

July, 2003 Monthly Progress Report

WRAP Regional Modeling Center

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Summary

The Western Regional Air Partnership (WRAP) is a partnership of 13 western states designed to promote cooperation in attaining Clean Air Act goals for improving visibility in Class I Areas. The Western Governors' Association (WGA) is supporting through WRAP a Regional Modeling Center (RMC) that includes a team of scientists from the University of California, ENVIRON Corporation, and the University of North Carolina. WRAP contracted to the RMC in 2001-2002 to develop model scenarios and data bases that were required by Section 309 of the CAA to support SIPs for states that opted to participate in the Section 309 process. In early 2003, WGA extended the RMC contract to complete modeling studies in support of Section 309 SIPs and to begin research and development on models and data sets to support SIPs and TIPS that will be prepared under Section 308 of the CAA. The RMC team works primarily with the WRAP Modeling Forum, however, the RMC also interacts with several other WRAP forums and state and tribe staff, and with other contractors who provide emissions data to the RMC.

This interim progress report is submitted by the RMC to WRAP describing progress during July, 2003. Tables 1 to 6 below summarize the status on each of the WRAP RMC 2003 major task areas identified in the 2003 work plan.

- Major accomplishments during July include the following:
- Completed Section 309 reporting.
- Implemented an updated version of the CB4 mechanism in CMAQ.
- Produced updated SAPRC99 speciation profiles for SMOKE.
- Reprocessed the 1996 MM5 files using the corrected MCIP 2.2.
- Acquired 2002 ambient data from several monitoring networks for use in the 2002 model performance evaluation.
- Completed the updated version of the 1996 CMAQ model performance simulation.

A major roadblock was the discovery that the MM5 files were corrupted, most likely this was a result of the problem with bad IBM disk drives that occurred in late 2001. The corrupted MM5 files do not affect our previous 309 modeling which used MCIP files that were created before the MM5 files were corrupted. However, corrected MM5 were needed to run the new MCIP version for the updated 1996 model performance evaluation case, and we replaced the corrupted MM5 with files from the original 8 mm tapes from ENVIRON. The MM5 files that we provided to the NPS in 2002 should be replaced with the corrected files.

We continue to be behind schedule on some tasks because of the increased effort during the first half of 2003 to identify and correct errors in Section 309 emissions and to redo some of the Section 309 CMAQ simulations. Delays in processing the contracts and sub-contracts for 2003 have also caused us to be behind schedule. We hope to make up some lost time and complete most project tasks by the end of 2003.

However, the availability of emissions inputs remains a major uncertainty in starting annual modeling for the year 2002. We plan to perform a first iteration of the 2002 modeling using 2002 emissions where available, and using “grown” 1996 emissions if 2002 emissions are not available. This simulation will serve as an exercise in debugging the model, emissions and evaluation procedures. We expect that a final 2002 model performance evaluation case will be completed in 2004. A high priority for August is to produce a revised work schedule for emissions processing in 2003 and to begin work on producing an initial 2002 inventory.

Table 1. Major Work Topic 0 – Project Management, Computer systems administration and maintenance

<p>Purpose: This task include project management, meetings and phone calls with project sponsor, computer administration, repairs, maintenance and upgrades.</p>
<p>July Activities Biweekly conferences calls, project management, preparation of reports. Updates to computer operating systems: Upgraded disk storage on a RAID5 disk systems. Ordered 4 dual CPU Opteron machines (funding 80% from NSF, 20% from WRAP).</p>
<p>July Deliverables None</p>
<p>Activities Planned for August Biweekly conferences calls, project management, preparation of reports. Computer systems upgrades and maintenance, updates to computer operating systems, data backups, maintenance of website. Testing and benchmarks on new AMD 64 bit Opteron CPUs.</p>

Table 2. Major Work Topic 1 – Task 309 - Finish §309 modeling and TSD

Purpose: Complete modeling and analysis in support of Section 309 SIPs
July Deliverables Emissions summary tables reviewed, corrected and revised. During July 2003, the RMC finalized several sections of the Section 309 TSD: <ul style="list-style-type: none">• Section 1 discussion on the use of modeling results to project future-year changes in visibility;• Section 2 discussion of visibility improvements at the 16 Class I areas on the Colorado Plateau;• Section 4 discussion of the 2018 SO₂ Annex Milestone with Uncertainty control scenario is better than BART at the 16 Class I areas; and• Section 10 discussion of visibility progress at the other Class I areas. We continued to work with Tom Moore of WRAP on refinements to the Section 309 TSD write providing additional write ups and technical activities as needed.
Activities Planned for August Review and edits to TSD as needed. Continue to place model results and QA on project website, as needed.

Table 3. Major Work Topic 2 – Tasks 4JKL, 5J, 6 - Develop/Document QA/QC for air quality modeling, Develop version control and case control system for model data sets, Perform diagnostic analyses to better understand the model performance, Model Analysis/Post-processing.

Purpose:

Task 4KL: Develop version control system for model data sets.

Task 5J: Perform diagnostic analyses to better understand the model performance.

Task 6CDE: Develop improved model performance evaluation tools.

July Activities

Task 4: none.

Task 5: Deferred until completing new model simulations.

Task 6: Continued to revise and debug model performance evaluation software..

July Deliverables

Task 6: Revised source code for model performance evaluation is available on the project website.

Activities Planned for August

Task 4: Investigate utility of cvs for large binary data sets.

Task 5&6: Begin model performance evaluation for redo of the 1996 performance evaluation case.

Table 4. Major Work Topic 3 – Task 4I - Air Quality Model Source Apportionment Capabilities

Purpose: Develop algorithms for the CMAQ model to attribute pollutants to source categories in air quality model simulations.

July Activities

Continued development of tagged species source apportionment (TSSA) algorithm for use in the CMAQ model. Major activities include:

- Implemented tracer species for aerosol nitrate) .
- Testing and debugging.

July Deliverables:

Deliverable date is December 2003, however, preliminary results will be presented at the October modeling forum meeting.

Activities Planned for August

Parallelize the TSSA code.

Testing and evaluation of the algorithm. Begin mobile source sensitivity simulations to compare with TSSA code.

Table 5. Major Work Topic 4 – Tasks 1ACD, 2ABC - Ammonia Inventory Improvement, Temporal Allocation and Chemical Speciation Improvements to the WRAP Point and Area Sources' Inventories, Improve SMOKE Emission Processing System

Purpose:

Task 1A: Develop improved NH₃ Inventory

1CD Temporal Allocation and Chemical Speciation Improvements to the WRAP Point and Area Sources' Inventories

2ABC Improve SMOKE Emission Processing System

July Activities

Task 1A: NH₃ emissions inventory improvements: a literature review and detailed work plan and revised schedule are completed. We have begun to identify and collect data needed for NH₃ inventories.

Task 1CD and Task 2ABC:

Work on additional post-processing emissions QA procedures is in progress.

Work on QA protocol and developing chemical/spatial/temporal allocation process summaries is in progress.

July Deliverables

None

Activities Planned for August

Continue collecting data for Task 1A NH₃ inventory.

Finalize and implement QA protocol .

Table 6. Major Work Topic 5 – Tasks 2E, 3C, 4DEFH - Process and compare 1996 emissions grown to 2002, Develop and process 2002 meteorological fields, identifying and documenting QA/QC procedures, Air Quality Model Development

Purpose: Develop and test improved and/or alternative model inputs and model formulation.

2E Process and compare 1996 emissions grown to 2002.

3C Develop and process 2002 meteorological fields, identifying and documenting QA/QC procedures.

4DEFH Air Quality Model Development: test PING; nested 12 km grid.

5AGI Revisit 1996 base case model performance with new emissions and model updates

5C Test SAPRC99 chemistry and compare with CB4.(NOTE: We are evaluating an updated CB4 v2002 before completing the SAPRC99 simulations.)

5MN Test REMSAD and CAMx4 and compare with CMAQ

July Activities

Select 12 km WRAP domain.

Started set up 36 and 12 km MM5 simulations.

Reprocessed all 1996 MM5 files with MCIP v2.2.

Completed a new CMAQ 1996 base case performance simulation. Had delays due to corrupted MM5 files, so we are delayed in completing the 1996 performance evaluation..

Completed test simulations for January/July using CB4-2002 in the new 1996 base case.

July Deliverables

None

Activities Planned for August

Complete the new CMAQ 1996 base case performance evaluation with all available updates and corrections to emissions, using the new MCIP v2.2 and CMAQ v4.2.2.

Analyze and compare the updated CB4-2002 in CMAQ for the test simulations for January/July.

Conversion of 1996 MM5 data from v2 to v3 format.

Process 1996 36 km MM5 data for input into REMSAD and CAMx4 using the same horizontal Lambert grid and 18 layer vertical layer structure as used by CMAQ.

Refine CMAQ-to-REMSAD and CMAQ-to-CAMx emissions, initial concentrations and boundary conditions processors.

Modify REMSAD and CAMx4 code to read in three-dimensional coordinates of point source emissions to be consistent with the CMAQ emissions, rather than internal calculation of plume rise as is done in the standard model.

Initial testing and evaluation of REMSAD and CAMx4 for January 1996.

