

**2010 Air Quality Focus Group Workshop  
NOAA Science Center, Silver Spring, MD  
15-16 September 2010**

**Summary of Feedback:**

- Summary of ozone feedback
  - Performs very well early in the season
  - Code orange: high POD, but also FAR
  - “Overpredicts in predictable ways” – steady bias
  - Overprediction in SE – need for emissions update? – newer regional emissions available; biogenic emissions?
  - Low ozone bias, e.g. Houston and the middle of LA basin - excessive titration? – emissions update?
  - Overprediction when moisture is high in Gulf states
  - Coastal overprediction, recirculation (e.g. August 10 in CT)
  - Bias by day of the week varies by region
  - Stratospheric influence
  - Revised ozone standard expected in 60-70ppb range; need for forecasting at additional locations
- Summary of PM feedback
  - Warm season:
    - Prediction useful
    - Increase (trend) in the beginning of PM events smaller than observed
    - Relatively few PM events this summer
  - Cold season:
    - Overprediction
    - Excessive day-to-day variability
- HPC / Feedback form /additional products
  - Forecasters are using HPC site
  - Find it much improved, helpful this year
  - Would be helpful to provide:
    - Cloud cover product
    - Snow cover
    - Archived discussions and figures
    - Upper level winds (850, 925 hPa) on boundary layer map
  - Simplify feedback form, label days
  - Upper level ozone fields
  - Bias correction of PM

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| Michael Geigert | CT DEP – Air Pollution Control Engineer           | <ul style="list-style-type: none"> <li>• Unusually warm summer over northern states</li> <li>• 24 days w/ at least one site &gt; 75 ppb</li> <li>• Operation model predicted 34 exceedance days; 22 of which correct</li> <li>• Very good in early season, except on June 20 (observed 68 ppb, experimental prediction 108 ppb)</li> <li>• July – September               <ul style="list-style-type: none"> <li>○ Exceedance days unusually late in the season</li> <li>○ Coastal overprediction (recirculation?): August 10 – 8 hour max of 139 predicted; 80 actual (from experimental)</li> </ul> </li> <li>• Model does well on southwest flow days</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                   | <ul style="list-style-type: none"> <li>• Concern with coastal sites               <ul style="list-style-type: none"> <li>○ Measure ozone offshore?</li> </ul> </li> <li>• Need to examine accumulation of very high ozone off the coast, especially in experimental guidance</li> </ul> |
| Bill Ryan       | Department of Meteorology – Penn State University | <ul style="list-style-type: none"> <li>• 2010 likely warmest summer (June/July/August) on record – 46 above 90 degrees</li> <li>• AQ could have been worse – but no days above 105 ppb</li> <li>• Experimental prediction higher than operational               <ul style="list-style-type: none"> <li>○ Experimental prediction had five additional false alarms of code orange ozone, but all close to threshold (76-79 ppb range)</li> </ul> </li> <li>• PM results               <ul style="list-style-type: none"> <li>○ Experimental model underpredicted PM and absolute error was similar to the persistence forecast</li> <li>○ PM verification is provisional – for PHL we use average of highest 4 continuous monitors as the best estimate of FRM results</li> <li>○ PM model doesn't respond strongly enough when events occur (sulfate?) – steps up to 20 ug/m<sup>3</sup>, observations go up to 30 ug/m<sup>3</sup>, PM model never reaches observed peak</li> <li>○ Few PM events this summer</li> <li>○ Experimental PM improved over prior years, now ~equal to persistence</li> </ul> </li> </ul> | <ul style="list-style-type: none"> <li>• Need to simplify/revise feedback form; offered to provide suggested improvements</li> </ul>                                                                                                                                                    |

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|----------------|---------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                |                                                                                                               | <ul style="list-style-type: none"> <li>• Remarkably good operational ozone prediction in 2010               <ul style="list-style-type: none"> <li>○ Persistence not as good as it usually is</li> <li>○ 8 false alarms</li> <li>○ False alarms - over estimate of stagnation along sea breeze front, but, of 4 similar cases, NAQFC correctly predicted high ozone in 3</li> </ul> </li> <li>• Sundays had a double or more bias, less Monday, flat rest of week</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                        |
| Debra Baker    | Air Monitoring Program<br>Air & Radiation Management Administration<br>Maryland Department of the Environment | <ul style="list-style-type: none"> <li>• More code orange days in 2010 than 2009</li> <li>• AQ-MOS was better than raw model results</li> <li>• Ensemble did much better, given low AQ-MOS to offset high model results</li> <li>• Critical success index               <ul style="list-style-type: none"> <li>○ 39% - NOAA highest of all models</li> </ul> </li> <li>• Hit Rate               <ul style="list-style-type: none"> <li>○ 39% NOAA model (same as AQ-MOS)</li> </ul> </li> <li>• False Alarm rate               <ul style="list-style-type: none"> <li>○ NOAA model 61%, AQ-MOS 38%</li> </ul> </li> <li>• Bias               <ul style="list-style-type: none"> <li>○ Over predicted code orange</li> <li>○ Highest was for the NOAA and Blue Sky Models</li> </ul> </li> <li>• Best mean error is AQ-MOS</li> <li>• NOAA RMSE improved in 2010 compared to 2009</li> <li>• AQ-MOS underpredicts code orange ozone</li> <li>• Ensemble much improved over last year</li> </ul> | <ul style="list-style-type: none"> <li>• Coastal issues               <ul style="list-style-type: none"> <li>○ Bay breeze pushes pollution back toward Baltimore... how to fix?                   <ul style="list-style-type: none"> <li>▪ Good results with WRF at 4-km resolution</li> </ul> </li> </ul> </li> </ul> |
| Dan Salkovitch | Virginia DEQ                                                                                                  | <ul style="list-style-type: none"> <li>• PM data vs TEOM observations for May 2008 – August 2010               <ul style="list-style-type: none"> <li>○ Impressed with NOAA Model</li> <li>○ Warm season                   <ul style="list-style-type: none"> <li>▪ Prediction is useful</li> <li>▪ Values relatively close</li> </ul> </li> </ul> </li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                        |

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|             |                                                                                           | <ul style="list-style-type: none"> <li> <ul style="list-style-type: none"> <li>▪ Roanoke prediction clustered well</li> </ul> </li> <li>○ Cold season overprediction           <ul style="list-style-type: none"> <li>▪ Overprediction worst than last year</li> <li>▪ Richmond: prediction 30 ug/m<sup>3</sup> higher than obs</li> </ul> </li> <li>• Ozone operational model for Richmond –9 exceedance days predicted by 12Z model           <ul style="list-style-type: none"> <li>○ Good guidance for code orange, overpredicting code red</li> <li>○ False alarms</li> </ul> </li> <li>• Roanoke rare exceedance – July 8, handled well by model           <ul style="list-style-type: none"> <li>○ Overprediction very common; false alarms routine with NOAA model</li> <li>○ AQ-MOS worked very well – tended to adjust model numbers down</li> </ul> </li> <li>• Hampton Roads/Norfolk           <ul style="list-style-type: none"> <li>○ Six exceedance days all predicted by model</li> <li>○ Overprediction is huge problem due to buildup over ocean</li> <li>○ Water interface problem since day 1</li> <li>○ False alarms quite high</li> <li>○ AQ-MOS worked well in this area</li> </ul> </li> </ul> |                               |
| Cary Gentry | Sr. Environmental Specialist – Forsyth County Environmental Affairs Dept – North Carolina | <ul style="list-style-type: none"> <li>• NOAA model did well early in the year – until mid June</li> <li>• NOAA model overpredicts number of code orange days</li> <li>• Model keeps with trends</li> <li>• Actual green – 81, actual exceedance days – 10           <ul style="list-style-type: none"> <li>○ Overprediction by NOAA model – predicted 34 exceedance days (6Z) and 33 (12Z)</li> </ul> </li> <li>• NOAA model overpredicting on Mondays</li> <li>• Problems with display switching between 6Z and 12Z maps</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                               |

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| George Bridgers | NC Division of Air Quality                                    | <p>Operational ozone:</p> <ul style="list-style-type: none"> <li>• NOAA ozone model overpredicted 7 code red days, 23 code orange days.</li> <li>• There were 83 days with temperatures over 90F <ul style="list-style-type: none"> <li>• Pretty constant overprediction of 15 ppb – Are there too many precursors in the model?</li> <li>• Predictions initiated at 06z and 12z are similar this year (no difference seen like last year).</li> </ul> </li> </ul> <p>Developmental PM:</p> <ul style="list-style-type: none"> <li>• Helpful</li> <li>• Sometimes misses the first day of enhancements</li> <li>• Great coordination with local WFO</li> </ul>                                                                                                                                                                                                                                                                                | <ul style="list-style-type: none"> <li>• Recommends using updated emissions: 2008 NEI</li> </ul> |
| Wes Behrend     | South Carolina Department of Health and Environmental Control | <ul style="list-style-type: none"> <li>• Very pleased with operational model overall</li> <li>• Relying on NOAA model for predictions</li> <li>• Fewer exceedances than NC because smaller urban areas</li> <li>• Exceedances <ul style="list-style-type: none"> <li>○ Upstate had 7 exceedances of ozone – lot of local urban pluming that occurs</li> <li>○ Midland zone – one exceedance</li> <li>○ Central zone – two exceedances <ul style="list-style-type: none"> <li>▪ July 28<sup>th</sup> – operational model forecasted a decrease from previous day in emissions, code green issued, ended up with 77 ppb</li> </ul> </li> <li>○ Experimental runs higher than operational runs</li> </ul> </li> <li>• Not too many false alarms, most occurred in upstate zone (9 monitors, leading to more hits)</li> <li>• South of Charlotte only one monitor in entire zone; in very vegetative area (not representative of area)</li> </ul> | <ul style="list-style-type: none"> <li>• Need updated emissions</li> </ul>                       |
| Geoff Allen     | Birmingham, Alabama                                           | <ul style="list-style-type: none"> <li>• Forecasts for Huntsville, Birmingham, and Mobile</li> <li>• Varied geography – mountains and flat</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                  |

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|                   |                           | <ul style="list-style-type: none"> <li>• Very hot summer</li> <li>• Very high dewpoints               <ul style="list-style-type: none"> <li>○ When in 70s, ozone didn't form</li> <li>○ Model overpredicts ozone under high humidity</li> </ul> </li> <li>• Overprediction</li> <li>• Birmingham – overall 66% predicted correct, false alarm 71%, 13 code oranges, predicted 4 of them, over biased by magnitude of 0.09 (overall improvement from last year)</li> <li>• Mobile – 70% correct, false alarm 75%, 2 observed CO and 4 predicted, biased 0.08 (improved from last year)               <ul style="list-style-type: none"> <li>○ Model has problem with sea breeze, rains every day</li> </ul> </li> <li>• Huntsville – 78% correct, 100% false alarm rate, one orange and not predicted, bias 0.04 (improved from last year)               <ul style="list-style-type: none"> <li>○ Not bad air anyway</li> </ul> </li> </ul> |                                                                                                                                                          |
| Michael Goldstein | Memphis Health Department | <ul style="list-style-type: none"> <li>• Forecasts for Memphis area – three states, three counties, and three EPA regions for four monitors</li> <li>• Transportation – bulk of emissions; lower with weaker economy               <ul style="list-style-type: none"> <li>○ Only one day above 85 ppb versus 29-30 in 2000</li> </ul> </li> <li>• Driven by humidity – two weeks of excessive heat warnings               <ul style="list-style-type: none"> <li>○ NOAA model giving predictions of 195 AQI, when really getting 48 AQI</li> </ul> </li> <li>• Return flow from Gulf provided low ozone numbers, but PM was up (not over 35, but still up, usually have some days over 35)               <ul style="list-style-type: none"> <li>○ Weaker economy and lower emissions likely contribute</li> </ul> </li> </ul>                                                                                                               | <ul style="list-style-type: none"> <li>• Overprediction under high humidity</li> <li>• Newer fleets and cleaner fuel have decreased emissions</li> </ul> |

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|                                    |                   | <ul style="list-style-type: none"> <li>• Comparisons for the last 6 months only</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                          |
| Wesley Copeland,<br>Nelson Chafetz | TCEQ FOSD - Texas | <ul style="list-style-type: none"> <li>• Seeing overprediction – however able to adjust to it</li> <li>• Interesting feature - “Houston ozone hole”               <ul style="list-style-type: none"> <li>○ Harris County – ship channel (majority emissions) is right on east side of county</li> <li>○ Values that are below background values – seems to be emissions inventory, excessive NOx (ozone sometimes in single digits – model consistently has this ozone hole)</li> </ul> </li> <li>• Power plant may be misplaced in the emissions inventory – Martin Lake (east of Longview, TX) – on NOAA model seeing ozone production southeast of Longview, think coordinates are wrong or using another source</li> <li>• Emissions inventories updated for 2008 inventories, in area of Texas west and SW of Fort Worth area called Barnett-Shale is a huge gas production region</li> </ul> | <ul style="list-style-type: none"> <li>• Need for updated emissions inventory</li> </ul> |

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| Bill Adamski | Wisconsin    | <ul style="list-style-type: none"> <li>• PM is a state-wide issue</li> <li>• Will compile statistics for last few years</li> <li>• Summer               <ul style="list-style-type: none"> <li>○ High ozone season</li> <li>○ PM not an issue in the summer</li> <li>○ All attention in regards to ozone were for counties along Lake Michigan</li> </ul> </li> </ul> |                               |

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|               |                               | <p style="text-align: center;">shore</p> <ul style="list-style-type: none"> <li>○ Ozone issue will be important for all counties with new lower standard</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                  |
| Scott Jackson | EPA                           | <ul style="list-style-type: none"> <li>• Utah had highest 8-hour average for entire country in January</li> <li>• SW Wyoming Emissions               <ul style="list-style-type: none"> <li>○ Power plant in Wyoming has a wrong location in NEI – close to Wyoming border, SW of Riverton</li> <li>○ Location seems to be ~ 100 miles off</li> </ul> </li> <li>• Phoenix               <ul style="list-style-type: none"> <li>○ Ozone transport away from city as day progresses</li> <li>○ Plume fades out then reappears at 4 AM to the northeast</li> </ul> </li> </ul>                                                                                                                                                                                 | <ul style="list-style-type: none"> <li>• Forecasters in CO should be included – Pat Reddy</li> <li>• Revised ozone standard expected in 60-70 ppb range; need for forecasting at additional locations</li> </ul> |
| Qian Li       | MSC Operations Ontario Region | <ul style="list-style-type: none"> <li>• Summertime PM prediction; CMAQ is better than GEM-MACH15, but both overpredict</li> <li>• Compared PM over 14 sites in Ontario</li> <li>• GEM-MACH15 using 2006 emissions, CMAQ still using 2000 emissions for Canada</li> <li>• CMAQ high overprediction for cold season</li> <li>• CMAQ has less variation in the summertime, closer to observations</li> <li>• UMOS-AQ remarkably improved GEM-MACH15 predictions</li> <li>• Two case studies included</li> <li>• Uncertainty in emissions inventory is likely a major contributor to overprediction</li> <li>• Segregated study for GEM-MACH PM forecasts suggests that primary PM emissions may be one cause for producing biased high predictions</li> </ul> | <ul style="list-style-type: none"> <li>• Evaluate CMAQ in urban and rural sites for primary PM</li> <li>• Update emissions inventory</li> </ul>                                                                  |

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| Sang-Mi Lee       | South Coast Air Quality District | <ul style="list-style-type: none"> <li>• South Coast Air Basin               <ul style="list-style-type: none"> <li>○ 36 permanent monitoring stations</li> <li>○ Terrain surrounds basin area</li> <li>○ Sea breeze brings pollutants into east side</li> <li>○ Southerly flow pushes pollutants to northern part of basin</li> </ul> </li> <li>• Evaluated ozone prediction summers 2008-2009               <ul style="list-style-type: none"> <li>○ Excess NOx titration in middle of basin (“ozone hole” over downtown LA)</li> <li>○ Reasonably good agreement near edge of basin</li> <li>○ High concentrations around basin appeared in NOAA model, might not be true</li> </ul> </li> <li>• Topography and monitoring stations within the basin               <ul style="list-style-type: none"> <li>○ Location important with respect to terrain and local flow patterns, different behaviors at different stations – four categories</li> <li>○ Performed analysis by site characteristics</li> </ul> </li> <li>• June to August 2010               <ul style="list-style-type: none"> <li>○ 1 hour max ozone concentrations and 8 hour show similar behavior                   <ul style="list-style-type: none"> <li>▪ Substantial low bias</li> <li>▪ Did not see overpredictions that east coast sees; most cases underpredicted</li> </ul> </li> </ul> </li> <li>• NOAA model has problem with getting sources from Mexico – inaccurate emissions inventory from Mexico</li> <li>• Over last three years, forecast improved (meteorological reason)</li> <li>• Ozone titration persistent for last few years</li> </ul> |                               |
| Christopher Reith | Arizona ADEQ                     | <ul style="list-style-type: none"> <li>• Emailed feedback               <ul style="list-style-type: none"> <li>○ Wide range of accuracy in model... dead-on early in the season to being grossly positively biased during much of the last few</li> </ul> </li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                               |

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|         |              | <ul style="list-style-type: none"> <li>weeks</li> <li>○ Accurately predicted five of seven ozone exceedance days; also predicted 40 that didn't occur</li> <li>○ Overprediction of AQI values</li> </ul> |                               |

The NOAA/NWS Hydrometeorological Prediction Center (HPC) forecaster can be contacted to request additional assistance (301-763-8201).