



WRAP Regional Modeling Center - Simulation Specifications

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

RMC Code: “[clean02a](#)”

Date Specifications Prepared: January ??, 2006

Time Window for Modeling/Analysis: emissions modeling start date, targeted tech memo publication date, start simulation January ??, complete results analysis by February ??

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

Purpose/Objective: Evaluate the impact of “natural” emissions and modeling domain background air quality conditions on visibility at WRAP region Class I areas. Provide insight into the regional model’s “floor” for analyzing future control strategies and reasonable progress by excluding anthropogenic emission sources.

Expected Analysis Methods: Specific analysis methods will generally be 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 would include:

- Standard displays of spatial distribution of concentrations of relevant pollutants (Sulfate, Nitrate, PM, OC, EC, etc...) for various temporal periods (daily, monthly, seasonal and annual totals)
- Standard displays of spatial distribution of difference in concentrations between "clean02" and base02 (or plan02) simulations

Input Data:

Emissions – emission data and QA found at: <http://pah.cert.ucr.edu/aqm/308/emissions/???.shtml>

- [BEIS3 biogenic emissions](#) (includes soil NO emissions)
- Natural component of [fire emissions](#) (wildfire, wildland fire use, non-federal rangeland fire)
- Windblown fugitive PM dust emissions (from [WRAP WB Dust model](#))
- Natural component of NH₃ emissions (low soil estimate and wild animals; from [WRAP NH₃ model](#))
- Sea Salt impacts to be estimated and added afterwards based on site-specific monitoring data for CI from new IMPROVE equation to account for sea salt
- Documentation on input data, model settings, and modeling/QA procedures provided through standard reporting products: [WRAP 2005-06 Emissions Workplan \\$mmdyy.xls](#)
 - Simulation schedule and input files
 - SMOKE configuration information/settings
 - Documentation of problems encountered with corrections, outstanding issues, and other important information about simulation clean02a
 - Parent EI and maps/tables of changes for this run
 - Detail dependent on purpose/objective and results analysis methods

Other Inputs and Model Settings

- Initial and Boundary Conditions based on natural GEOS-CHEM simulation
- Model version, settings and configuration same as for 2002 Base and 2002 Typical
- Time period simulated – annual, typical year, meteorology for 2002 used
- Lightning NOx emissions not included (for now)

Results

Output Products

Products for this simulation include spatial plots showing the annual average concentration of PM2.5 species, and the model reconstructed visibility as light extinction (units of inverse megameters) and as deciviews. Plots are available on the webpage at: <http://pah.cert.ucr.edu/aqm/308/cmaq.shtml#clean>

Summary of Key Findings

Figure 1 shows the model reconstructed light extinction in the clean emissions model simulation. A major component of the clean emissions was the natural fire emissions in the WRAP states, and as a result the largest visibility impairment is in the regions with natural fire emissions. Contributions to light extinction from all other sources was small in regions with out large fire emissions, as evidenced in the eastern US where the extinction was only slightly larger (about 2 Mm^{-1}) than perfectly clean conditions.

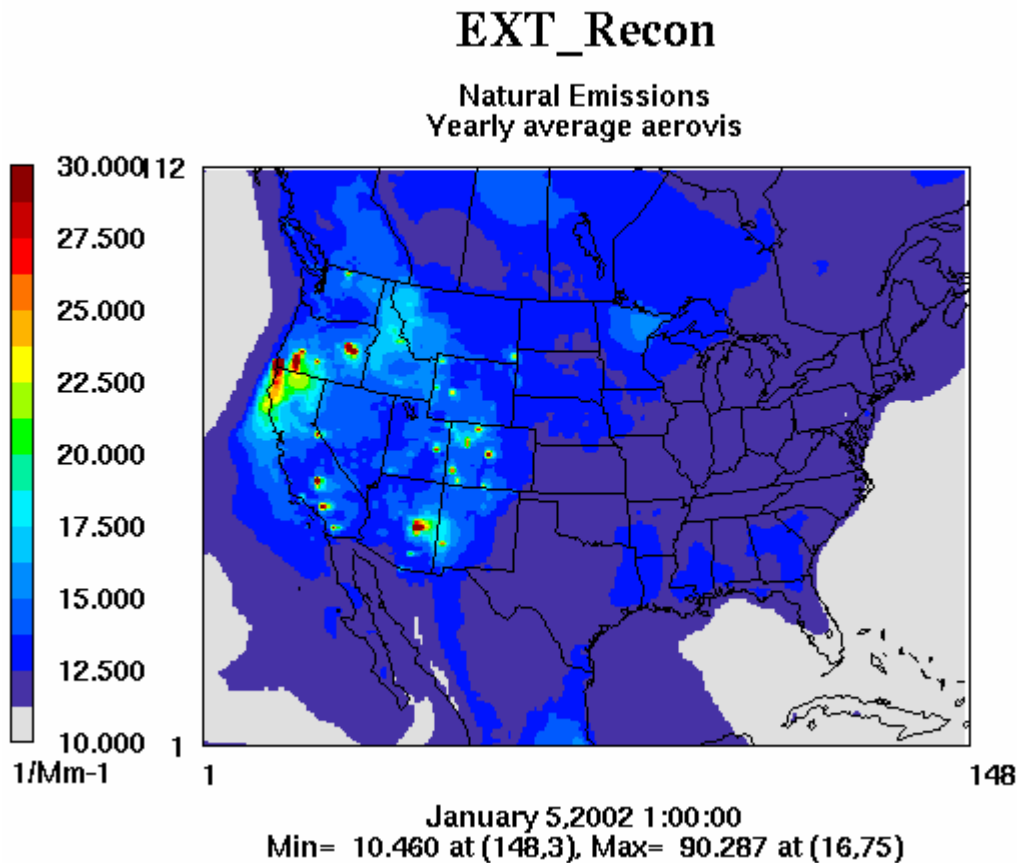


Figure 1. Annual average model reconstructed visibility as extinction coefficient

Interpretation/Recommendations

Although there are large uncertainties in the natural emissions and it is also known that we are missing certain components of the natural emissions, the components of the natural inventory used in this sensitivity simulation did contribute to relatively large visibility impairment in regions where there were large wildfires. Extinction coefficients as large as 90 Mm^{-1} were simulated in the southern Oregon and northern California regions, and this was most likely a result of the large Biscuit fire in Oregon with contributions from smaller fires and other natural emissions. These visibility impairment levels exceed the natural visibility levels specified in the Regional Haze Natural Visibility guidance document, and will make it more difficult for the modeling to demonstrate progress goals because of the large contribution to visibility impairment that is uncontrollable. In regions of the country for which we lacked large natural fire emissions, the modeled clean visibility is only slightly greater than perfectly clean Rayleigh conditions of 10 Mm^{-1} . The model may be overly optimistic in these regions because we lack a complete or accurate natural emissions inventory. These results are very tentative because of the large uncertainty in natural emissions. Considerable effort may be needed to investigate natural conditions in future modeling studies. It will be difficult to determine clean conditions based on observations because of the currently pervasive influence of anthropogenic emissions.