

Comparative analysis of MANE-VU 2002 Simulation with EPA NERL CMAQ 2002 Simulation Internal Documentation for Mult-Agency Eastern Critical Loads Project Deposition Estimates

Prepared by:
Eric K. Miller, Ecosystems Research Group, Ltd.
In consultation with John Graham, NESCAUM

5/21/2009

All comparisons are made with annual deposition provided in kg/ha.

EPA NERL CMAQ 2002 provided by Robin Dennis and is “precip corrected bias adjusted”.

The bias adjustment for sulfur has one step (first step) and the bias adjustment for nitrate and ammonium has two steps. The first step is to multiply the CMAQ deposition by the ratio of PRISM-to-MM5 precipitation. This would be like adjusting the wet concentration fields from CMAQ. The second step is to compare these precipitation-adjusted data to NADP data across the eastern US, identify the degree of bias, and come up with a single multiplicative factor that will remove this regional bias (on average - there will still be scatter due to errors in emissions, etc.). This second step covers the entire eastern US. It is not specific to the NE.

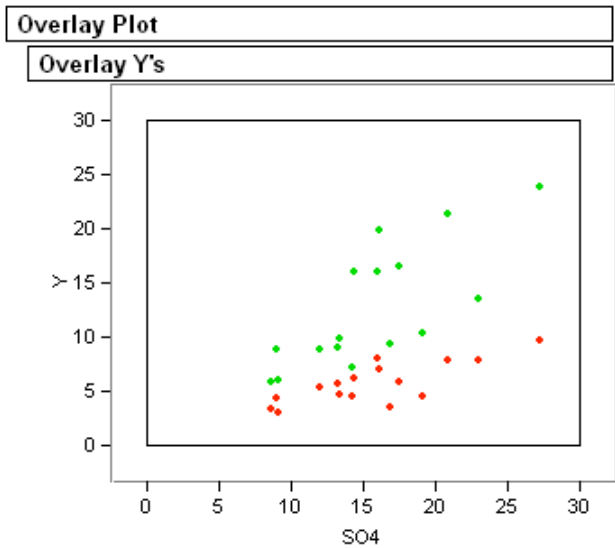
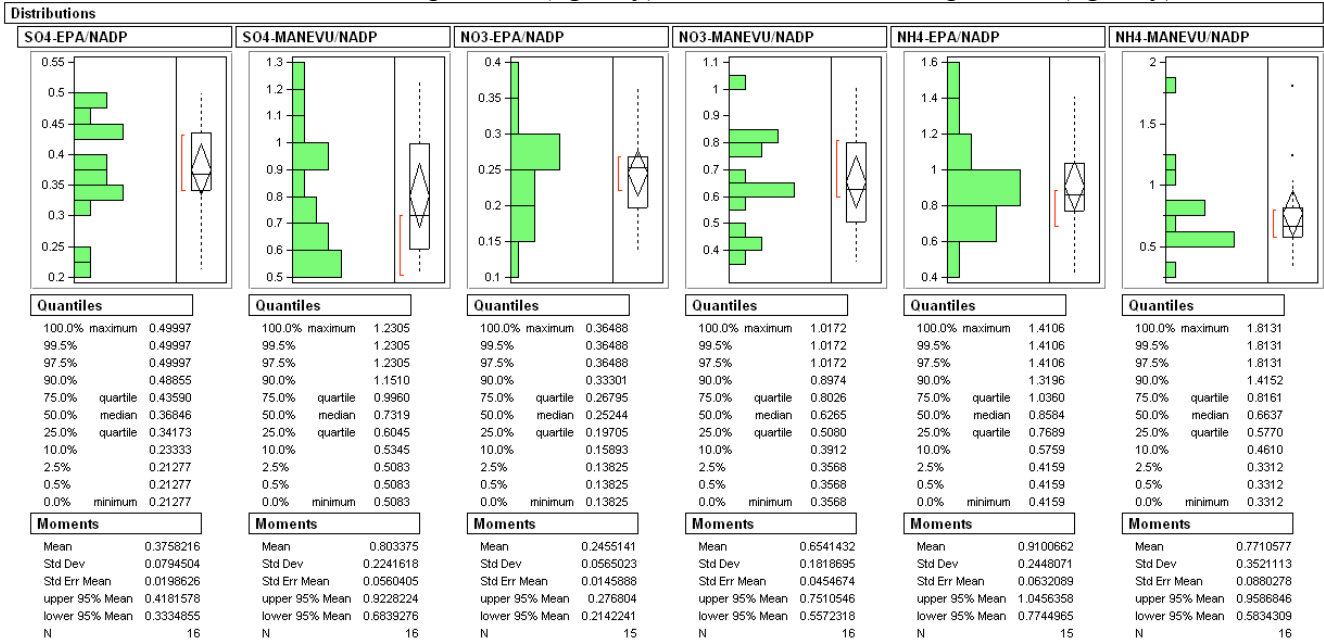
This is a work in progress and there is as of yet no formal documentation. Kristen can get you the MM5 and PRISM data that we used for you to better understand. I'm having problems with a server and can't get you the bias correction numbers yet for step two. What we found is that the step two bias for sulfate was negligible and not worth bothering about. That is why sulfur only goes through one "correction" step.

MANE-VU CMAQ 2002 was provided by John Graham at NESCAUM.

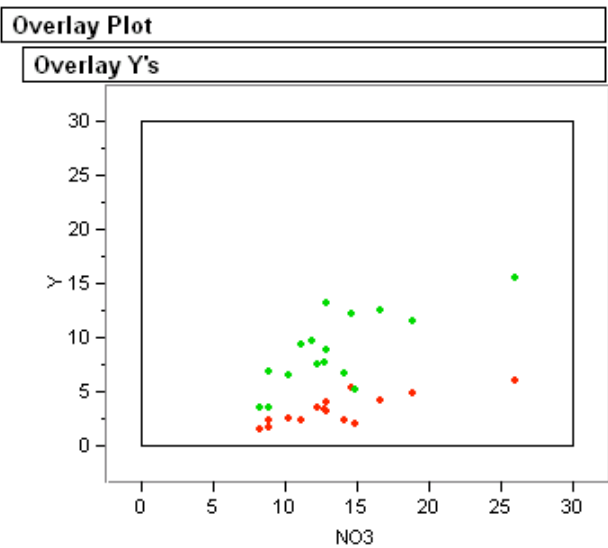
The MANE-VU CMAQ run used MM5 data provided by EPA (we think it is the same version as EPA used). However the emissions inventory was different taking into account SIPs. There were no other corrections made to the data.

Comparison of CMAQ results with NADP observations

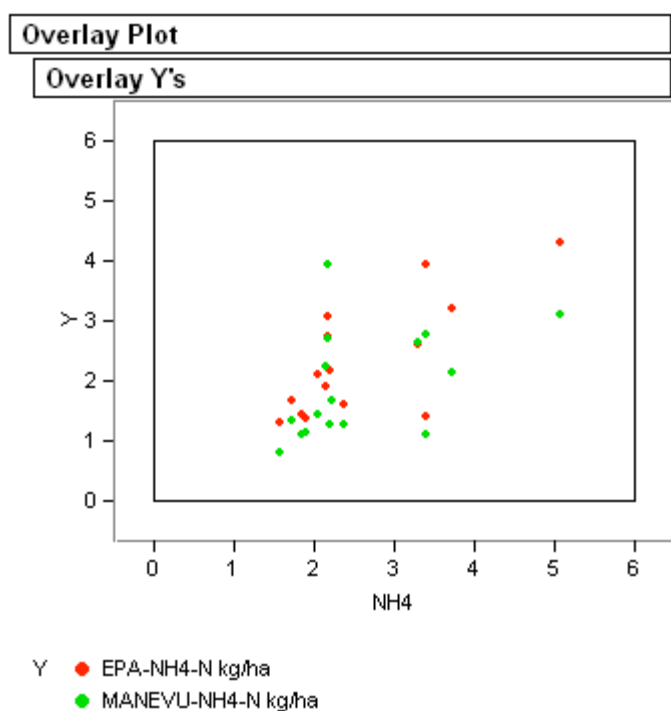
Ratio of CMAQ run estimated deposition (kg/ha/y) to NADP observed deposition (kg/ha/y)



Y ● EPA-SO4-S kg/ha
● MANEVU SO4-S kg/ha



Y ● EPA-NO3-N kg/ha
● MANEVU NO3-N kg/ha



Summary of comparison with NADP observations

The MANE-VU simulation is in better agreement with Northeast NADP observations than the EPA simulation.

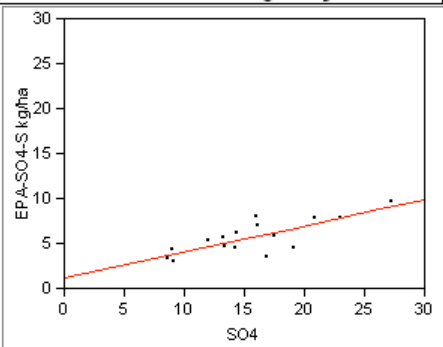
Both simulations were reasonably well correlated with NADP observations.

The simulations were better correlated with each other than with the NADP observations.

There appears to be something about the 12km PRISM/MM5 precipitation amount ratio correction that is skewing the Northeast low for sulfate.

The largest deviations between the two simulations were for NO₃ with MANE-VU averaging 2.6X EPA. Still the MANE-VU simulation averaged about 0.65 X the NADP observations.

Bivariate Fit of EPA-SO4-S kg/ha By SO4



— Linear Fit

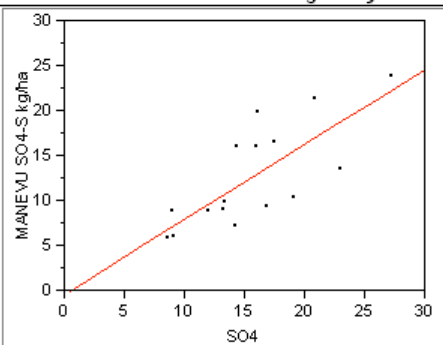
Linear Fit

$$\text{EPA-SO4-S kg/ha} = 1.1927968 + 0.291916 \text{ SO4}$$

Summary of Fit

RSquare	0.614623
RSquare Adj	0.587097
Root Mean Square Error	1.231834
Mean of Response	5.790475
Observations (or Sum Wgts)	16

Bivariate Fit of MANEVU SO4-S kg/ha By SO4



— Linear Fit

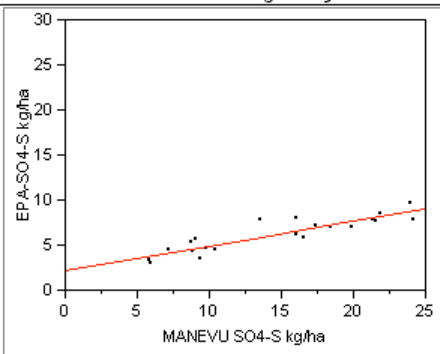
Linear Fit

$$\text{MANEVU SO4-S kg/ha} = -0.418613 + 0.8344332 \text{ SO4}$$

Summary of Fit

RSquare	0.574368
RSquare Adj	0.543965
Root Mean Square Error	3.827984
Mean of Response	12.72371
Observations (or Sum Wgts)	16

Bivariate Fit of EPA-SO4-S kg/ha By MANEVU SO4-S kg/ha



— Linear Fit

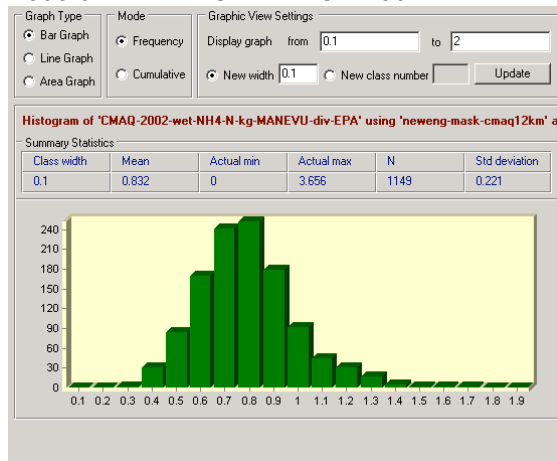
Linear Fit

$$\text{EPA-SO4-S kg/ha} = 2.2109171 + 0.2762956 \text{ MANEVU SO4-S kg/ha}$$

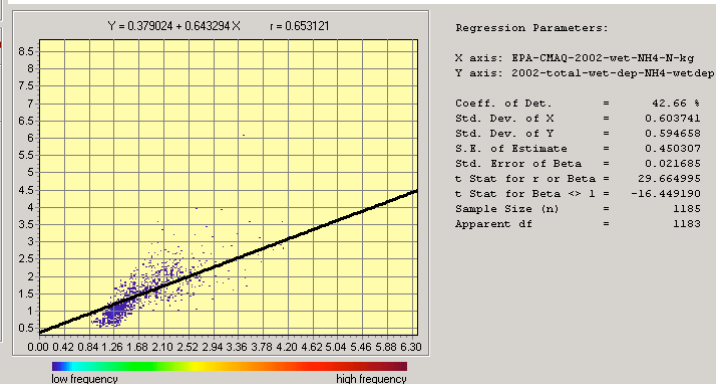
Summary of Fit

RSquare	0.811134
RSquare Adj	0.801194
Root Mean Square Error	0.8413
Mean of Response	6.25343
Observations (or Sum Wgts)	21

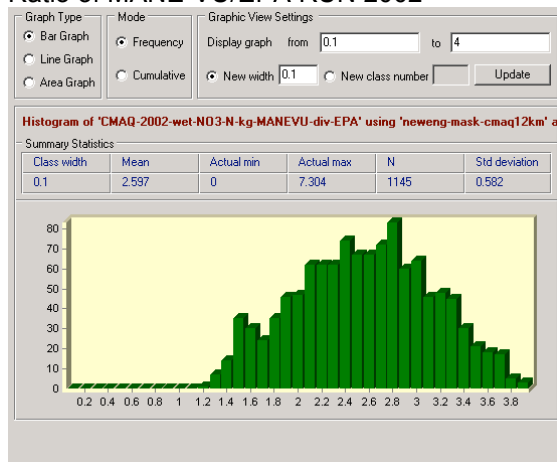
Wet Deposition of Reduced N (NH₄) Ratio of MANE-VU/EPA RUN 2002



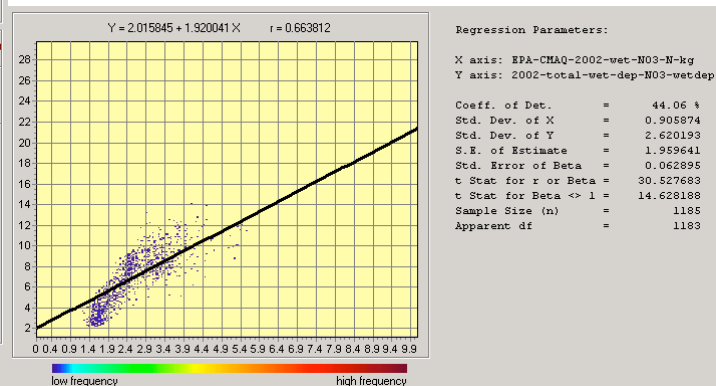
Correlation of MANE-VU with EPA RUN 2002



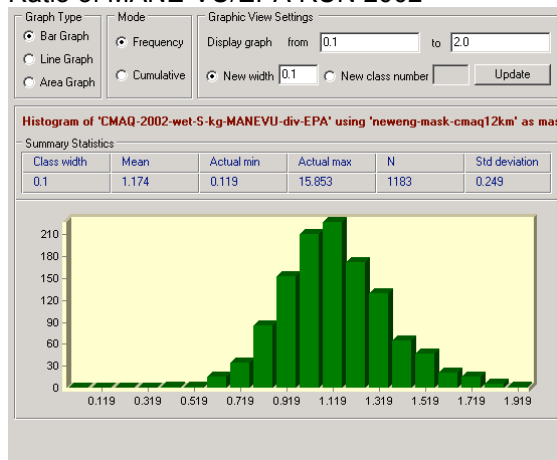
Wet Deposition of Oxidized N (NO₃) Ratio of MANE-VU/EPA RUN 2002



Correlation of MANE-VU with EPA RUN 2002



Wet Deposition of S Ratio of MANE-VU/EPA RUN 2002



Correlation of MANE-VU with EPA RUN 2002

