



Evaluation of Point Source Sensitivity Runs for the State of North Carolina

Janice Godfrey and Ming Xie
**North Carolina Department of
Environment and Natural Resources**
Division of Air Quality



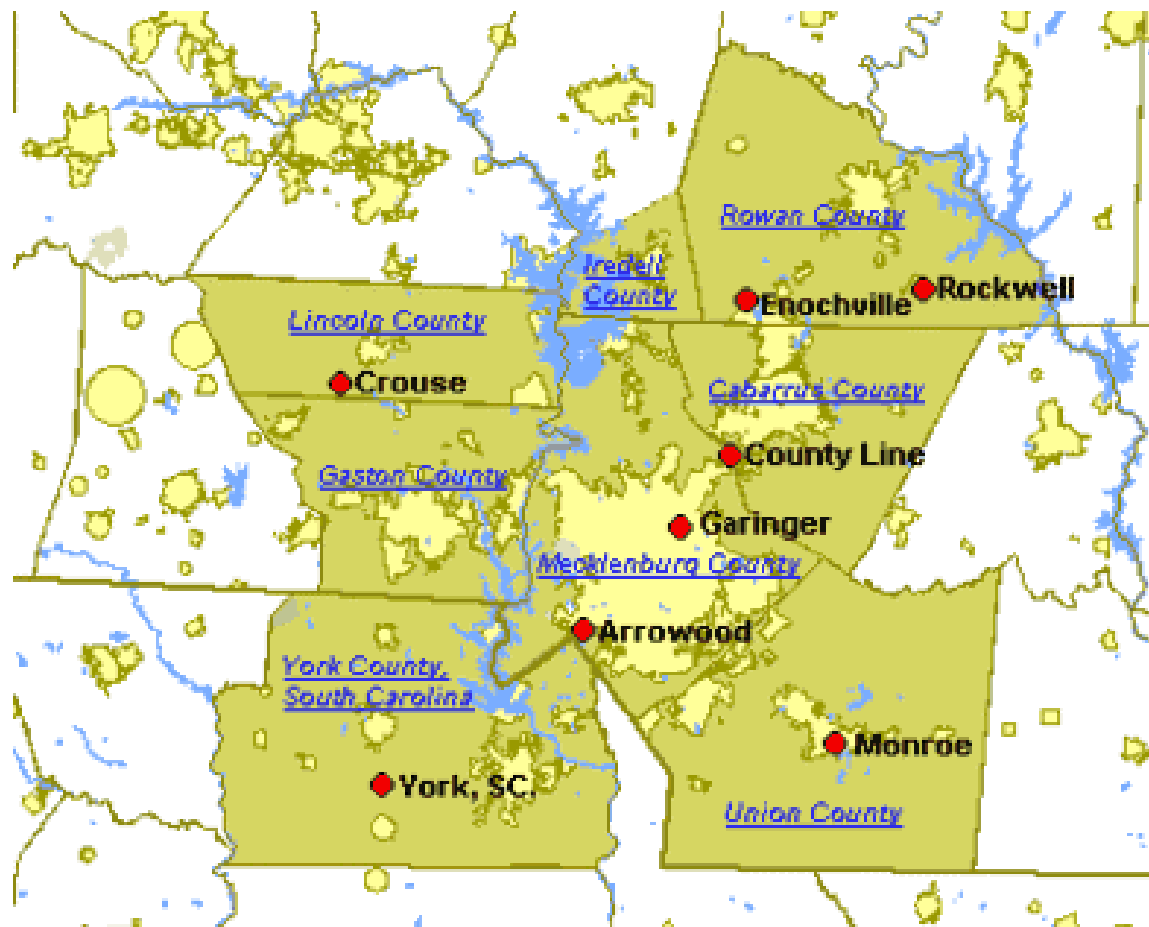
Metrolina Nonattainment Area:

Violating the 8-hour ozone standard at the end of the 2006 ozone season:

Site Name	County	AIRS Code	Season Highest	Days \geq 85ppb	4 th Highest	3year Average
Crouse	Lincoln	37-109-0004	0.096	3	0.082	0.079
Arrowood	Mecklenburg	37-119-1005	0.098	1	0.080	0.080
County Line	Mecklenburg	37-119-1009	0.102	8	0.093	0.088
Garinger	Mecklenburg	37-119-0041	0.103	7	0.091	0.088
Enochville	Rowan	37-159-0022	0.098	7	0.089	0.085
Rockwell	Rowan	37-159-0021	0.088	5	0.085	0.083
Monroe	Union	37-179-0003	0.096	2	0.080	0.078
York, SC	York	45-091-0006	0.084	0	0.079	0.076



Metrolina Nonattainment Area & Monitor Locations





NCDAQ must submit an attainment demonstration to EPA in June 2007 for the Metrolina nonattainment area.

- In house sensitivity runs with VISTAS Base F4 (pthour files for May-September).
- SMOKE and CMAQ.
- Point source control strategies reflecting additional controls for Duke Power.



Utility NO_x Emission Reductions since 2006 Ozone Season 3,275 tons/season

Additional cuts modeled:

06P –updated with Duke Energy's 2006 ozone season plan.

Opt 1 –updated with Duke Energy's 2006 ozone season plan with SCR at Marshall 4.

Opt 2 - updated with Duke Energy's 2006 ozone season plan with tweaking at Allen, Buck and Riverbend.

Opt3 –updated with Duke Energy's 2006 ozone season compliance plan with SCR at Marshall 4 and tweaking at Allen, Buck and Riverbend.



Additional cuts modeled cont.:

06planR – Sources were updated with Duke Energy's revised ozone season compliance plan.

06planR_AS5 – SCR was imposed at Allen Steam #5.

06planR_AS5-T – SCR at Allen #5 and tweaking at Allen, Riverbend, and Buck.

06planR_A5M3T - In this run SCR was imposed at Allen #5, SCR at Marshall#3, tweaking at Allen, Riverbend, and Buck.

06planR_MS3 – SCR was imposed at Marshall Steam #3.

06planR_MS3-T –SCR at Marshall Steam #3 and tweaking at Allen, Riverbend, and Buck.



Additional cuts modeled cont.:

06planR_MS3-4-T – In this run SCR was imposed at Marshall Steam #3 and #4 and tweaking at Allen, Riverbend, and Buck.

06planR_C6-7 – In this run units 1-4 at Cliffside were replaced by Cliffside 6&7 with an increased emission rate.



Run	NOx cut	Measures
OPT1	-1319	2006 Plan, SCR at Marshall 4
OPT2	-445	2006 Plan, Tweaking at Allen, Buck, Riverbend
OPT3	-1764	Combination of OPT1 and OPT2
AS5	-354	Revised 2006 Plan, SCR Allen 5
AS5-T	-507	Revised 2006 Plan, SCR Allen 5 and Tweaking
A5M3-T	-1810	Revised 2006 Plan, SCR Allen 5, Marshall 3, Tweaking
MS3	-1267	Revised 2006 Plan, SCR Marshall 3
MS3-T	-1456	Revised 2006 Plan, SCR Marshall 3 and Tweaking
MS3-4-T	-2674	Revised 2006 Plan, SCR Marshall 3,4 and Tweaking
C6-7	291	Revised 2006 Plan, Cliffside 1-4 shutdown, added 6, 7

A or AS = Allen Steam

M or MS = Marshall

C = Cliffside

T = Tweaking at Allen, Buck, and Riverbend



Issue

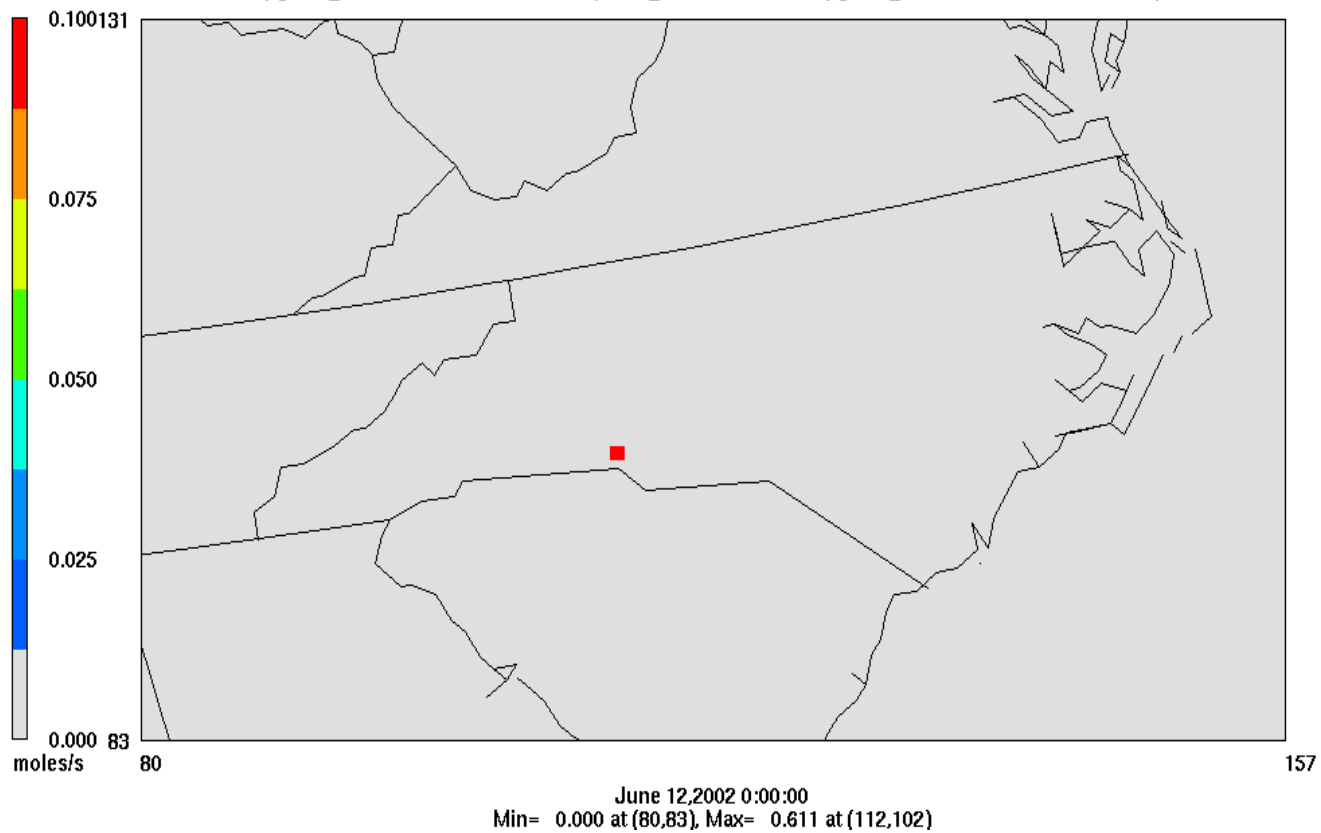
- Running many sensitivity runs for whole 12km domain very time consuming.
- Scripts were written to fulfill this task.



NOx 06planR - AS5 (layers summed)

June 12, 2009

a=vertot.pgts3d_1.20020612.1.vista12.200906planR_AS5.ncf, c=vertot.pgts3d_1.20020612.1.vista12.200906planR.ncf

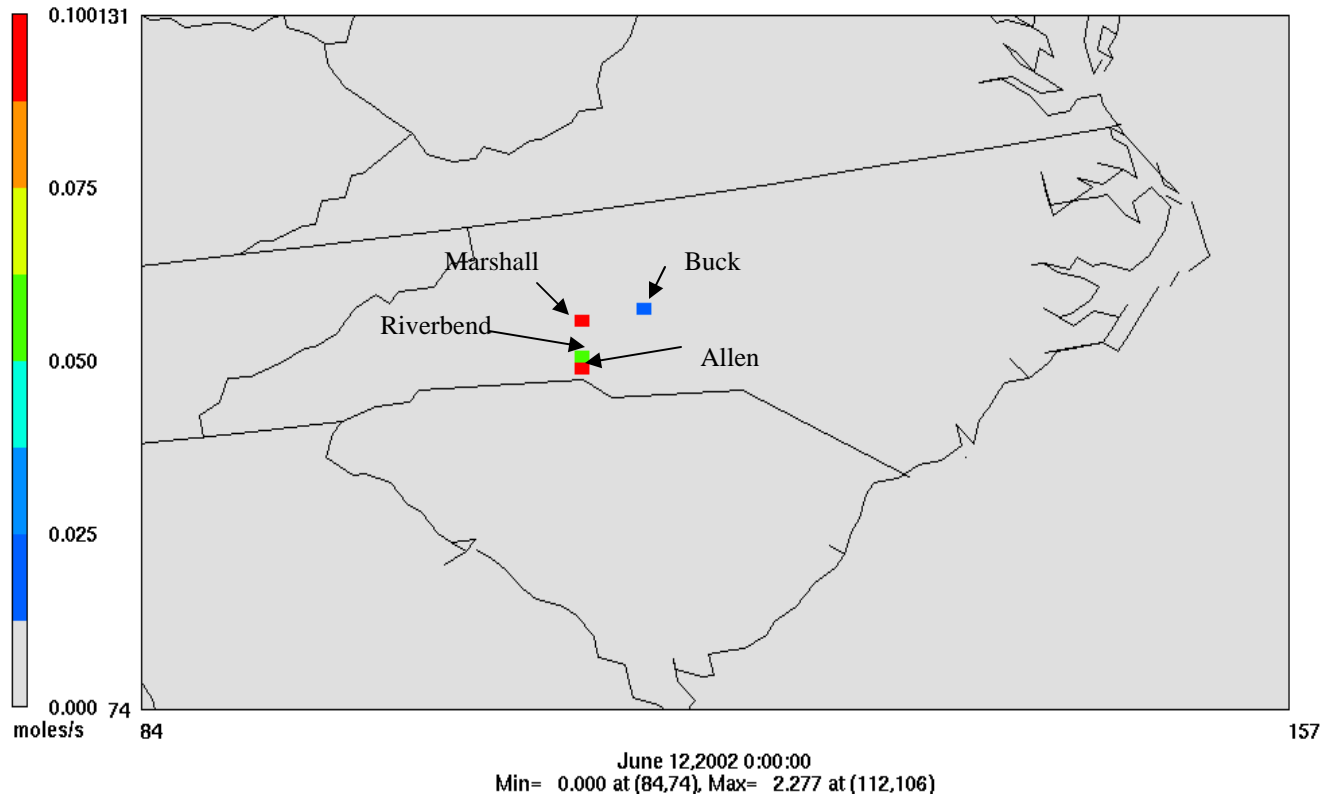




NOx 06planR - A5M3T (layers summed)

June 12, 2009

b=vertot.pgts3d_1.20020612.1.vista12.200906planR_A5M3T.ncf, c=vertot.pgts3d_1.20020612.1.vista12.200906planR.ncf

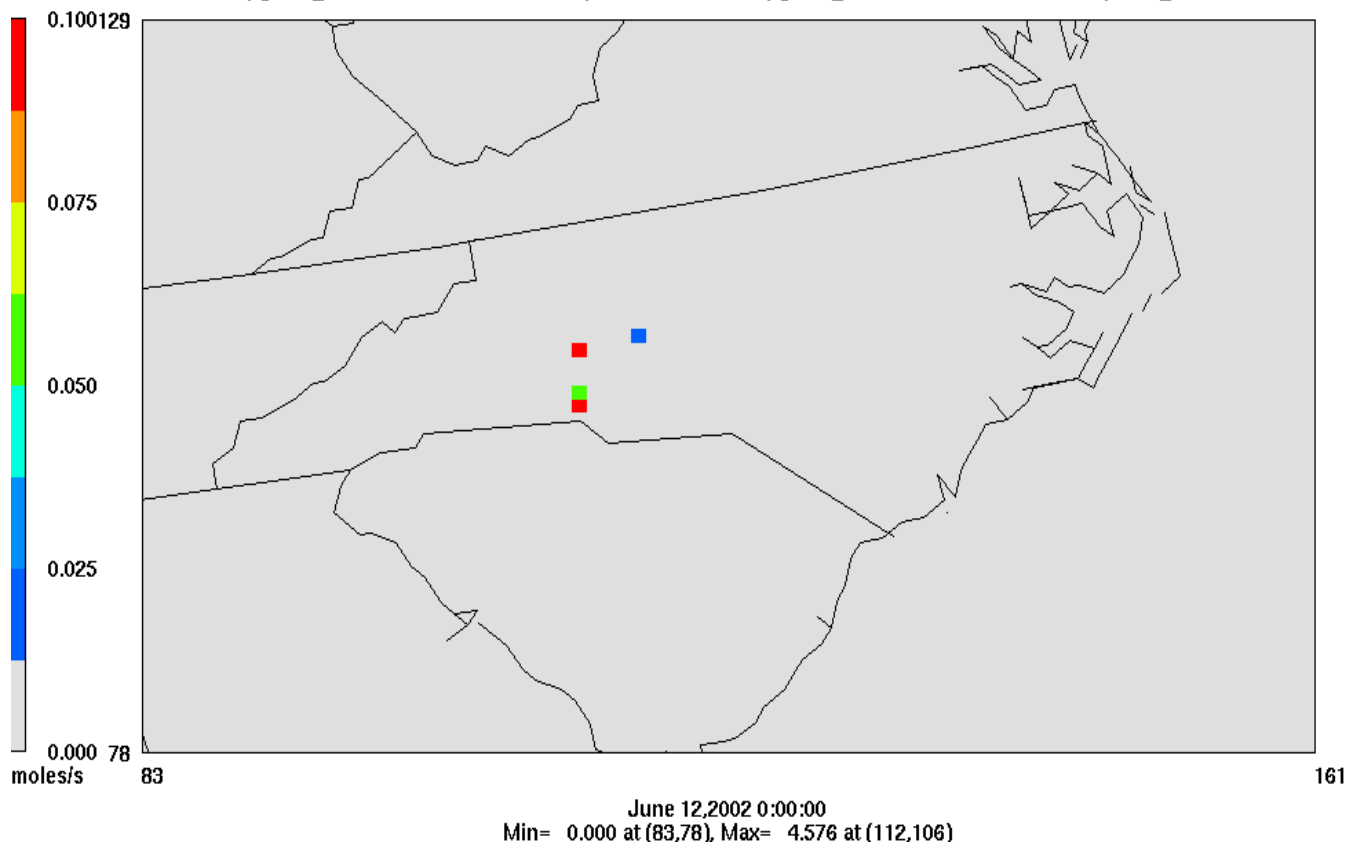




NOx 06planR - MS3-4-T (layers summed)

June 12, 2009

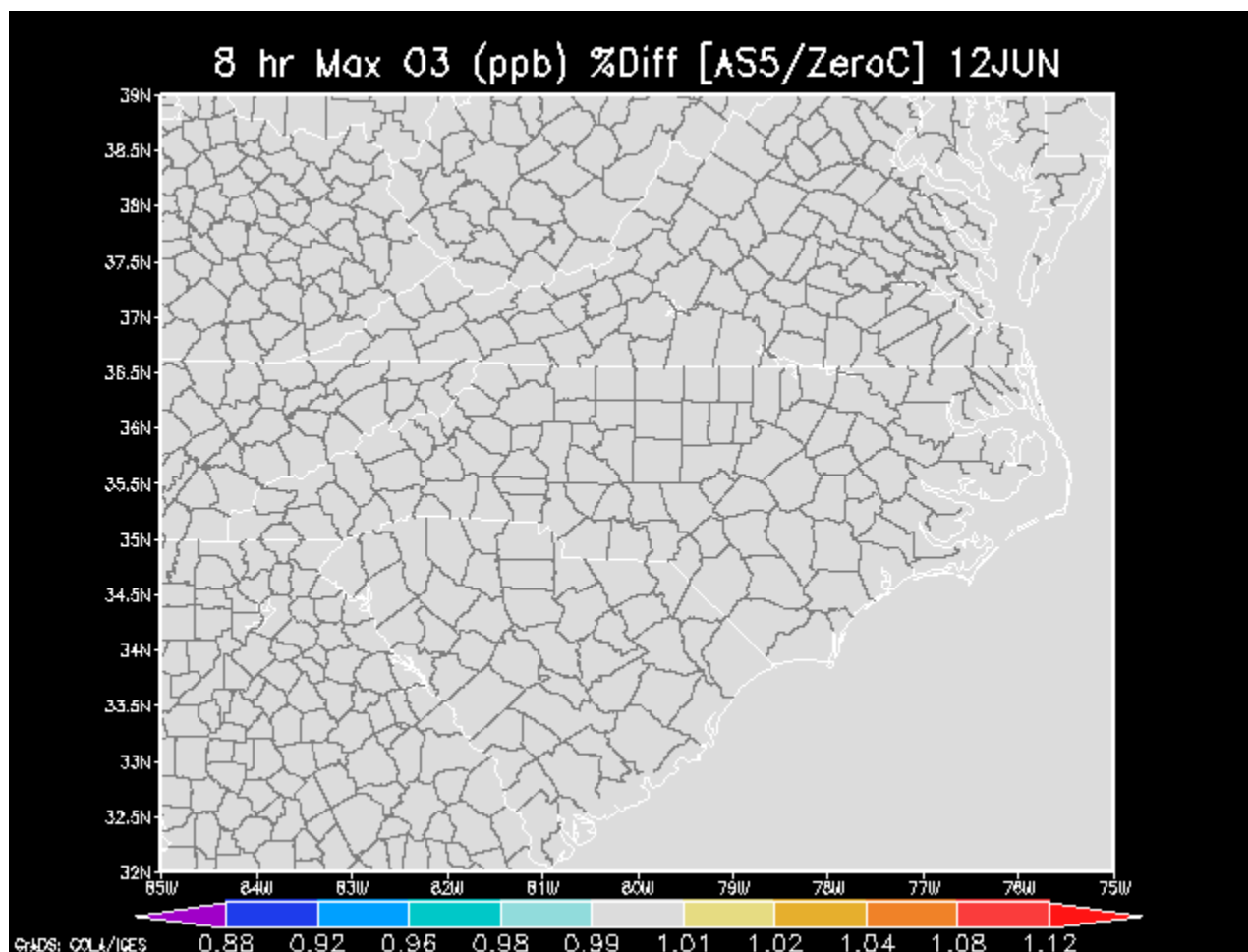
c=vertot.pgts3d_l.20020612.1.vista12.200906planR.ncf, f=vertot.pgts3d_l.20020612.1.vista12.200906planR_MS3-4-T.ncf



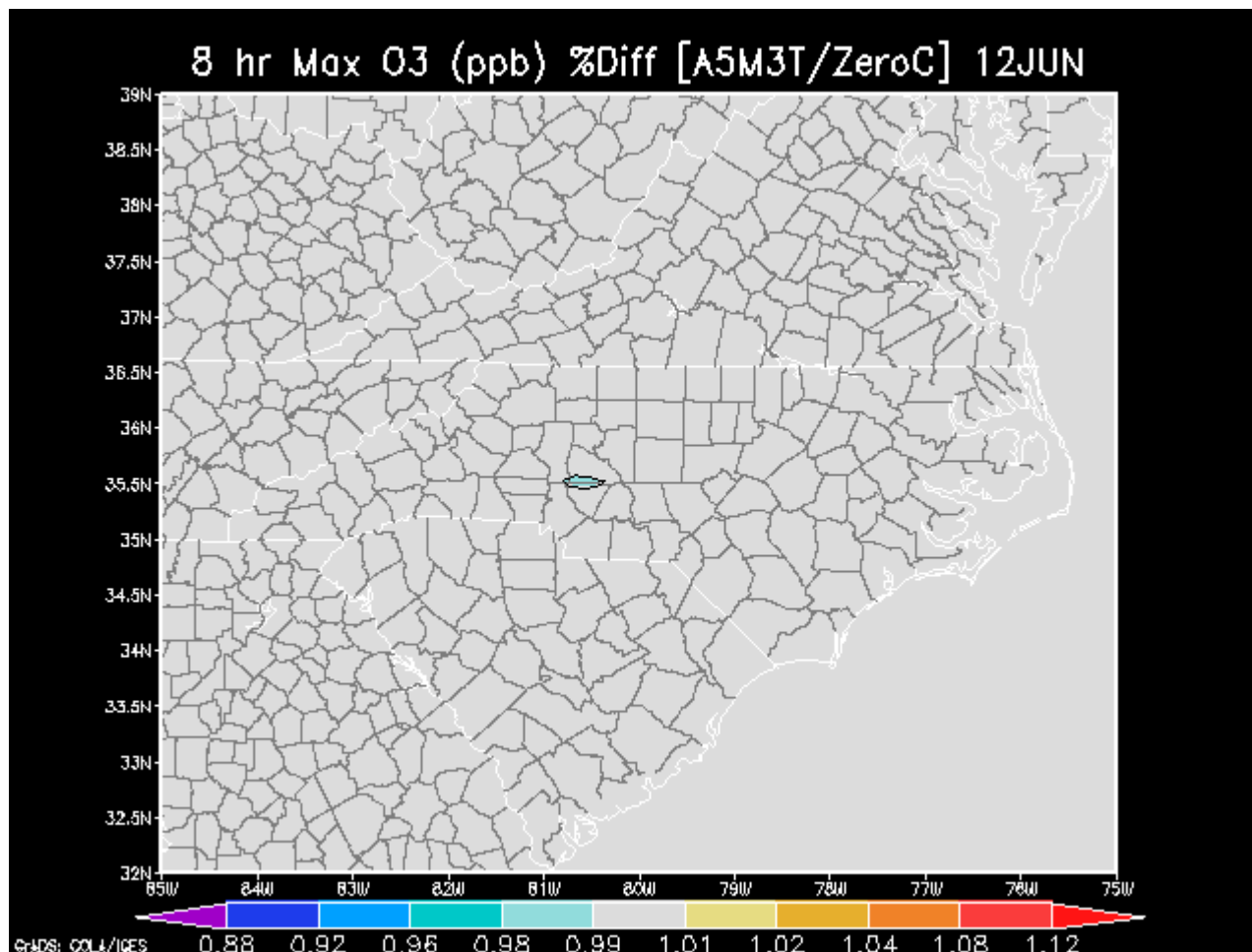


CMAQ

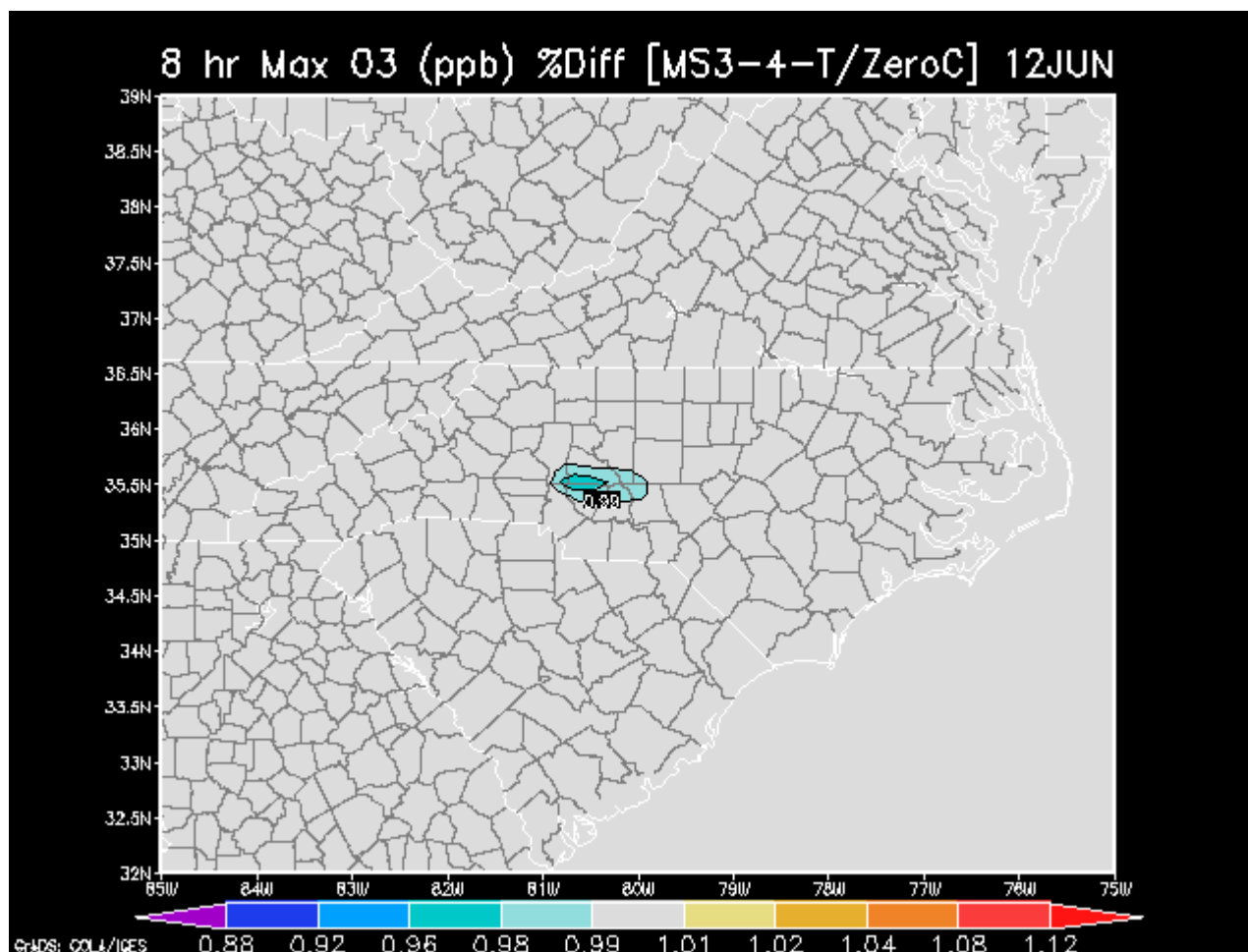
- Run w/ secondary organic aerosol, SOAmods, enhancement
- Nested 36/12 km grid (one way nesting)
- 19 vertical layers
- Region top of 100 mb



CMAQ results for sensitivity run AS5.



CMAQ results for sensitivity run A5M3T.



CMAQ results for sensitivity run MS3-4-T.



Resulting 2009 DVFs

AIRS ID	SITE	BF4	06P	06PR	OPT03	AS5	MS3	MS3-T	AS5-T	A5M3T	MS3-4-T	C6-7
37-109-0004	Crouse	78		79	77	78	78	78	78	78	77	
37-119-1005	Arrowood	74	74	74	74	74	74	74	74	74	74	76
37-119-1009	County Line	85	85	85	85	85	85	85	85	84	84	86
37-119-0041	Garinger	84	84	84	84	84	84	84	84	84	84	85
37-159-0022	Enochville	84	84	84	83	84	84	84	84	84	83	85
37-159-0021	Rockwell	84	83	83	83	83	83	83	83	83	83	84
37-179-0003	Monroe	73	73	73	75	72	72	72	72	72	72	78



Conclusions

- The CMAQ model remained relatively “stiff” despite some fairly significant NO_x reductions from power plants.
- In addition to these controls being costly, they would also take more time than is available to implement.
- Focus for future reductions for the Metrolina nonattainment area cannot be on point source reductions alone.



NCDAQ's Contingency Plan

- Federal Measures:
 - Fleet turnover of light/heavy-duty engine standards from the on-road mobile sector
 - Non-road engine standards.
- State Measures:
 - lowering the NO_x RACT



What we learned

- Relatively easy to apply simple programs to ratio hourly emissions for sensitivity runs to show effects of controls at point sources.
- Scripts can be written to reduce the manual work and speed up SMOKE processing and merging.



Janice Godfrey

janice.godfrey@ncmail.net

Ming Xie

ming.xie@ncmail.net

