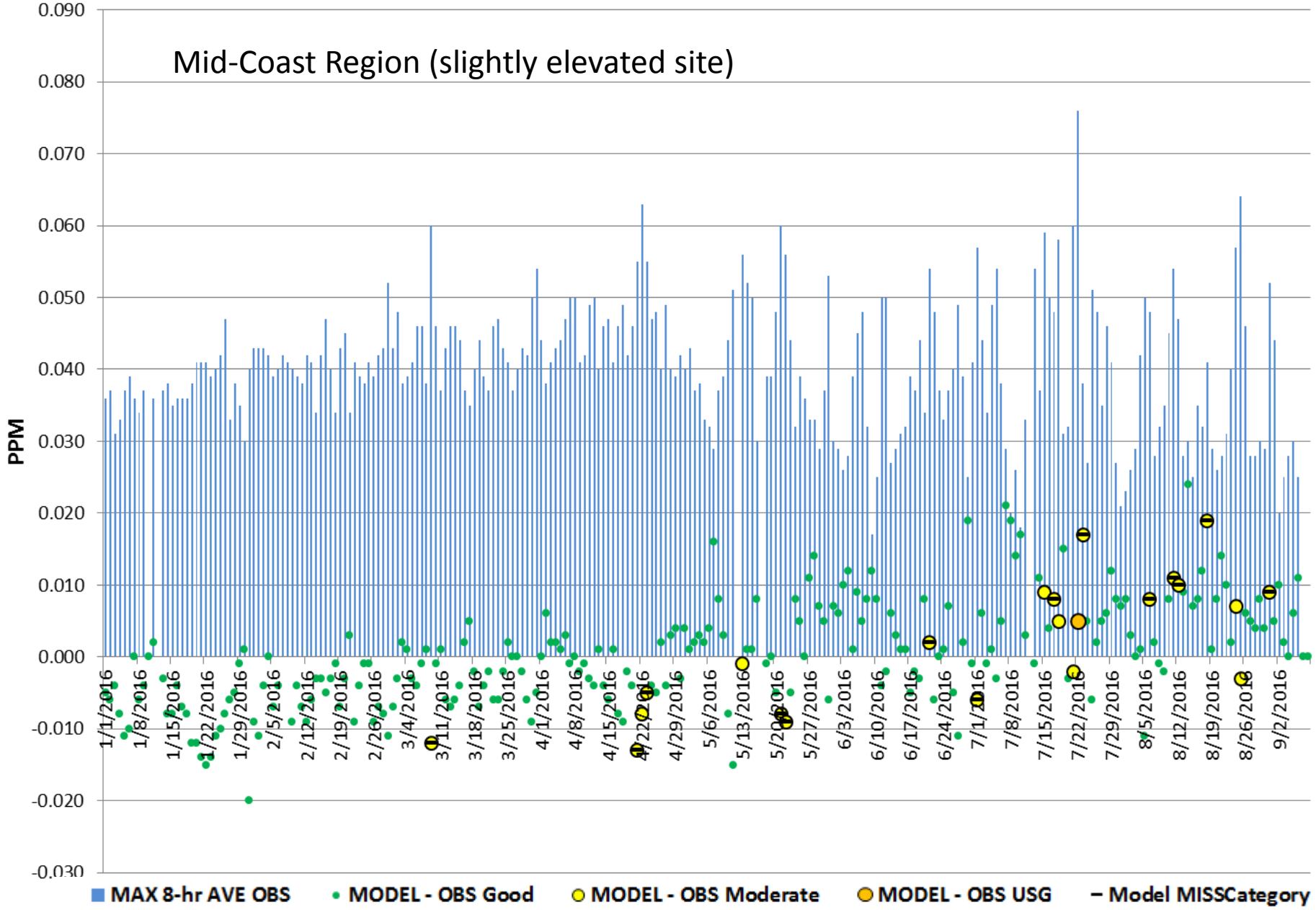


NOAA's AQFS CMAQ V4.6.3 EXPERIMENTAL MODEL OZONE PREDICTIONS vs OBSERVATIONS AT SHAPLEIGH, MAINE

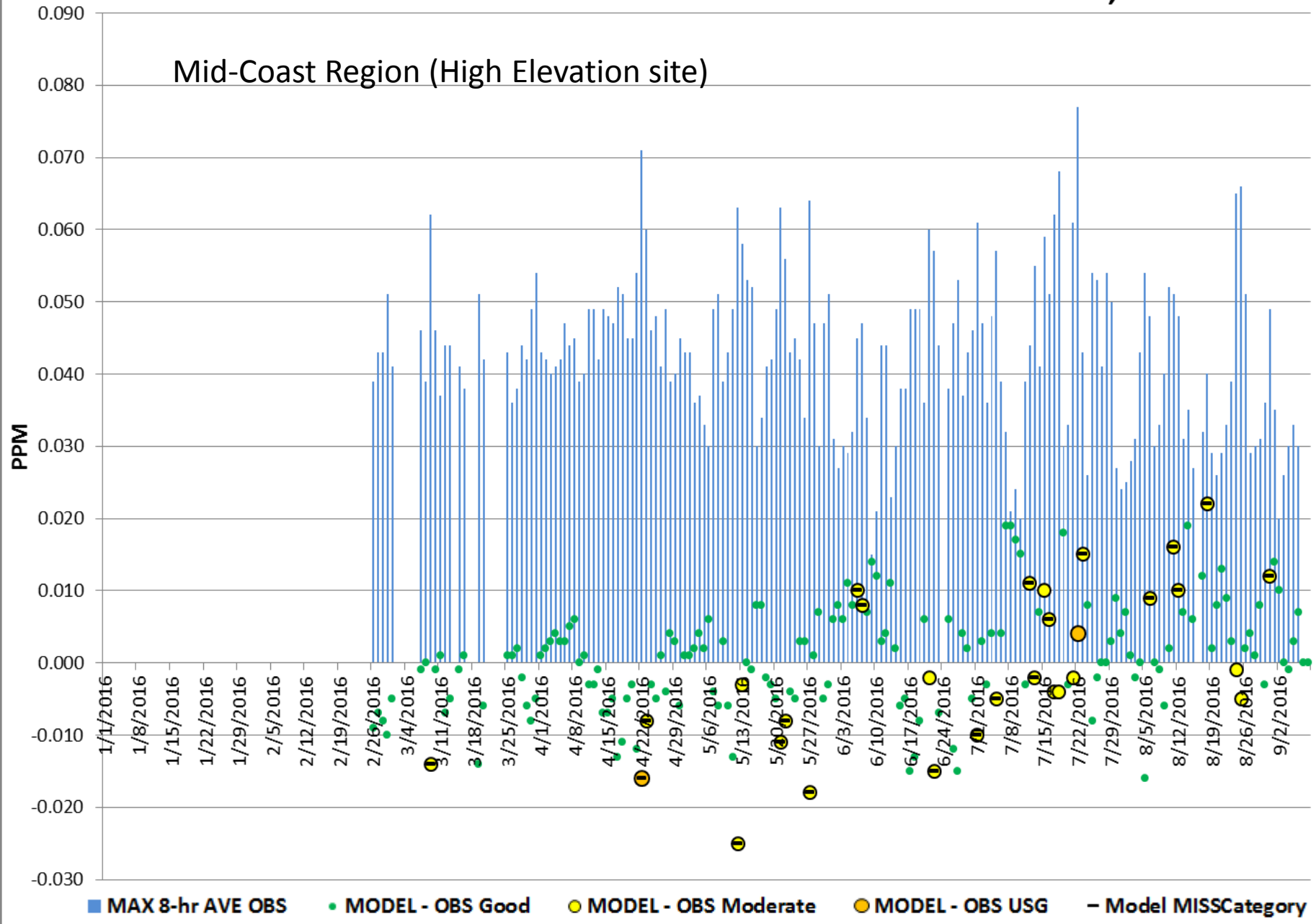



NOAA's AQFS CMAQ V4.6.3 EXPERIMENTAL MODEL OZONE PREDICTIONS vs OBSERVATIONS AT PORT CLYDE, MAINE
Mid-Coast Region
PPM
0.090
0.080
0.070
0.060
0.050
0.040
0.030
0.020
0.010
0.000
-0.010
-0.020
-0.030
1/1/2016
1/8/2016
1/15/2016
1/22/2016
1/29/2016
2/5/2016
2/12/2016
2/19/2016
2/26/2016
3/4/2016
3/11/2016
3/18/2016
3/25/2016
4/1/2016
4/8/2016
4/15/2016
4/22/2016
4/29/2016
5/6/2016
5/13/2016
5/20/2016
5/27/2016
6/3/2016
6/10/2016
6/17/2016
6/24/2016
7/1/2016
7/8/2016
7/15/2016
7/22/2016
7/29/2016
8/5/2016
8/12/2016
8/19/2016
8/26/2016
9/2/2016
MAX 8-hr AVE OBS
MODEL - OBS Good
MODEL - OBS Moderate
MODEL - OBS USG
Model MISSCategory

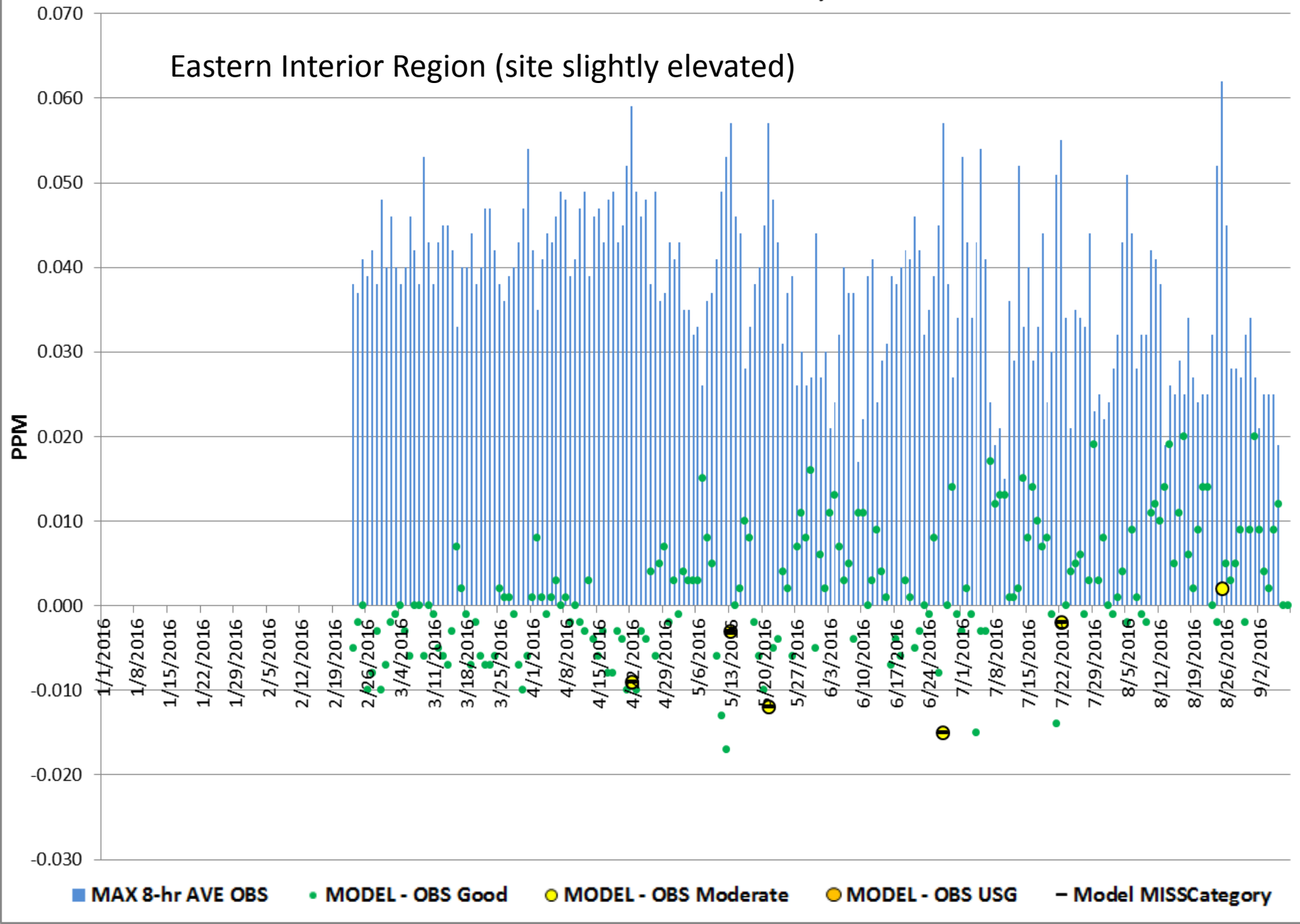
NOAA's AQFS CMAQ V4.6.3 EXPERIMENTAL MODEL OZONE PREDICTIONS vs OBSERVATIONS AT ACADIA NATIONAL PARK, MAINE



NOAA's AQFS CMAQ V4.6.3 EXPERIMENTAL MODEL OZONE PREDICTIONS vs OBSERVATIONS AT THE SUMMIT OF CADILLAC MT, ME



NOAA's AQFS CMAQ V4.6.3 EXPERIMENTAL MODEL OZONE PREDICTIONS vs OBSERVATIONS AT HOLDEN, MAINE



PARTICLE POLLUTION

Overview of Model Performance

- As would be expected -- the model does well with regional PM2.5
- Our concerns are the valleys (6/8 of our PM2.5 BAMS monitors are in valleys)
- Model doesn’t do very well during the winter, especially in valleys
- Probably due to a combination of complex micrometeorology and local emissions (may be unreasonable to expect model to accurately predict winter PM on this scale)

Overview of Model Performance Cont.

- Wood burning for winter heat is a portion of the problem and is the least predictable.
- During the cooler months often the days with the highest observed values are the days with the greatest model under predictions.
- Model forecast is a good guide on regional loading to start the forecast process

Overview of Model Performance Cont.

Forecaster then looks at:

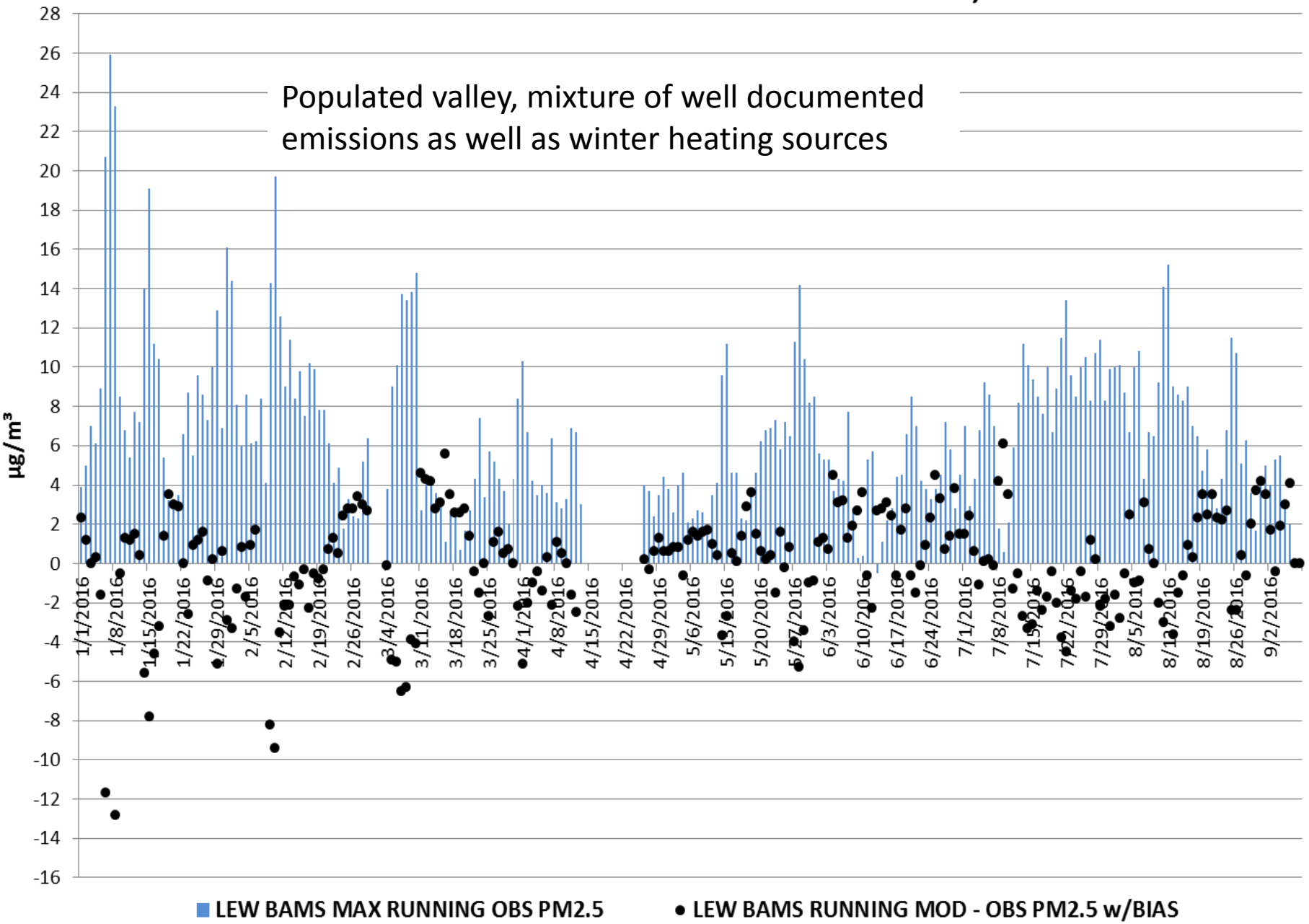
Winter --

- Prediction of duration, depth and strength of nocturnal inversions
- Following morning's wind, sky condition, etc.
- Recent PM2.5 values in relation to met conditions

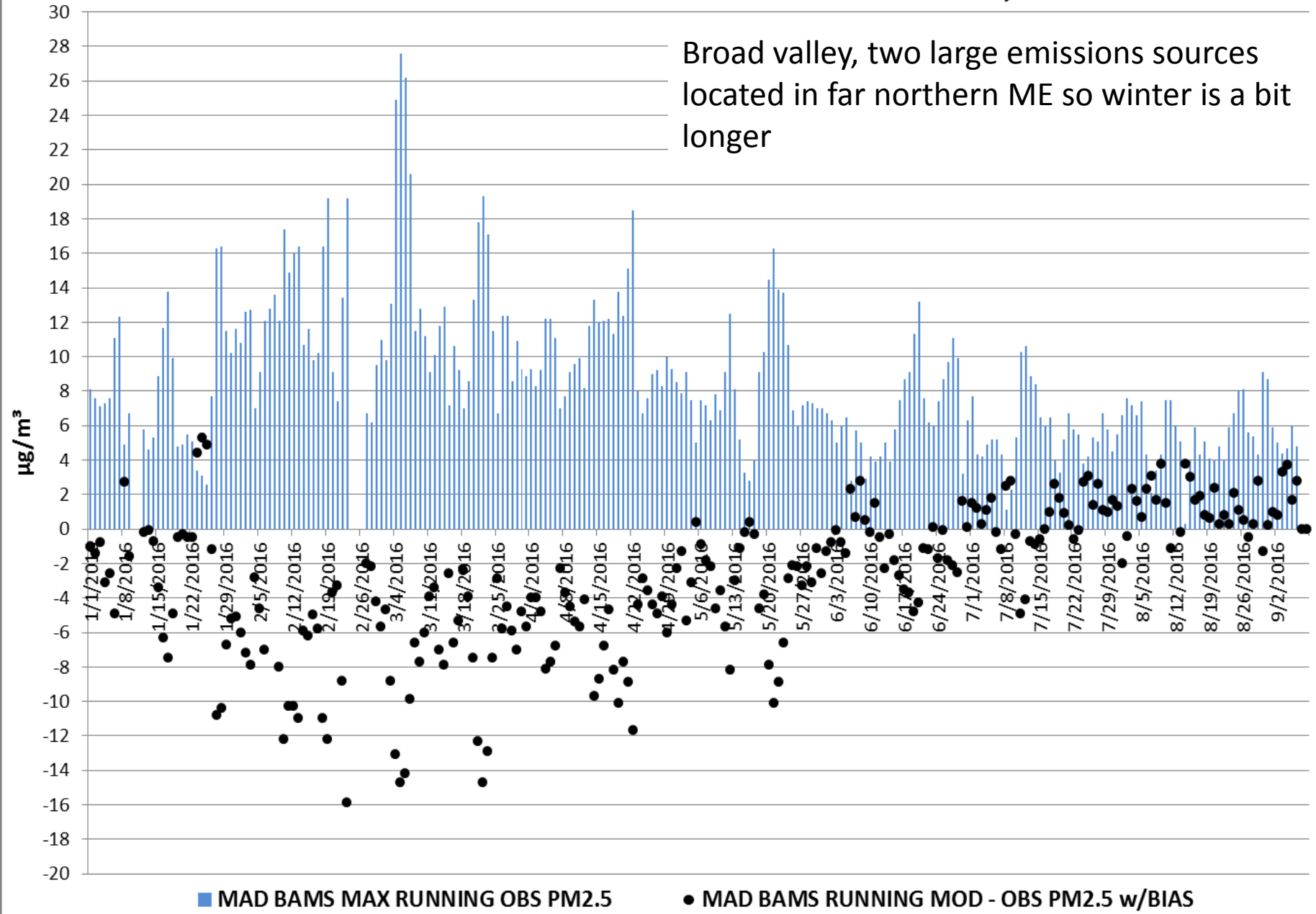
Summer --

- Smoke and AOD

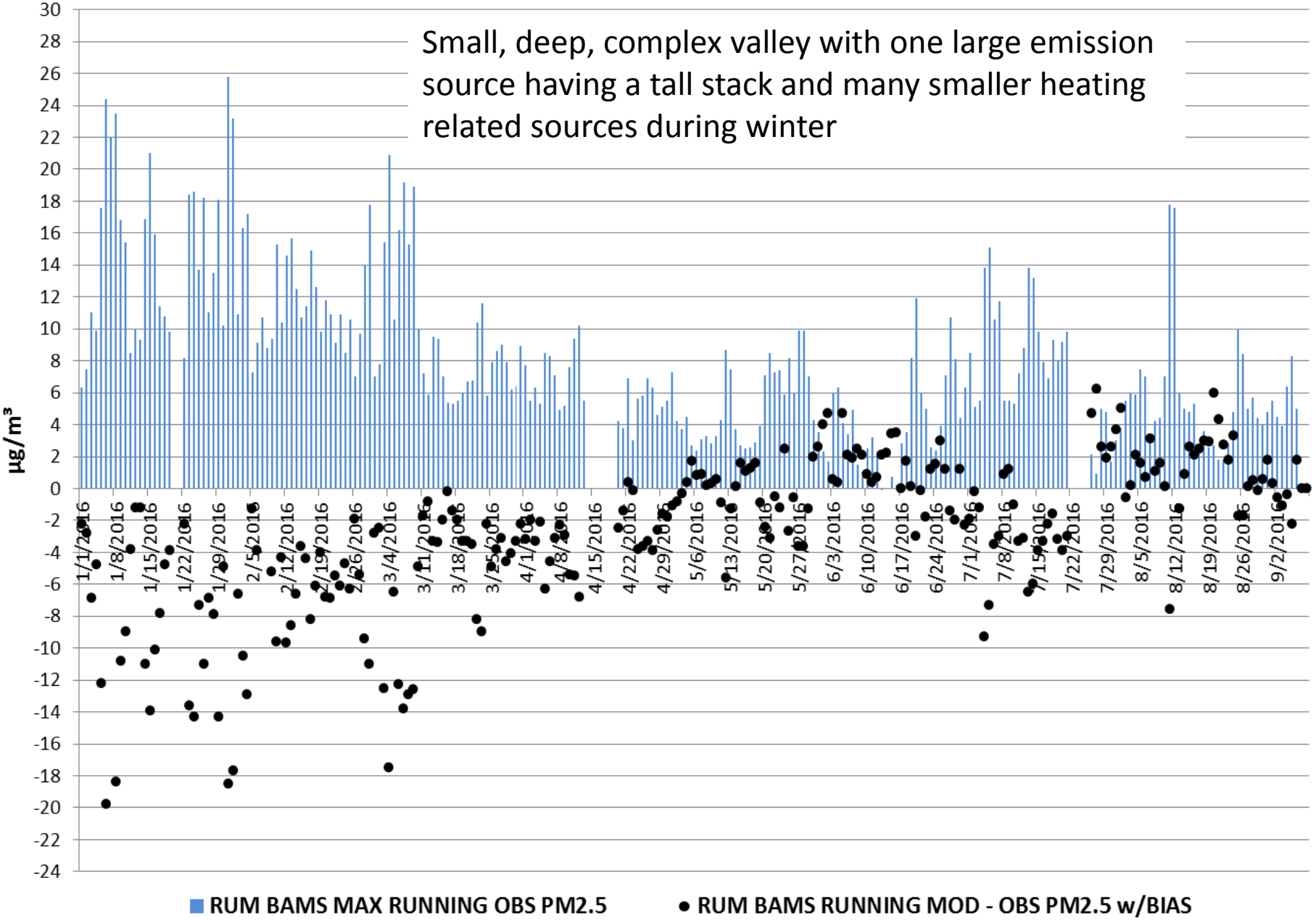
NOAA's AQFS CMAQ V4.6.3 EXPERIMENTAL MODEL PM2.5 w/bias
PREDICTIONS vs OBSERVATIONS AT LEWISTON, MAINE



NOAA's AQFS CMAQ V4.6.3 EXPERIMENTAL MODEL PM2.5 w/bias
PREDICTIONS vs OBSERVATIONS AT MADAWASKA, MAINE



NOAA's AQFS CMAQ V4.6.3 EXPERIMENTAL MODEL PM2.5 w/bias
PREDICTIONS vs OBSERVATIONS AT RUMFORD, MAINE

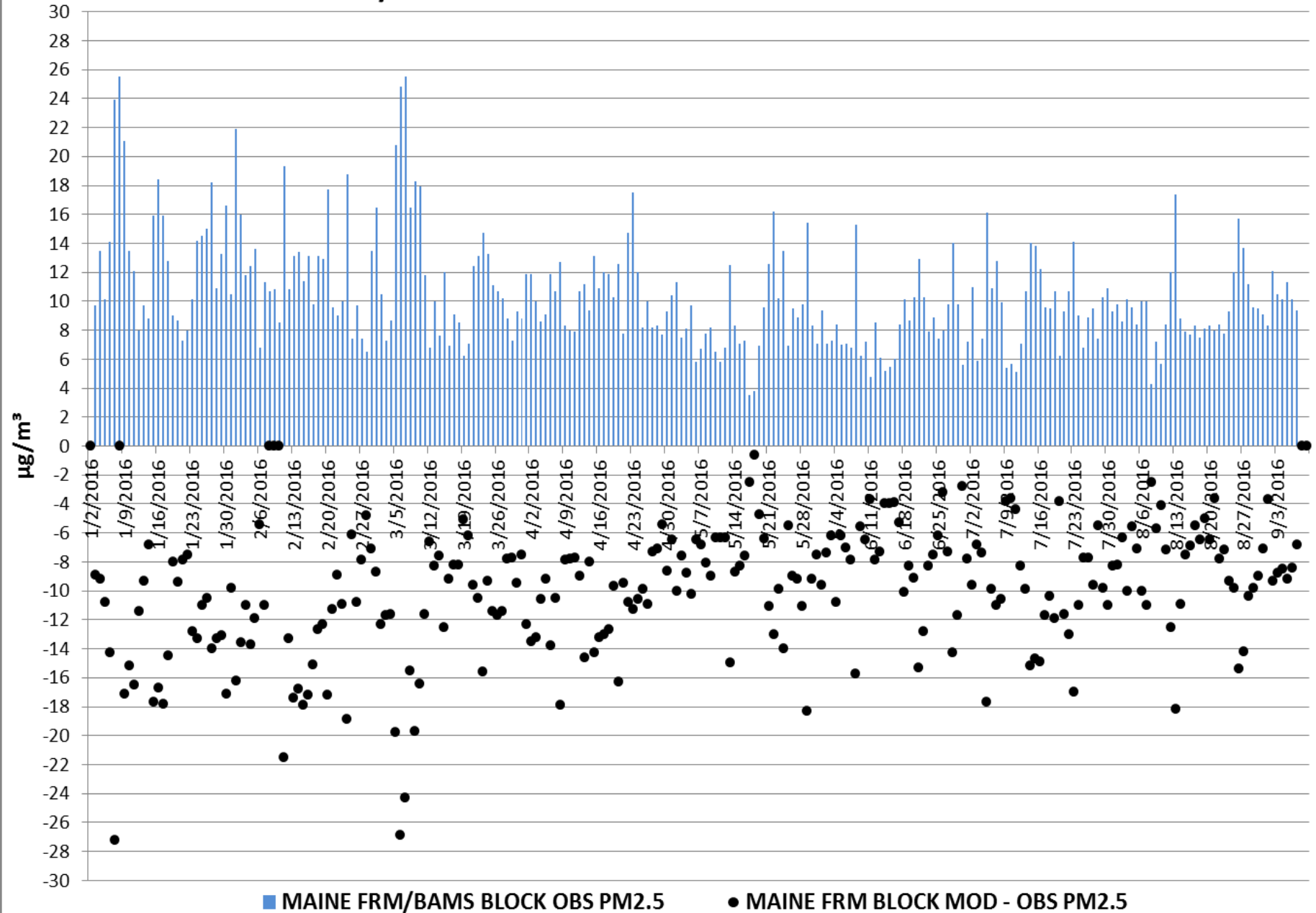


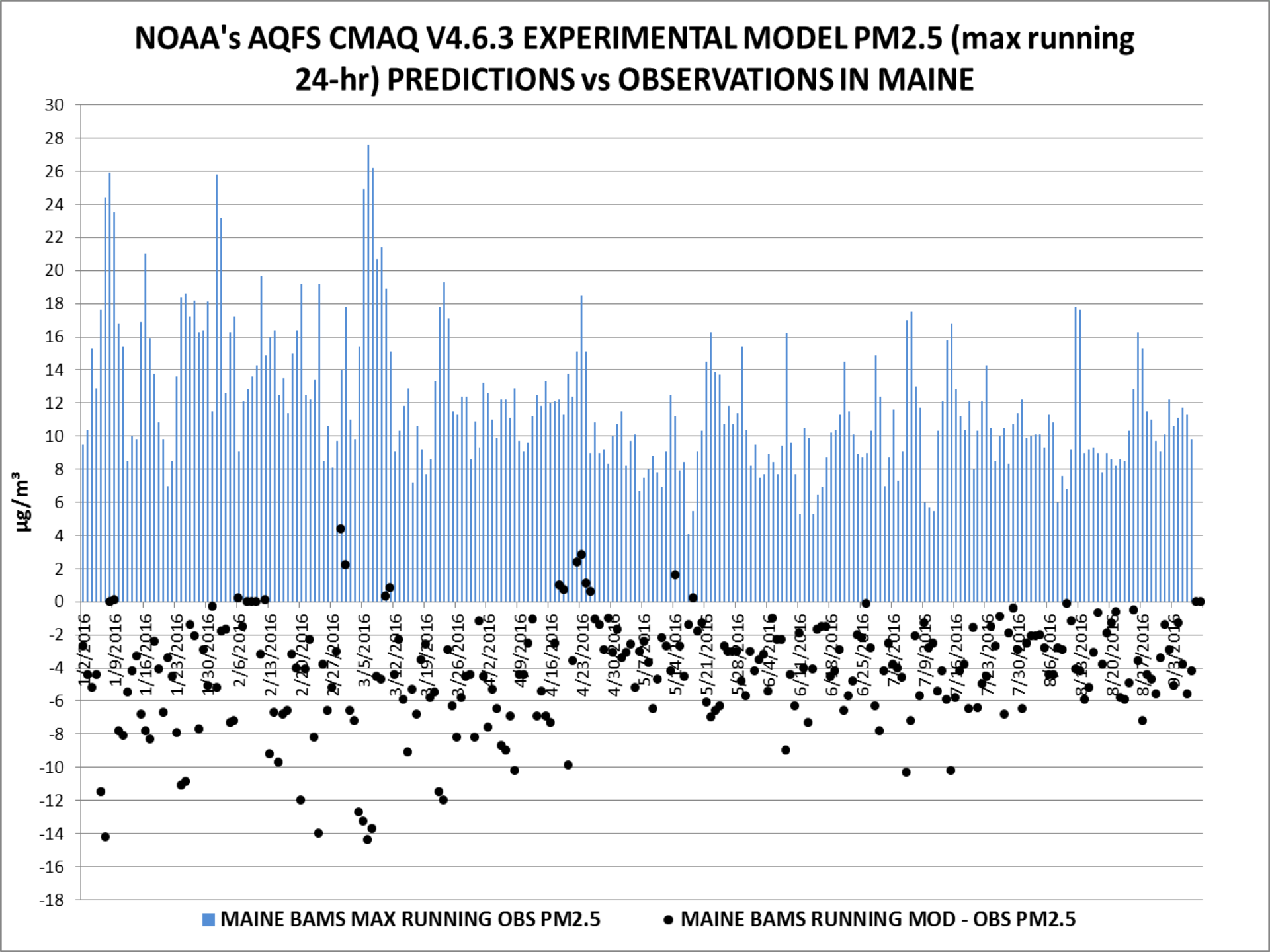
Statewide Max Comparisons

The following charts are:

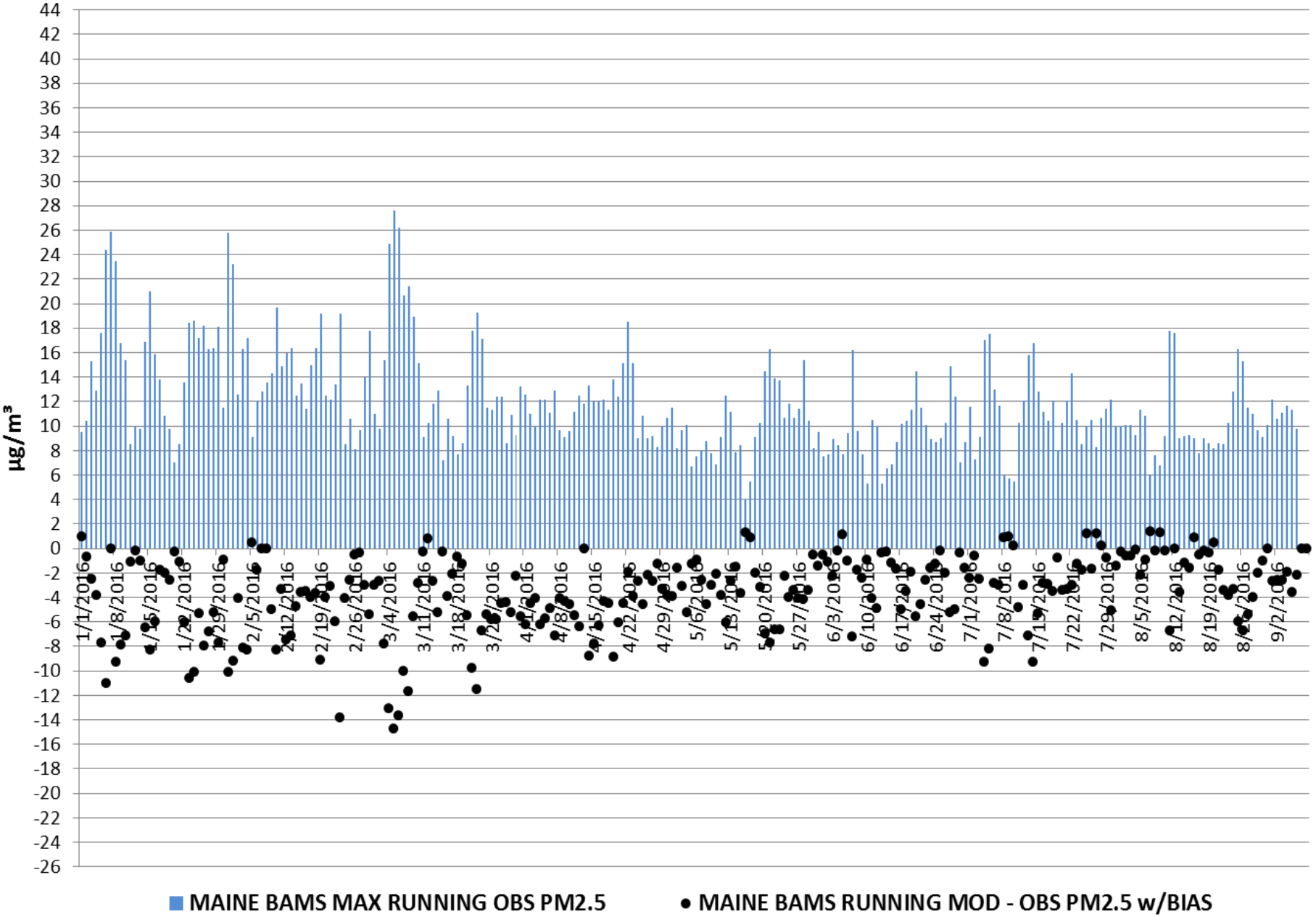
- The daily statewide maximum observed value plotted with the daily statewide maximum difference of the model minus the observed.
- These charts illustrate the difference the between the block (midnight to midnight) averaging and the running 24 hour average
- They also demonstrate the improvement in the bias corrected output.

NOAA's AQFS CMAQ V4.6.3 EXPERIMENTAL MODEL PM2.5 (BLOCK 24-hr) PREDICTIONS vs OBSERVATIONS IN MAINE




NOAA's AQFS CMAQ V4.6.3 EXPERIMENTAL MODEL PM2.5 (max running 24-hr) PREDICTIONS vs OBSERVATIONS IN MAINE
µg/m³
30
28
26
24
22
20
18
16
14
12
10
8
6
4
2
0
-2
-4
-6
-8
-10
-12
-14
-16
-18
1/2/2016
1/9/2016
1/16/2016
1/23/2016
1/30/2016
2/6/2016
2/13/2016
2/20/2016
2/27/2016
3/5/2016
3/12/2016
3/19/2016
3/26/2016
4/2/2016
4/9/2016
4/16/2016
4/23/2016
4/30/2016
5/7/2016
5/14/2016
5/21/2016
5/28/2016
6/4/2016
6/11/2016
6/18/2016
6/25/2016
7/2/2016
7/9/2016
7/16/2016
7/23/2016
7/30/2016
8/6/2016
8/13/2016
8/20/2016
8/27/2016
9/3/2016
MAINE BAMS MAX RUNNING OBS PM2.5
MAINE BAMS RUNNING MOD - OBS PM2.5

NOAA's AQFS CMAQ V4.6.3 EXPERIMENTAL MODEL PM2.5 w/bias
PREDICTIONS vs OBSERVATIONS IN MAINE



Conclusions

- This model is currently the best of what is available to us and has been for the last few years
- We appreciate that we can analyze performance to guide our interpretation of the model output

Requests

- Could use Day 3+ forecast for weekend forecasting
- Could use high elevation Ozone forecast to help with Cadillac Mtn (and Holden?)

- PLEASE, PLEASE, PLEASE – don't use Portland data to verify/compare OZONE model performance. It is not representative of the area.

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