



WRAP Regional Modeling Center - Simulation Specifications

Scenario Name: 2002 “Clean” Simulation with actual 2002 fire emissions

RMC Code: “[base02b_NoWBD](#)”

Date Specifications Prepared: April 24, 2006

Time Window for Modeling/Analysis: Complete results analysis by April 2006.

Description: 2002 Annual 36-km CMAQ air quality model simulation using only “natural” or background emissions sources.

Purpose/Objective: Evaluate the impact of wind blown dust emissions on visibility at WRAP region Class I areas.

Expected Analysis Methods: Specific analysis methods are determined based on the nature of the simulation and the stated purpose and objectives. These typically involve a number of standard post-processing products used to elucidate relevant modeling results and analyses and aid in summarizing and interpreting the simulation results. For the present simulation these include:

- Plots showing spatial distribution of the impacts of the wind blown dust emissions on the following PM species: coarse material (CM), fine SOIL, total PM_{2.5} model reconstructed deciviews (DCV_Recon) model reconstructed light extinction (EXT_Recon).

Input Data:

Emissions

All emissions used in the no wind blown dust sensitivity case are identical to the emissions in the Base 2002 B simulation, with the exception that wind blown dust emission were removed. Windblown dust emissions and QA are on the RMC webpage at: http://pah.cert.ucr.edu/aqm/308/wb_dust2002/wb_dust_ii_36k.shtml

Other Inputs and Model Settings

All other model input data are identical to that used in the Base 2002 B simulations:

- Initial and Boundary Conditions based on natural GEOS-CHEM simulation
- Model version CMAQ 4.5 settings and configuration same as for 2002 Base and 2002 Typical.
- Time period simulated is April and May because these are the two months with the largest wind blown dust emissions

Results

Output Products

Analysis products include plots showing spatial distribution of the impacts of the wind blown dust emissions on the following PM species: coarse material (CM), fine SOIL, total PM_{2.5} model reconstructed deciviews (DCV_Recon) model reconstructed light extinction (EXT_Recon). These plots are presented for both daily

average and monthly average effects of wind blown dust at this link: <http://pah.cert.ucr.edu/aqm/308/cmaq.shtml#base02bvsnwbd>. The plots are prepared as difference in concentrations between no wind blown dust and the and base 2002 simulations, so that the positive values in the plots indicate contributions from wind blown dust.

Summary of Key Findings

Figure 1 shows the monthly average contribution to light extinction for April. Contributions of wind blown dust are less than 1 Mm^{-1} in most of the WRAP region. The largest impacts are in the CENRAP region and Mexico. Figure 2 shows the monthly average contribution to light extinction for May. The impacts in May are smaller than in April but affect the same regions. Because wind blown dust depends strongly on wind speed and is highly variable and localized, the effects at a particular IMPROVE site and a particular date are not well represented by monthly averages. The webpage includes animations of the daily average contributions of wind blown dust for April and May, and Figure 3 shows an example plot for April 6, 2006. Contributions can be significantly larger on any given day than indicated by the monthly average results.

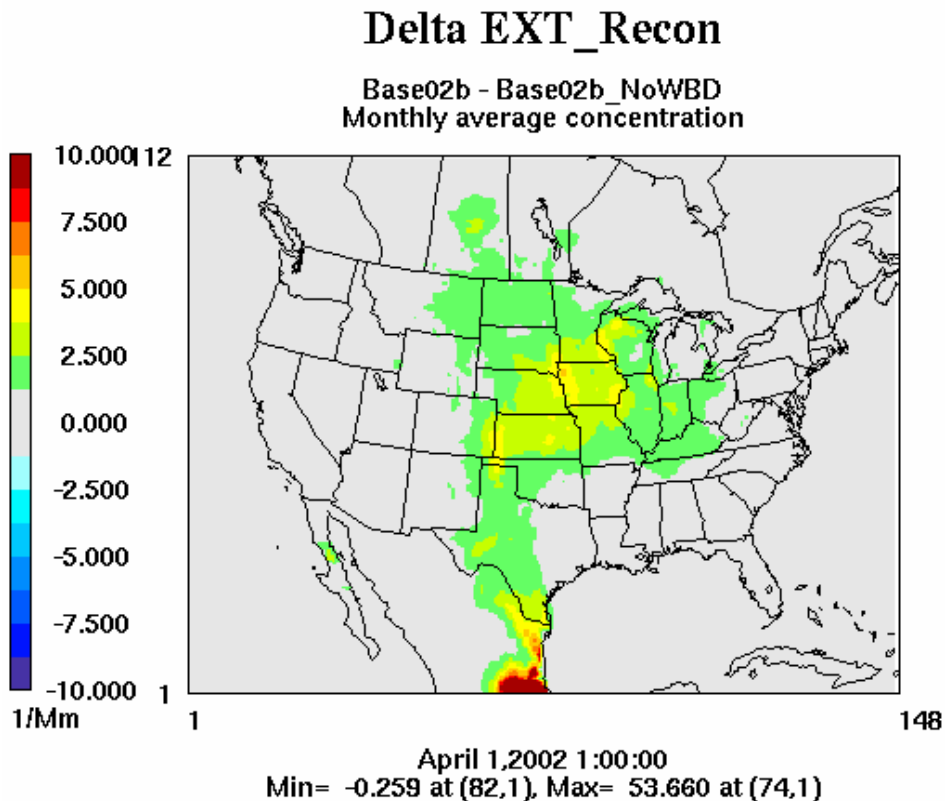
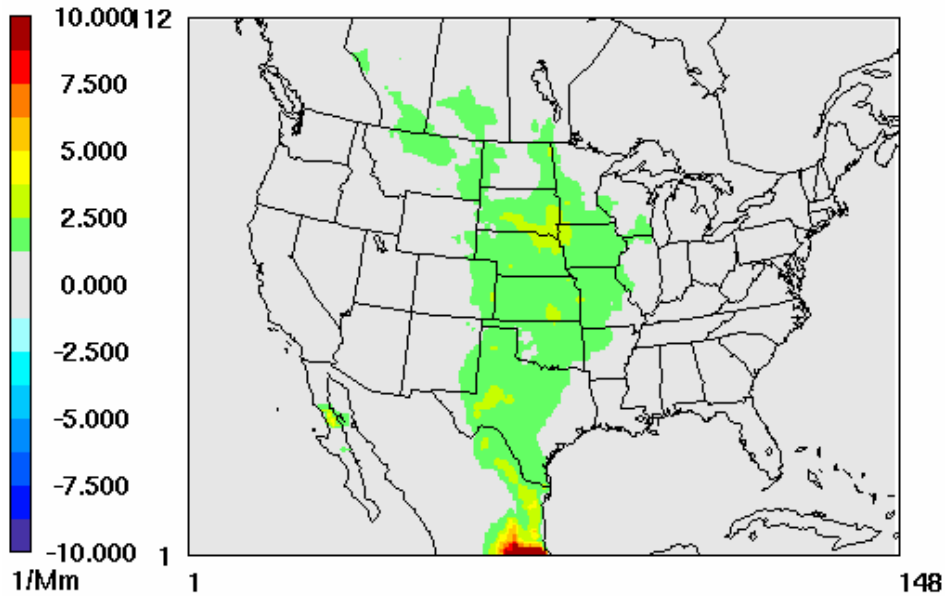


Figure 1. Monthly average for April, 2002 contribution of wind blown dust emissions to model reconstructed visibility as extinction coefficient.

Delta EXT_Recon

Base02b - Base02b_NoWBD
Monthly average concentration

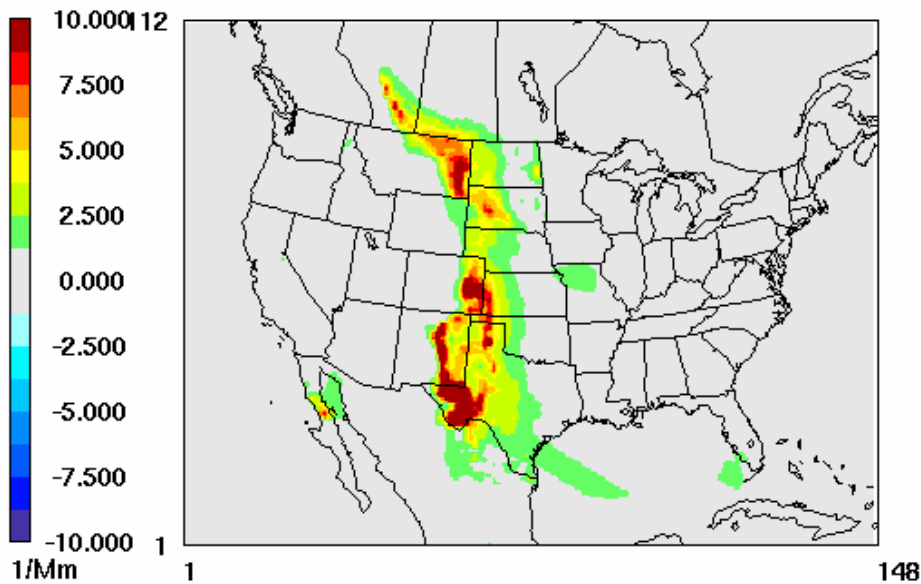


May 1, 2002 1:00:00
Min= -0.038 at (27,33), Max= 32.704 at (73,1)

Figure 2. Monthly average for May, 2002 contribution of wind blown dust emissions to model reconstructed visibility as extinction coefficient.

Delta EXT_Recon

Base02b - Base02b_NoWBD
Daily average concentration



April 6, 2002 1:00:00
Min= -0.879 at (44,83), Max= 33.240 at (60,30)

Figure 3. Daily average for April 6, 2002 contribution of wind blown dust emissions to model reconstructed visibility as extinction coefficient.

Interpretation/Recommendations

The model sensitivity simulations show that wind blown dust emissions can have a significant impact on visibility on certain days in WRAP states, especially in the eastern part of the WRAP region. The monthly average contribution, however, is relatively small with maximum values in the eastern WRAP region of only about 2 Mm^{-1} . Moreover, the Base 2002 B model performance evaluation showed that the visibility models have little skill in simulating the observed concentrations of coarse material measured at IMPROVE sites. It is likely that this is due in part to the difficulty of modeling the emissions of wind blown dust. This sensitivity simulation shows that wind blown dust emissions are not a major contributor to visibility impairment over long term periods but that they can have significant impacts on particular days. Given the difficulty of improving the wind blown dust emissions models additional efforts at improving the skill of the models in simulating wind blown dust is a low priority.