

2014 Virginia Ozone Season Forecast Verification

Kristen Stumpf and Dan Salkovitz

Virginia Department of Environmental Quality

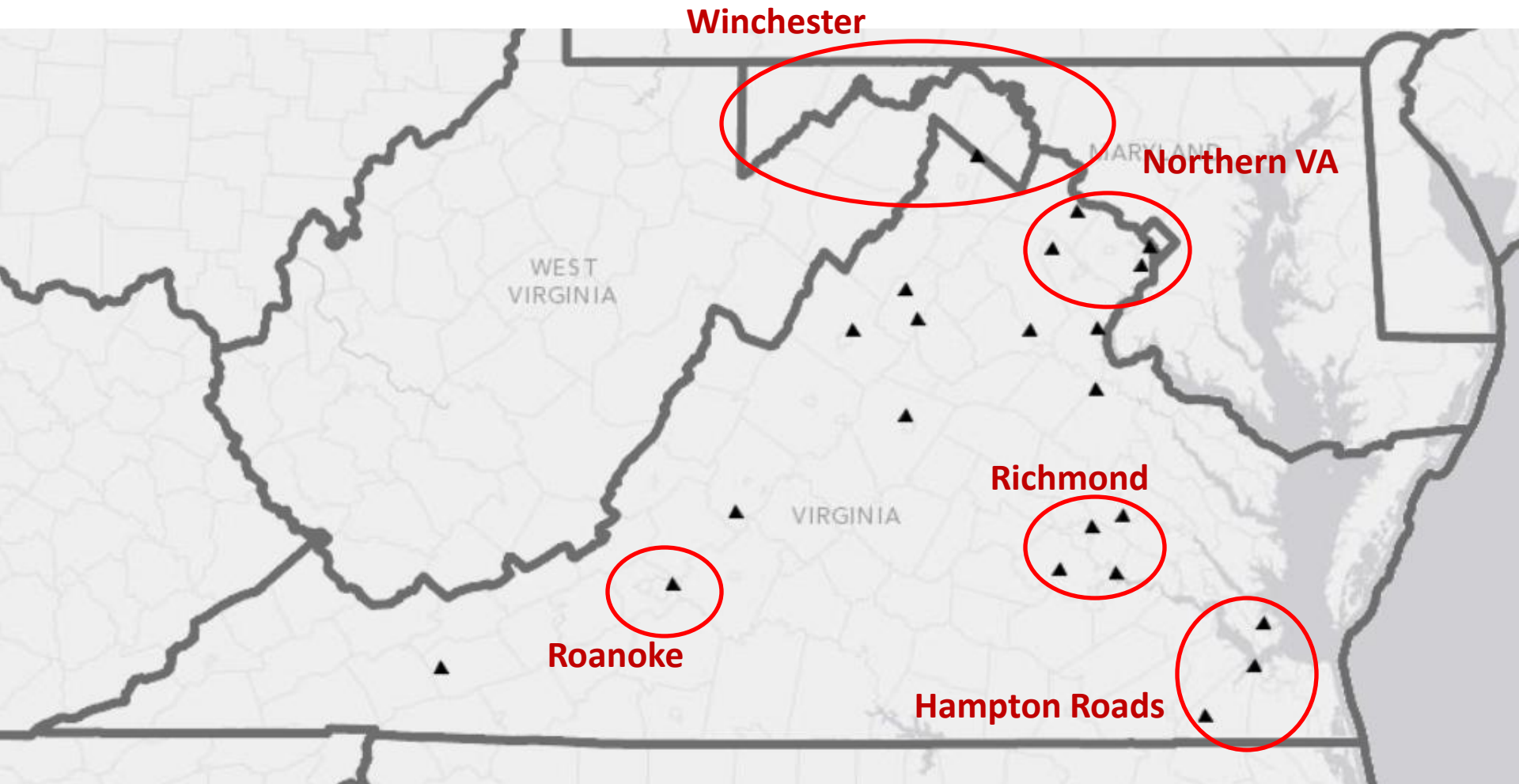
NOAA Air Quality Forecaster Focus Group Workshop

Sept 9-10, 2014

2014 Ozone Season

- 5 forecast areas in VA
 - VA DEQ prepares forecasts for **Richmond, Roanoke, Hampton Roads, and Winchester**
 - VA DEQ and MDE collaborate for **Winchester, VA/Western MD/Martinsburg, WV** consensus forecast
 - MDE and MWCOG collaborate for **Northern VA/DC** area consensus forecast
- Only 3 exceedance days so far this year
 - 6/16: Northern VA, Richmond
 - 7/11: Northern VA
 - 8/27: Northern VA

VA Ozone Monitors and Forecast Areas



Moderate/USG Threshold

5/1/14 – 9/1/14
06Z NOAA Model

Next Day Forecast

| Agency | City | Forecasts | Percent Correct | Bias | FAR | CSI | POD | Skill | Matrix |
|---|-------------------|-----------|-----------------|------|-----|-----|-----|-------|--------------|
| Virginia Dept. of Environmental Quality | Hampton Roads | 123 | 94 | | 100 | 0 | | 0 | 116 7 0 0 |
| Virginia Dept. of Environmental Quality | Northern Virginia | 123 | 97 | 1.00 | 67 | 20 | 33 | 3 | 118 2 2 1 |
| Virginia Dept. of Environmental Quality | Richmond | 123 | 97 | 5.00 | 80 | 20 | 100 | 2 | 118 4 0 1 |
| Virginia Dept. of Environmental Quality | Roanoke | 119 | 100 | | 0 | | | 0 | 119 0 0 0 |
| Virginia Dept. of Environmental Quality | Winchester | 123 | 100 | | 0 | | | 0 | 123 0 0 0 |

- False Alarms: 7 in Hampton Roads, 4 in Richmond
- Did capture the one exceedance day in Richmond

Matrix: A B A: forecast and obs below threshold, B: forecast above, obs below threshold
C D C: forecast below, obs above threshold, D: forecast and obs above threshold

Moderate/USG Threshold

5/1/14 – 9/1/14

12Z NOAA Model

Next Day Forecast

| Agency | City | Forecasts | Percent Correct | Bias | FAR | CSI | POD | Skill | Matrix |
|---|-------------------|-----------|-----------------|------|-----|-----|-----|-------|--------------|
| Virginia Dept. of Environmental Quality | Hampton Roads | 123 | 97 | | 100 | 0 | | 0 | 119 4 0 0 |
| Virginia Dept. of Environmental Quality | Northern Virginia | 123 | 96 | 0.25 | 100 | 0 | 0 | 0 | 118 1 4 0 |
| Virginia Dept. of Environmental Quality | Richmond | 123 | 98 | 2.00 | 100 | 0 | 0 | 0 | 120 2 1 0 |
| Virginia Dept. of Environmental Quality | Roanoke | 119 | 100 | | 0 | | | 0 | 119 0 0 0 |
| Virginia Dept. of Environmental Quality | Winchester | 123 | 100 | | 0 | | | 0 | 123 0 0 0 |

- False Alarms: 4 in Hampton Roads, 2 in Richmond
- Missed the one exceedance day in Richmond

Matrix: A B A: forecast and obs below threshold, B: forecast above, obs below threshold
C D C: forecast below, obs above threshold, D: forecast and obs above threshold

Moderate/USG Threshold

5/1/14 – 9/1/14

Forecaster

Next Day Forecast

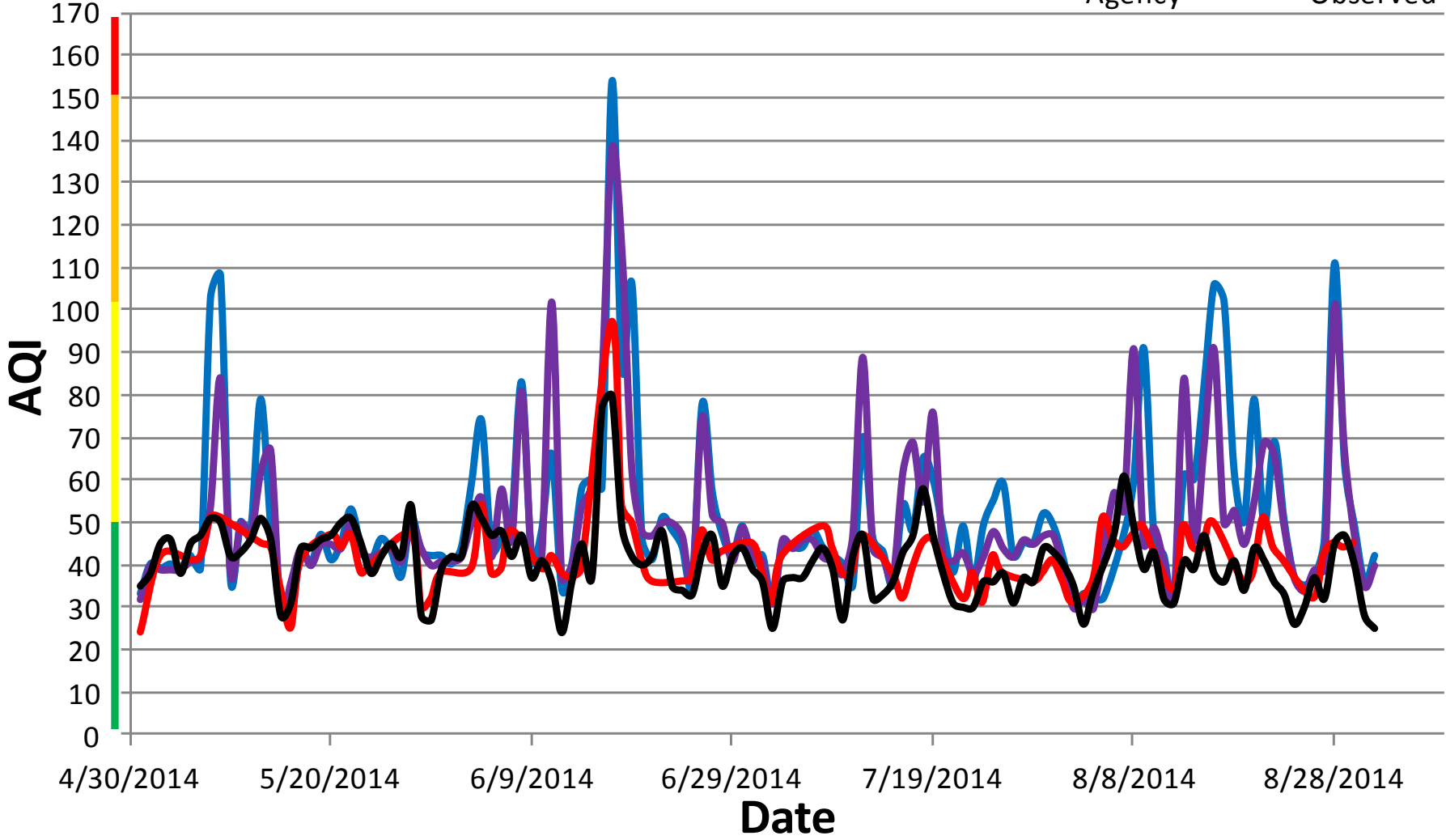
| Agency | City | Forecasts | Percent Correct | Bias | FAR | CSI | POD | Skill | Matrix |
|---|-------------------|-----------|-----------------|------|-----|-----|-----|-------|-------------|
| Virginia Dept. of Environmental Quality | Hampton Roads | 85 | 100 | | 0 | | | 0 | 85 0 0 0 |
| Virginia Dept. of Environmental Quality | Northern Virginia | 85 | 93 | 1.00 | 100 | 0 | 0 | 0 | 79 3 3 0 |
| Virginia Dept. of Environmental Quality | Richmond | 85 | 99 | | 100 | 0 | | 1 | 84 1 0 0 |
| Virginia Dept. of Environmental Quality | Roanoke | 83 | 100 | | 0 | | | 0 | 83 0 0 0 |
| Virginia Dept. of Environmental Quality | Winchester | 85 | 100 | | 0 | | | 0 | 85 0 0 0 |

- False Alarms: 1 in Richmond
- Missed the one exceedance day in Richmond (doesn't show in stats because it wasn't a "Next Day" forecast)

Matrix: A B A: forecast and obs below threshold, B: forecast above, obs below threshold
C D C: forecast below, obs above threshold, D: forecast and obs above threshold

Hampton Roads

06Z 12Z
Agency Observed

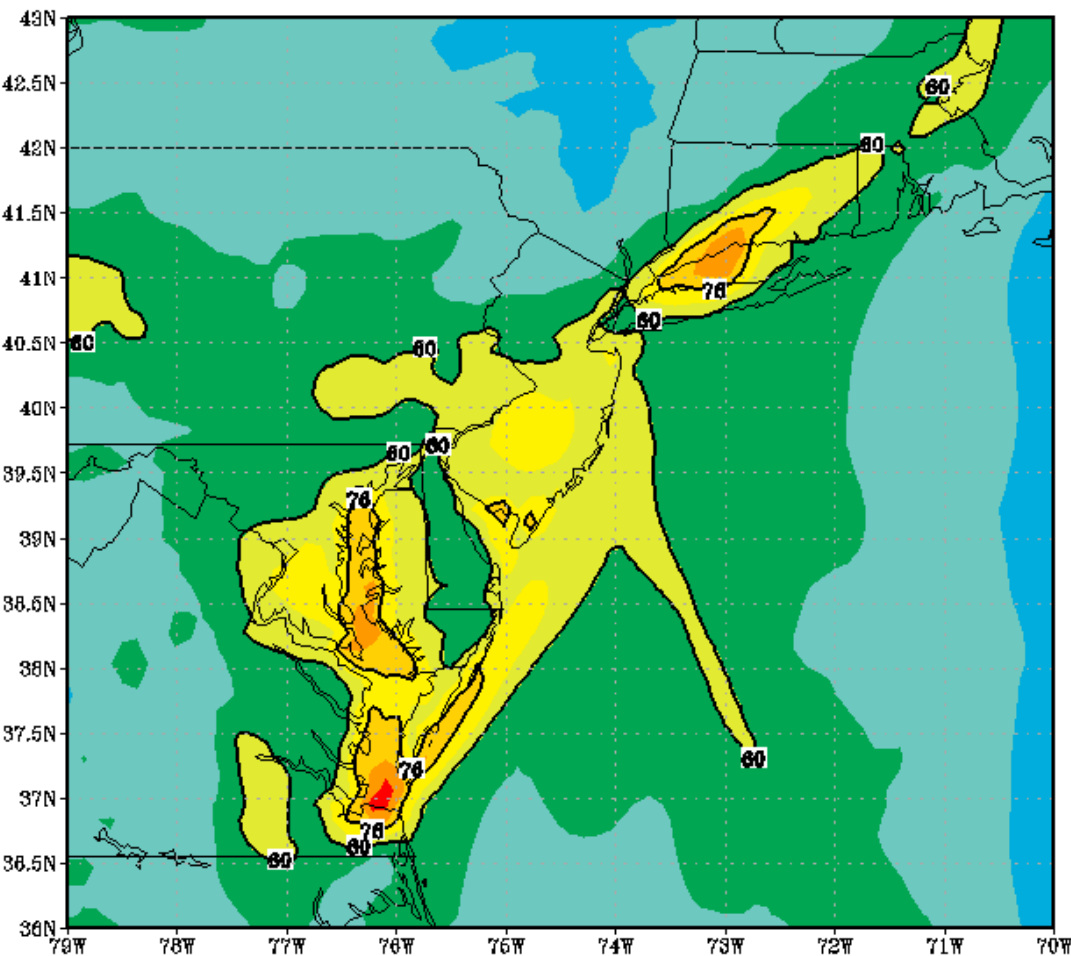


(Daily forecasted and observed ozone AQI from AirNow-Tech)

High Ozone Example in Hampton Roads

Operational Model 06Z Forecast AQI for Jun 17

06Z 31H-48H 2 day 8h max sf O₃ (ppbv) Valid 17 JUN 2014



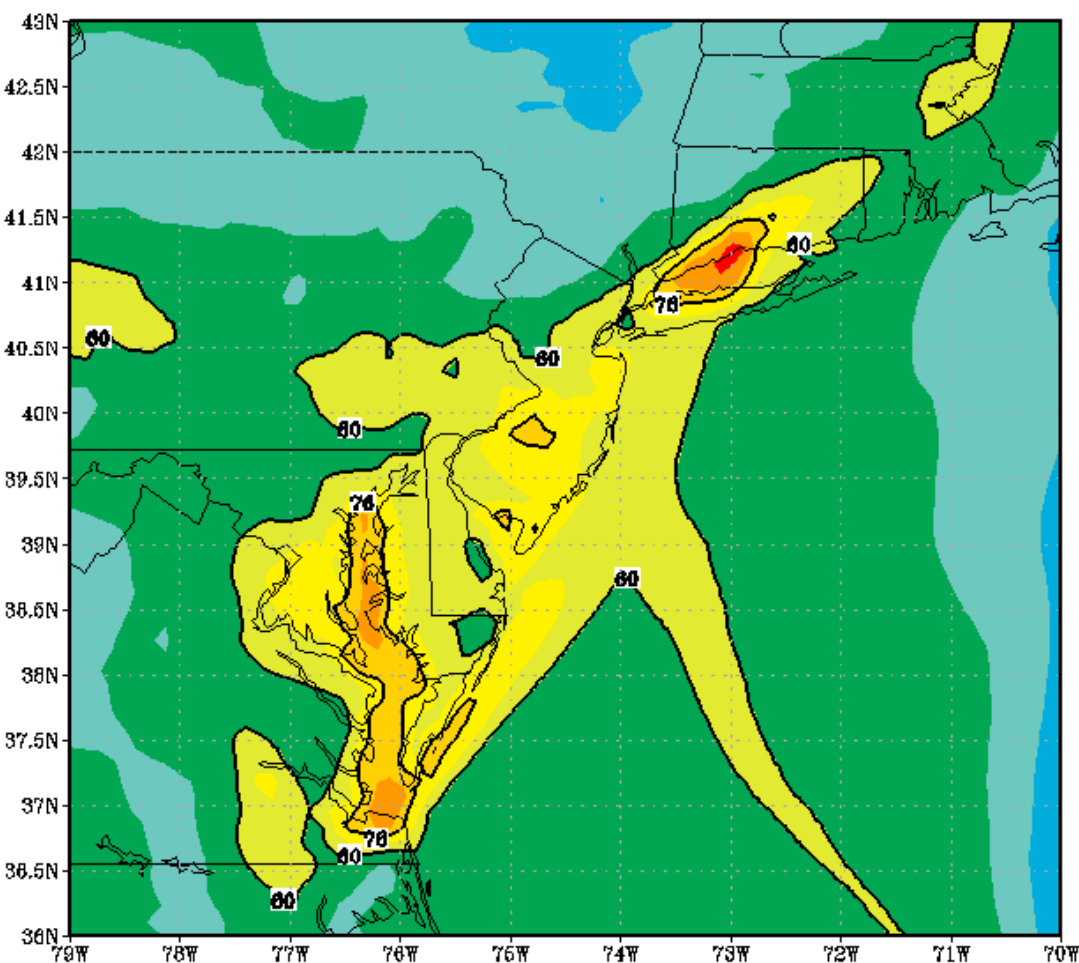
AirNow Max Observed AQI
Jun 17



High Ozone Example in Hampton Roads

Experimental Model 06Z Forecast AQI for Jun 17

06Z 31H-48H 2 day 8h max sf O_3 (ppbv) Valid 17 JUN 2014

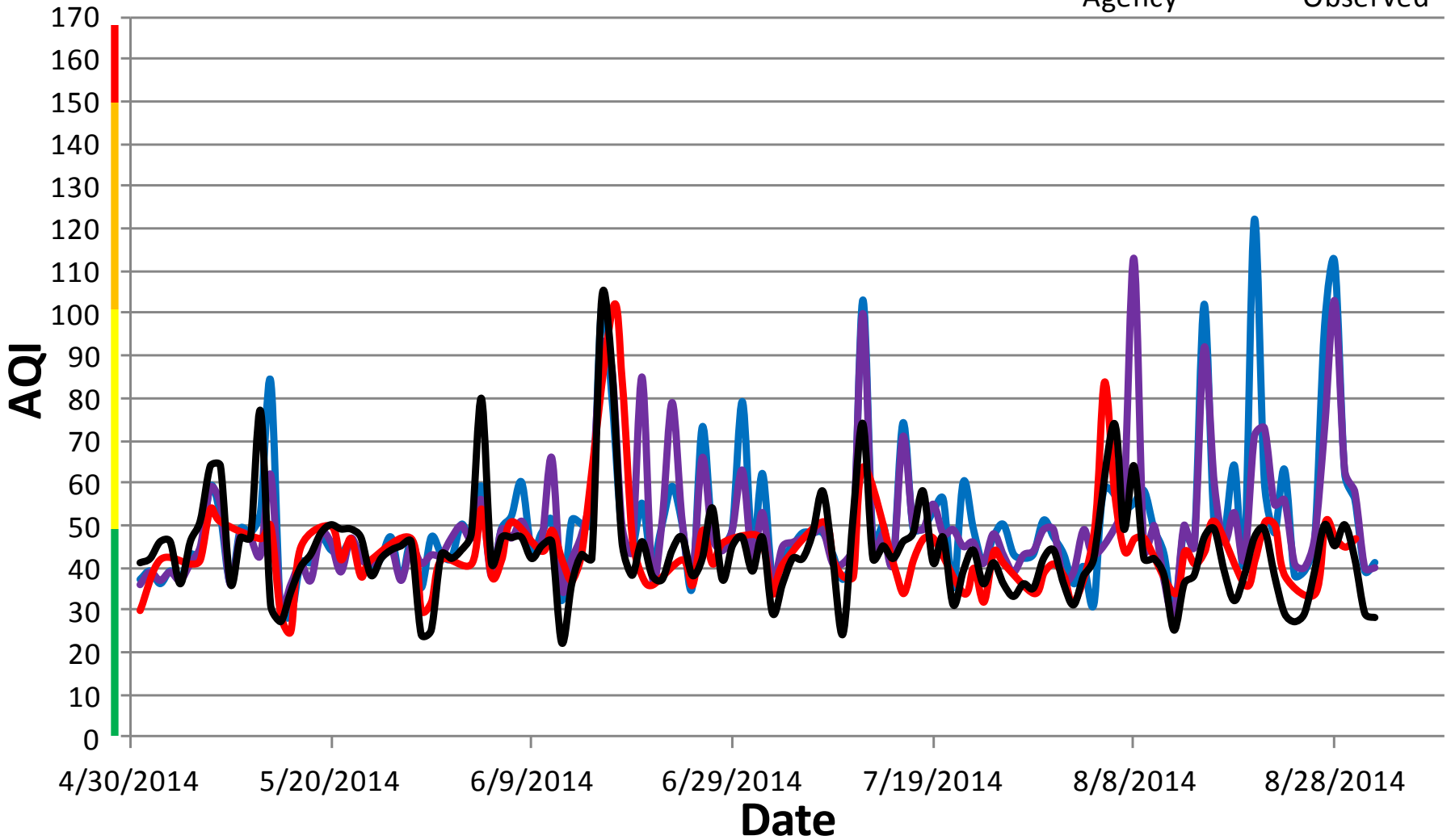


AirNow Max Observed AQI
Jun 17



Richmond

06Z Agency 12Z Observed

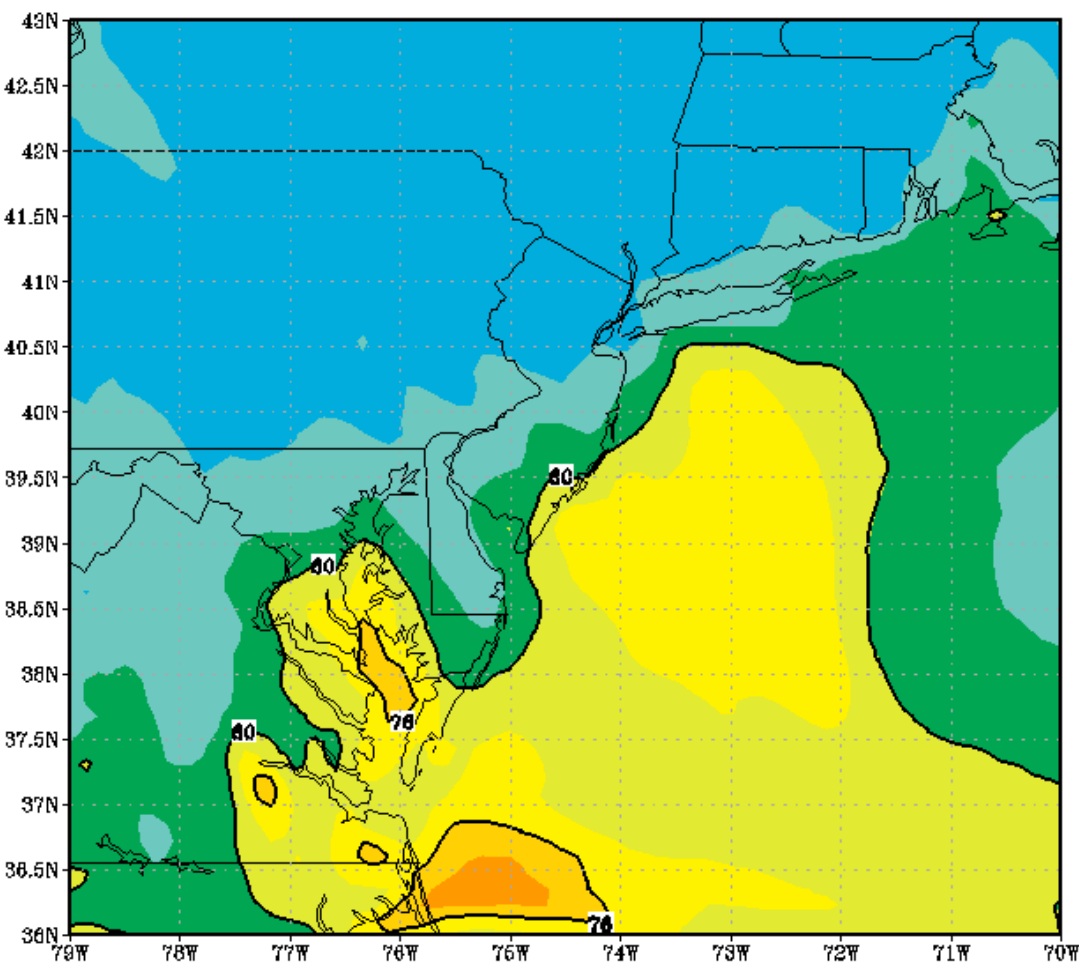


(Daily forecasted and observed ozone AQI from AirNow-Tech)

High Ozone Example in Richmond

Operational Model 06Z Forecast AQI for Aug 28

06Z 31H-48H 2 day 8h max sf O_3 (ppbv) Valid 28 AUG 2014



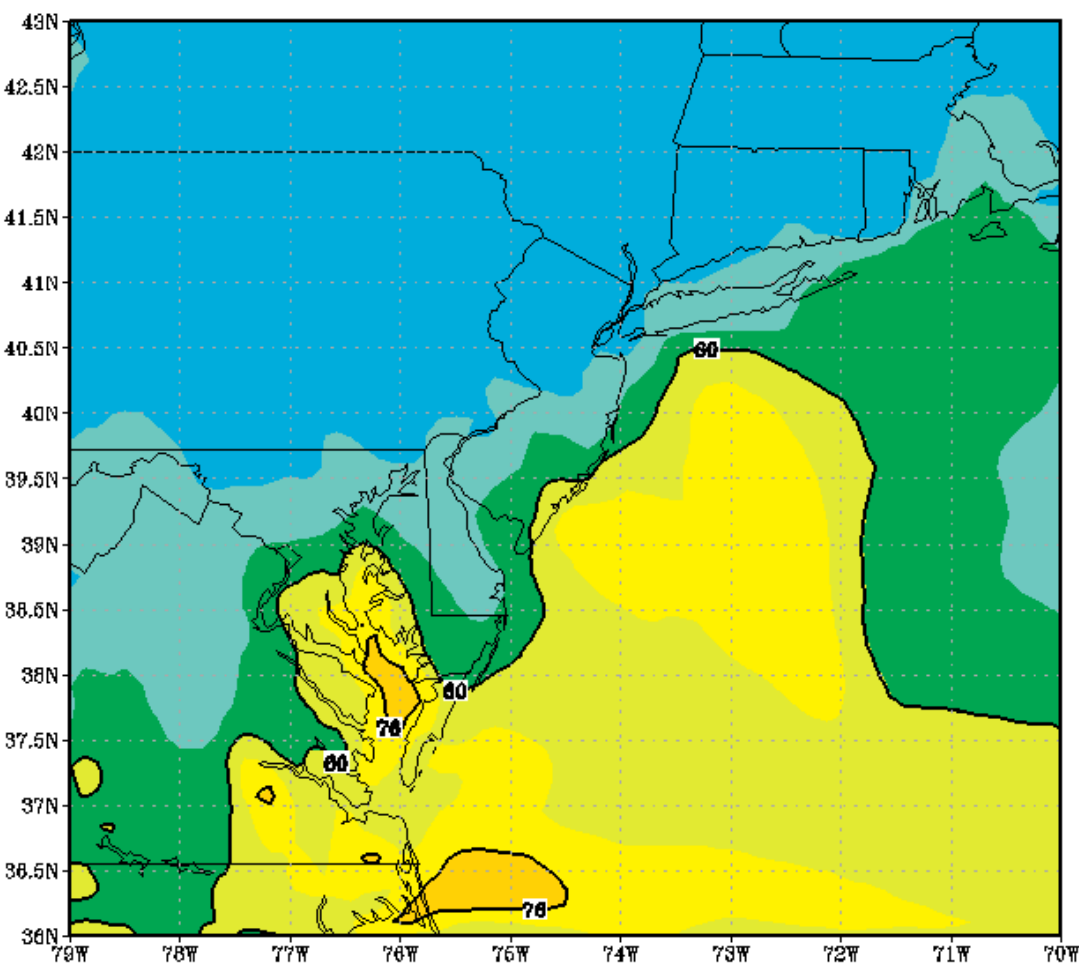
AirNow Max Observed AQI
Aug 28



High Ozone Example in Richmond

Experimental Model 06Z Forecast AQI for Aug 28

06Z 31H-48H 2 day 8h max sf O₃ (ppbv) Valid 28 AUG 2014

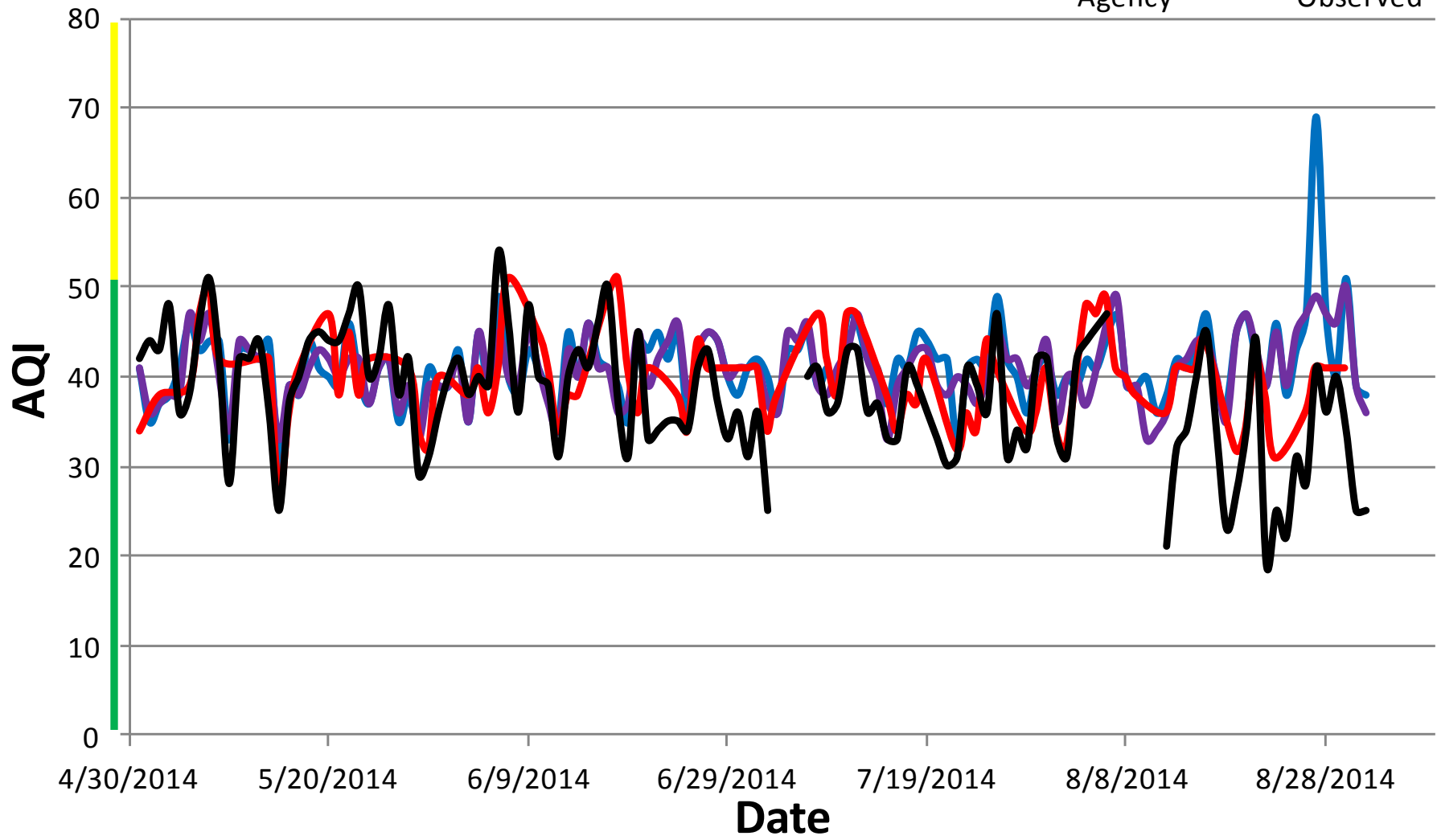


AirNow Max Observed AQI
Aug 28



Roanoke

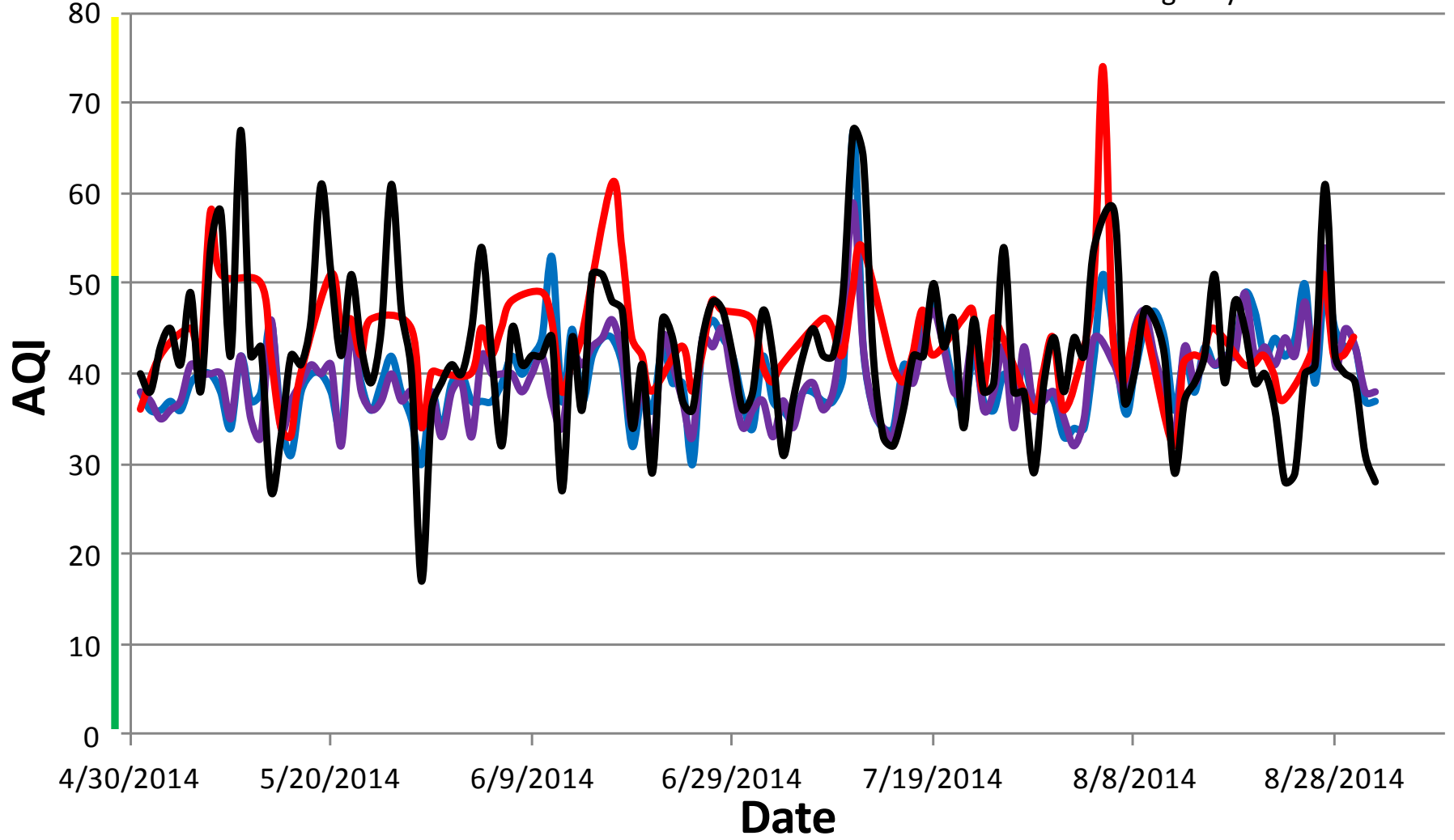
06Z 12Z
Agency Observed



(Daily forecasted and observed ozone AQI from AirNow-Tech)

Winchester, Western MD, Martinsburg

06Z Agency 12Z Observed



(Daily forecasted and observed ozone AQI from AirNow-Tech)

Summary

- Only 3 exceedance days so far this year available for evaluation.
- The 06Z model captured the single ozone exceedance day in Richmond, but also had 4 false alarms.
- Both model runs had more false alarms than the human forecaster, especially in Hampton Roads.
- Along the Moderate/USG Threshold, the human forecasters have been more accurate in Richmond and Hampton Roads than the models.

Additional Information

Good/Moderate Threshold

5/1/14 – 9/1/14

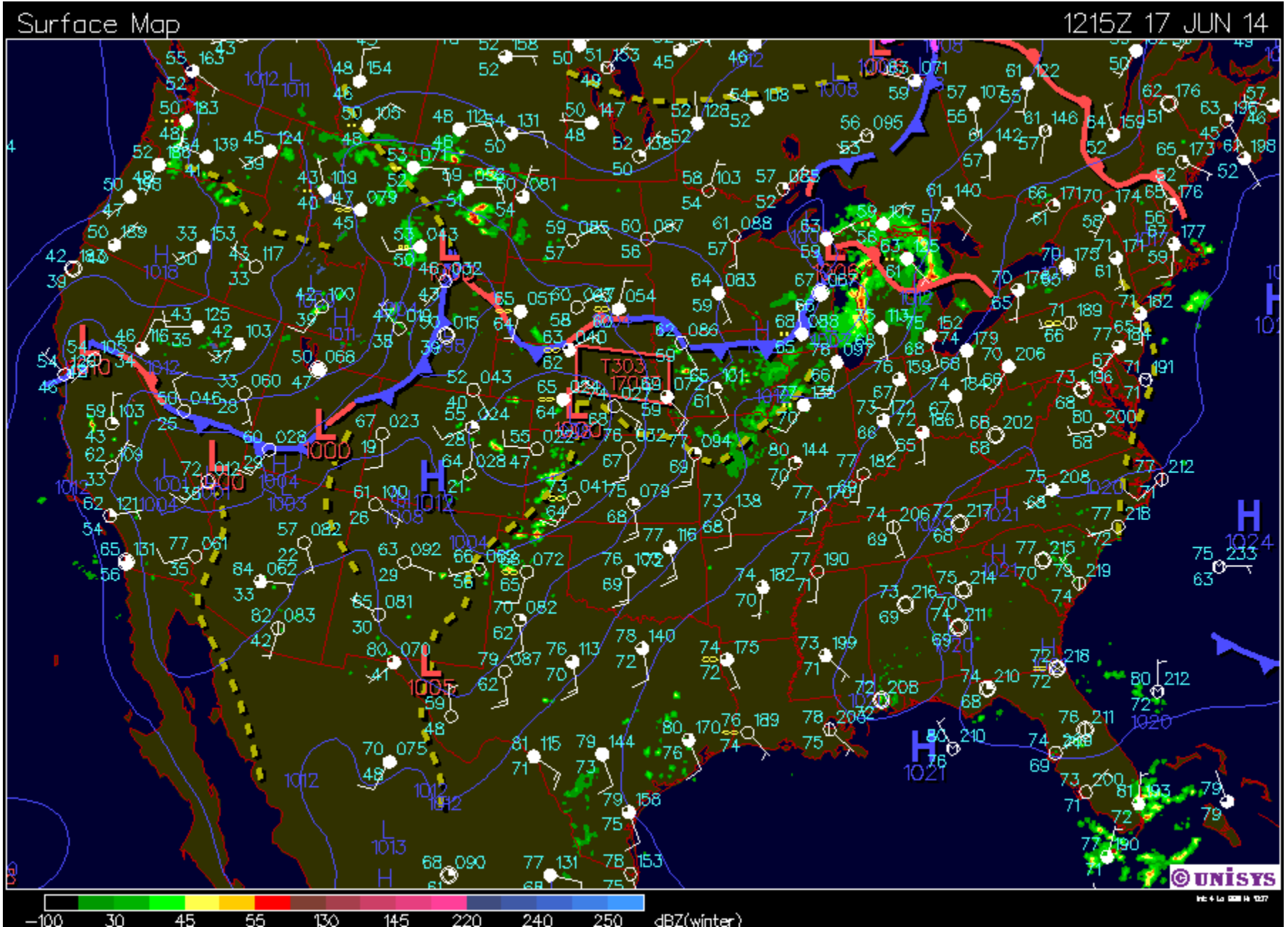
Forecaster

Next Day Forecast

| Agency | City | Forecasts | Percent Correct | Bias | FAR | CSI | POD | Skill | Matrix |
|---|-------------------|-----------|-----------------|------|-----|-----|-----|-------|---------------|
| Virginia Dept. of Environmental Quality | Hampton Roads | 85 | 87 | 0.70 | 57 | 21 | 30 | 4 | 71 4 7 3 |
| Virginia Dept. of Environmental Quality | Northern Virginia | 85 | 76 | 1.50 | 44 | 50 | 83 | 44 | 45 16 4 20 |
| Virginia Dept. of Environmental Quality | Richmond | 85 | 87 | 0.93 | 38 | 42 | 57 | 9 | 66 5 6 8 |
| Virginia Dept. of Environmental Quality | Roanoke | 83 | 95 | 1.00 | 100 | 0 | 0 | -2 | 79 2 2 0 |
| Virginia Dept. of Environmental Quality | Winchester | 85 | 91 | 0.67 | 25 | 43 | 50 | 10 | 71 2 6 6 |

Matrix: A B A: forecast and obs below threshold, B: forecast above, obs below threshold
C D C: forecast below, obs above threshold, D: forecast and obs above threshold

Jun 14 – Hampton Roads False Alarm



Aug 28 – Richmond False Alarm

