

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

Name(s)	Organization	Comments on 2010 Evaluation	Comments on Future Activities
Michael Geigert	CT DEP – Air Pollution Control Engineer	<ul style="list-style-type: none"> • Unusually warm summer over northern states • 24 days w/ at least one site > 75 ppb • Operation model predicted 34 exceedance days; 22 of which correct • May – June <ul style="list-style-type: none"> ○ Overpredictions even in high ozone day; experimental model predicted very high amounts (observed 68 predicted 108 for June 20) • July – September <ul style="list-style-type: none"> ○ Late exceedance days ○ August 10 – 8 hour number of 139 predicted; 80 actual (from experimental) • Very good in early season • Model does well on southwest flow days 	<ul style="list-style-type: none"> • Concern with coastal sites <ul style="list-style-type: none"> ○ Measure ozone offshore? • PBL height over water is low (meteorological level) • Recommend use of NAM trajectories instead of GDAS for future evaluations • Need to confirm accumulation of very high ozone off the coast, especially in experimental guidance
Bill Ryan	Department of Meteorology – Penn State University	<ul style="list-style-type: none"> • 2010 likely warmest summer (June/July/August) on record – 46 above 90 degrees • AQ could have been worse – haven't had a day above 105 ppb • Experimental model produced more ozone than the operational model <ul style="list-style-type: none"> ○ Five additional (13 total) false alarms of code orange ozone. Although, additional false alarms were forecasts in 76 ppb • PM results <ul style="list-style-type: none"> ○ Experimental model underpredicted PM and absolute error was similar to the persistence forecast ○ PM verification is provisional – for PHL we use average of highest 4 continuous monitors as the best estimate of FRM results ○ PM model doesn't respond strongly enough when events occur (sulfate?) – steps up to 20 ug/m³, observations go up to 30, PM model 	<ul style="list-style-type: none"> • Need to simplify/revise feedback for; offered to provide suggested improvements

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

Name(s)	Organization	Comments on 2010 Evaluation	Comments on Future Activities
		<ul style="list-style-type: none"> ○ never recovers ○ Not seeing as much PM as used to (didn't get above 35 ug/m³) ○ Experimental PM improved over prior years, now ~equal to persistence ● Operational model had remarkably good results in 2010 <ul style="list-style-type: none"> ○ Persistence not as good as it usually is ○ 8 false alarms ○ False alarms - over estimate of stagnation along sea breeze front, but, of 4 similar cases, NAQFC correctly predicted high ozone in 3 ● Sundays had a double or more bias, less Monday, flat rest of week 	
Debra Baker	Air Monitoring Program Air & Radiation Management Administration Maryland Department of the Environment	<ul style="list-style-type: none"> ● Not enough oranges last year to compare ● AQ-MOS was better than raw model results ● Ensemble did much better, given low AQ-MOS to offset high model results ● Critical success index <ul style="list-style-type: none"> ○ Model results outperformed AQ-MOS ● Hit Rate <ul style="list-style-type: none"> ○ Little difference between NOAA and AQ-MOS ○ Blue Sky AQ-MOS had a 0% hit rate ● False Alarm rate <ul style="list-style-type: none"> ○ Blue sky 38% ○ MDE forecasters 58% ○ Regression 2 had worst at 63% ● Bias <ul style="list-style-type: none"> ○ Blue sky AQ-MOS bias free (whole season) ○ All others over predicted code orange and above AQI ○ Highest was for the NOAA and Blue Sky 	<ul style="list-style-type: none"> ● See coastal issues <ul style="list-style-type: none"> ○ Bay breeze pushes pollution back toward Baltimore... how to fix? <ul style="list-style-type: none"> ▪ See good results with WRF at 4-km resolution

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

Name(s)	Organization	Comments on 2010 Evaluation	Comments on Future Activities
		<p style="text-align: center;">Models</p> <ul style="list-style-type: none"> • Mean Square Errors <ul style="list-style-type: none"> ○ Similar to 2009 ○ Ensemble performance improved • Gross Errors <ul style="list-style-type: none"> ○ Similar to last year ○ NOAA and ensemble improved ○ Both AQ-MOS gross errors similar to models • RMSE <ul style="list-style-type: none"> ○ Similar to last year ○ NOAA and ensemble improved ○ Both AQ-MOS similar to models • Overall AQ-MOS outperformed the models • Had problems forecasting days above Code Orange • AQ-MOS underpredicts ozone • Ensembles much improved over last year 	
Dan Salkovitch	Virginia DEQ	<ul style="list-style-type: none"> • May 2008 – August 2010 PM data vs observed TEOM <ul style="list-style-type: none"> ○ Richmond shows more model overprediction during last cold season <ul style="list-style-type: none"> ▪ Differences of 30 ug between observed and predicted ○ Warm season closer – values relatively close; useful; problems with overprediction in warm season ○ Roanoke <ul style="list-style-type: none"> ▪ Overprediction in cold season (worse than last year) ▪ Warm season – not bad, clustered well; clustered right around threshold ▪ Impressed with NOAA model • Ozone operational model for Richmond – through 	<ul style="list-style-type: none"> •

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

Name(s)	Organization	Comments on 2010 Evaluation	Comments on Future Activities
		<p>September 9 exceedance days; 12 Z model predicted those exceedance days</p> <ul style="list-style-type: none"> ○ Generally overpredicted – predicted code red for six of nine days (good guidance, overpredicting) ○ Did have two code red days – model predicted that ○ False alarms <ul style="list-style-type: none"> ● Roanoke rare exceedance – July 8, handled well by model <ul style="list-style-type: none"> ○ Overprediction very common; false alarms routine with NOAA model ○ AQ-MOS worked very well – tended to adjust model numbers down ● Hampton Roads/Norfolk <ul style="list-style-type: none"> ○ Sea breezes; model is rough in this area – six exceedance days <ul style="list-style-type: none"> ▪ Model predicted all six, one day reached code red (model predicted purple) ○ Overprediction is huge problem due to buildup over ocean ○ Water interface problem since day 1 ○ False alarms quite high ○ AQ-MOS worked well in this area 	
Cary Gentry	Sr. Environmental Specialist – Forsyth County Environmental Affairs Dept – North Carolina	<ul style="list-style-type: none"> ● Problems with going back and forth between 6Z and 12Z maps – tend to switch back and forth ● Actual green – 81, actual exceedance days – 10 <ul style="list-style-type: none"> ○ Overprediction by NOAA model – predicted 34 exceedance days (6Z) and 33 (12Z) ● NOAA model overpredicting on Mondays ● NOAA model did well early in the year – until mid June model seemed to separate and overpredict again ● Model keeps with trends 	<ul style="list-style-type: none"> ● NOAA model continuously overpredicts number of code orange days ● Wants to see how much improves with the corrections to model ● Troubling at lower AQI levels

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

Name(s)	Organization	Comments on 2010 Evaluation	Comments on Future Activities
George Bridgers	NC Division of Air Quality	<ul style="list-style-type: none"> • Focus on Charlotte and Triangle – close to being outside of NAAQS • Charlotte <ul style="list-style-type: none"> ○ NOAA model not a decision support tool – no benefit at all ○ 14 days over standard (1 red, 13 orange); model would have predicted 8 reds and 43 oranges ○ AQ-MOS <ul style="list-style-type: none"> ▪ Not perfect; overpredicts about 15 ppb for operational • With updated emissions saw greater performance last year • End of summer – close to 90 ninety degree days – most were dry <ul style="list-style-type: none"> ○ Wasn't convection; issues with PBL perhaps • Better performance in NOAA model <ul style="list-style-type: none"> ○ Northeasterly flow would provide pollution from MD and VA; get into increased emissions suit, model performed better ○ Charlotte over-forecasted quite a bit ○ Model had too many precursors, wanted to predict ozone • PBL – very high mixing heights • Day of forecasts comparable to previous day next day forecast (better than last year; useful) • On red days predicted – very close to code purple • PM experimental was useful <ul style="list-style-type: none"> ○ Tendency of model is decent • Regularly checked MODIS imagery for issues • Coordination with local NWS offices (going on 4 years) including new ones made with offices that don't have County Warning Areas • Statistical tools have own problems due to drier 	<ul style="list-style-type: none"> • NOAA model needs to be further developed • DoE needs to provide more money for funding • Models cannot handle very hot, very dry days • Check mixing heights with respect to the models • Tailor PM to look at AQ-MOS product from Sonoma and at Blue-Sky model • Hazard times – what timeframes are put on AQA <ul style="list-style-type: none"> ○ When do they start, when do they end ○ Local coordination issue, make more standardized ○ Coordinate with EPA on what they should be in general • Look forward to improvements with CB05 and emissions updates • New standards

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

Name(s)	Organization	Comments on 2010 Evaluation	Comments on Future Activities
		<p>conditions</p> <ul style="list-style-type: none"> • Always had to apply 15 ppb bias to NOAA models (tailoring for model) 	
Wes Behrend	South Carolina Department of Health and Environmental Control	<ul style="list-style-type: none"> • Exceedances <ul style="list-style-type: none"> ○ Upstate had 7 exceedances of ozone – lot of local urban pluming that occurs ○ Midland zone – one exceedance ○ Central zone – two exceedances <ul style="list-style-type: none"> ▪ July 28th – operational model forecasted a decrease from previous day in emissions, code green issued, ended up with 77 ppb ○ Experimental runs higher than operational runs • Not too many false alarms, most occurred in upstate zone (9 monitors, leading to more hits) • Very pleased with operational model overall for CMAQ • South of Charlotte only one monitor in entire zone; in very vegetative area (not representative of area) • Are relying on NOAA model for predictions • Less exceedances than NC because smaller urban areas as well 	<ul style="list-style-type: none"> • With more information about underprediction will be shared with the group • More than one monitor per zone (at least two or three) – have yet to see exceedance in zone with one monitor • EPA and emissions should consider attending these meetings
Geoff Allen	Birmingham, Alabama	<ul style="list-style-type: none"> • Forecasts for Huntsville, Birmingham, and Mobile • Varied geography – mountains and flat • Very hot summer • 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) • 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"> •

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

Name(s)	Organization	Comments on 2010 Evaluation	Comments on Future Activities
		<ul style="list-style-type: none"> ○ Model has problem with seabreeze, rains every day ● 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"> ○ Not bad air anyway ● Very high dewpoints <ul style="list-style-type: none"> ○ When in 70s, ozone didn't want to form ○ Model doesn't take into account high humidities in the summertime ● Overprediction 	
Michael Goldstien	Memphis Health Department	<ul style="list-style-type: none"> ● Comparisons for the last 6 months only ● Forecasts for Memphis area – three states, three counties, and three EPA regions for four monitors ● Very big when it comes to transportation – bulk of emissions; when economy is down so is transportation <ul style="list-style-type: none"> ○ Days above 85 ppb were 29-30 in 2000; this year had one ● Driven by humidity – two weeks of excessive heat warnings <ul style="list-style-type: none"> ○ NOAA model giving predictions of 195 AQI, when really getting 48 AQI ● Newer fleets and cleaner fuel have decreased emissions ● 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"> ○ With lower economy lower emissions, likely contributes to this 	<ul style="list-style-type: none"> ● Refining model to get humidity involved – it is a driving factor for Gulf Coast and mid-southeast ● Mixing – decent mixing @ 700-850 mb won't have much ozone ● Would like to have observed values to assimilate

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

Name(s)	Organization	Comments on 2010 Evaluation	Comments on Future Activities
Wesley Copeland, Nelson Chafetz	TCEQ FOSD - Texas	<ul style="list-style-type: none"> • Seeing overprediction – however able to adjust to it • Interesting feature in Houston – “Houston ozone hole” <ul style="list-style-type: none"> ○ Harris County – ship channel (majority emissions) is right on east side of county ○ Values that are below background values – not sure why, seems to be emissions inventory, NOx (sometimes as low as single digits – model consistently has this ozone hole) • Exceptions – at 65 ppb Big Ben National Park in Texas goes into non-attainment (no emission sources) <ul style="list-style-type: none"> ○ 50-60 miles south there is a power plant in Mexico contributes to ozone over area • Power plant – Martin Lake (east of Longview, TX) – on NOAA model seeing ozone production southeast of Longview, think coordinates are wrong or using another source • 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. 	<ul style="list-style-type: none"> • Take a look at suspected ozone “hole” over Houston • Want verification maps – directed toward the NCEP site <ul style="list-style-type: none"> ○ See wind barbs or vectors on the verification maps • Change direction and use a 2009 inventory due to updated activities leading to ozone emissions (engines, pumps, point source engine emissions in the Barnett-Shale area) <ul style="list-style-type: none"> ○ Similar effect in central Pennsylvania, on a smaller scale though; parts of Utah (east of Salt Lake City) ○ Peons in Colorado, basin in Wyoming – saw extremely high ozone in the winter because of drilling and pumping, point emissions

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

Name(s)	Organization	Comments on 2010 Evaluation	Comments on Future Activities
Bill Adamski	Wisconsin	<ul style="list-style-type: none"> • Don't track performance of models for ozone • PM is a state-wide issue • For the most part just work on own instincts <ul style="list-style-type: none"> ○ Will compile statistics for last few years with regards to actual numbers and how models have predicted • Summer <ul style="list-style-type: none"> ○ High ozone season ○ PM vanished in terms of concerns ○ All attention in regards to ozone were for counties along Lake Michigan shore ○ When new ozone standard is promulgated @ end of October, all counties will go orange on attainment, some second tier will as well if standard is lower; will look to PM standard as well 	<ul style="list-style-type: none"> •
Scott Jackson	EPA	<ul style="list-style-type: none"> • Utah had highest 8-hour average for entire country in January • SW Wyoming Emissions <ul style="list-style-type: none"> ○ Power plant in Wyoming has a wrong location in NEI – close to Wyoming border, SW of Riverton ○ Location seems to be ~ 100 miles off • Phoenix <ul style="list-style-type: none"> ○ Ozone transport away from city as day progresses ○ Plume fades out then reappears at 4 AM to the northeast • Wintertime ozone phenomena <ul style="list-style-type: none"> ○ Utah – Uinta Basin <ul style="list-style-type: none"> ▪ 50K people, not many sources of pollution except for drilling – 7,000 	<ul style="list-style-type: none"> • Address location of power plant in NEI (Wyoming) • Address late plume in Arizona • Forecasters in CO should be included – Pat Reddy • Issue of stratospheric intrusion – look at model to address <ul style="list-style-type: none"> ○ Limited occurrence, but does happen

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

Name(s)	Organization	Comments on 2010 Evaluation	Comments on Future Activities
		<ul style="list-style-type: none"> active drilling rigs so VOCs present <ul style="list-style-type: none"> ▪ Tanks at well site not controlled, emit VOC ▪ 38 days where at least one site had concentration > 75 ppb ▪ 6 purple days at Ouray site ▪ Max concentration 8 hour average 4th maximum was 117.4 	
Qian Li	MSC Operations Ontario Region	<ul style="list-style-type: none"> • During summer periods CMAQ shows better scale than GEM-MACH15 • PM available in many locations in southern Ontario, but only stations are chosen for which AQHI forecasts are currently issued – area of verification • Using 2006 emissions in GEM-MACH15 for Canada, CMAQ still using 2000 emissions for Canada • CMAQ high overprediction for cold season, during warm season GEM-MACH shows more variation in predictions • CMAQ has less variation in the summertime • Large bias in CMAQ over GEM-MACH <ul style="list-style-type: none"> ○ CMAQ MB: 15 vs 5 ug/m³ ○ GEM-MACH15 MB: 6-8 ug/m³ • Both numerical models tend to overpredict daily mean PM year round • During cold season GEM-MACH15 had a lower bias and error than CMAQ • During warm season, particularly in the summer months, CMAQ modeled daily mean PM is in better agreement with measurements • UMOS-AQ remarkably improved GEM-MACH15 predictions • Case study: March 5-11, 2010 <ul style="list-style-type: none"> ○ Stable conditions, pollutants accumulated 	<ul style="list-style-type: none"> • Evaluate CMAQ in urban and rural sites for primary PM • Look at updating emissions inventory

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

Name(s)	Organization	Comments on 2010 Evaluation	Comments on Future Activities
		<ul style="list-style-type: none"> ○ CMAQ greater bias in Toronto and Newmarket, lower bias in Windsor and Ottawa ○ Observed value of 30, CMAQ produced 125 ○ CMAQ better agreement at Windsor ○ UMOS-AQ greatly improved model first guidance, but missed some peak values ○ Synoptic situation contributing to poor AQ <ul style="list-style-type: none"> ▪ Ridge of high pressure situated over Great Lakes/Ohio River valley ▪ Stagnant conditions allowed pollutants to accumulate ○ CMAQ shows high plume center in Ontario, GEM-MACH shows a better pattern, but overpredicted Toronto ○ Spatial pattern similar, model can find it, but systematic overprediction ● Case study: July 4-9, 2010 <ul style="list-style-type: none"> ○ CMAQ in good agreement with obs with some variations at Toronto ○ GEM-MACH larger variations ○ Synoptic situation <ul style="list-style-type: none"> ▪ Strong upper level ridge of high pressure ▪ Corresponding surface high centered over the western mid atlantic region ▪ Clear skies, high temps, light/calm winds, limited vertical mixing, ○ GEM-MACH produced large area of PM ○ CMAQ tended to miss the pattern of where center was ○ Both CMAQ and GEM-MACH overpredicted PM at urban centers year round ○ GM performs better than CMAQ during cold 	

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

Name(s)	Organization	Comments on 2010 Evaluation	Comments on Future Activities
		<p>months when CMAQ shows high bias across regions, particularly over GTA area</p> <ul style="list-style-type: none"> ○ During warm months, CMAQ better agreement with measurements across study sites with reduced bias and model error ○ UMOS-AQ showed encouraging results with improvement over models direct guidance, limited to area where measurements available <ul style="list-style-type: none"> ● Uncertainty in emissions inventory is likely a major contributor to overprediction ● Segregated study for GM PM forecasts suggests that primary PM emissions may be one cause for producing biased high predictions 	
Sang-Mi-Lee	South Coast Air Quality District	<ul style="list-style-type: none"> ● South Coast Air Basin <ul style="list-style-type: none"> ○ 36 permanent monitoring stations ○ Terrain surrounds basin area ○ Seabreeze brings pollutants into east side ○ Southerly flow pushes pollutants to northern part of basin ● Model performance 2008 <ul style="list-style-type: none"> ○ Low bias in middle of basin: over titration by NOx ○ Reasonably good agreement near edge of basin ○ Elevated ozone plumes in Salton Sea air basin and Ventura County ● Model performance 2010 <ul style="list-style-type: none"> ○ Excess NOx titration in the middle basin ○ Ozone hole over downtown LA ○ High concentrations around basin appeared in NOAA model, might not be true ● Topography and monitoring stations within the basin <ul style="list-style-type: none"> ○ Location important with respect to terrain, different behaviors at different stations – four 	<ul style="list-style-type: none"> ●

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

Name(s)	Organization	Comments on 2010 Evaluation	Comments on Future Activities
		<p style="text-align: center;">categories</p> <ul style="list-style-type: none"> • Coastal Area <ul style="list-style-type: none"> ○ Focus on daily 1 hour max ozone ○ Good correlation with model • Coachella Valley (desert stie) <ul style="list-style-type: none"> ○ 1 hour daily max ozone ○ Fairly good agreement • Santa Clarita valley (northern) <ul style="list-style-type: none"> ○ Surprisingly good ○ Max concentration observed of 120 ppb, very high for some areas, but good for that area • Inland area <ul style="list-style-type: none"> ○ Consistent low bias ○ Most of population located here • Low bias outside of basin, good agreement inside basin • June to August 2010 <ul style="list-style-type: none"> ○ 1 hour max ozone concentrations and 8 hour show similar behavior <ul style="list-style-type: none"> ▪ Substantial low bias ▪ Did not see overpredictions that east coast sees; most cases underpredicted • June and July 2008 <ul style="list-style-type: none"> ○ Model appears to have similar behavior • Performance of 1 hour forecast <ul style="list-style-type: none"> ○ Statistically, model has improved ○ Substantial decrease in observation mean • South coast AQMD Prognostic Modeling system <ul style="list-style-type: none"> ○ Launched spring of this year ○ Shows similar patterns to NOAA model • NOAA model has problem with getting sources from Mexico – inaccurate emission inventory from Mexico 	

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

Name(s)	Organization	Comments on 2010 Evaluation	Comments on Future Activities
		<ul style="list-style-type: none"> • Models underpredicting in general, AQMD shows some overprediction • In Central LA, AQMD overpredicts, NOAA model underpredicts • Bias is smaller in AQMD products <ul style="list-style-type: none"> ○ Horizontal resolution is 4 km ○ Updated land use land cover ○ SAPRC99 chemical mechanism vs CB04 <ul style="list-style-type: none"> ▪ Known to perform better in urbanized areas ○ SCAQMD emission over-projected • NOAA products still show low bias in the middle, probably due to NOx over-titration • Over last three years, forecast improved (meteorological reason) • Prognostic model system is not official system – not available to general public • Ozone titration persistent for last few years 	

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