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Final Report for the Western Regional Air Partnership (WRAP) 2002 Model Performance Evaluation

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Prepared for:

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Contents

Executive Summary [Gail/Ralph/Tom - 5 pages]	
Tables	
Figures	
Abbreviations	
1. Introduction[Gail/Tom - 6 pages]	
1.1 Background.....	
1.1.1 Need for regional haze modeling	
1.1.2 Role of the Western Regional Air Partnership.....	
1.1.3 WRAP strategic plan	
1.1.4 Organization of the Regional Modeling Center	
1.2 Overview of Visibility Modeling Datasets	
1.3 Description of WRAP modeling domain.....	
Includes meteorological domain; EI domain and vertical structure.	
2. Final 2002 Emissions Inventories [Zac/MO - 20 pages]	
2.1 Introduction	
Description of "emissions processing" will include the use of spatial surrogates, speciation methods/databases and gridding schemes.	
Emissions QA products will be in a separate appendix, to include:	
1) Stacked bars by WRAP state	
2) Pie charts for WRAP states/entire 36km domain	
3) Density plots	
4) Tabulated state totals by WRAP states/all areas of entire 36km domain	
5) Any of the products from the RMC QA page (spatial plots, time series, vertical profiles)	
6) QA regressions comparing the emissions totals at different stages of the modeling (import to SMOKE vs. gridding vs temporalization)	
2.2 Point Source Emissions	
Note: each emissions sub-section should address these topics, as appropriate:	
Sources of Raw Emissions Data.....	
Emissions Processing	
Uncertainties and Future Work	
2.3 Area Source Emissions.....	
2.4 Mobile Source Emissions	
2.5 Non-Road Emissions	
2.6 Biogenic Emissions	
2.7 Fire Emissions	

2.8	Dust Emissions
2.9	Ammonia Emissions.....
2.10	Canadian, Mexican and other RPO Emissions
2.11	Special Emissions Categories.....
	some source categories like the oil and gas industry are being handled since these categories received "special attention". How are any special speciations factors that are being used for O&G being documented?
2.12	Summary.....
2.12.1	Summary of Emissions QA (refer to Appendix).....
2.12.2	Effects of Uncertainties and Future Work.....
	this can include the description of missing emissions including sources such as lightning, sea salt are not inventoried/modeled
3.	Meteorology Data [Ralph - 3 pages].....
3.1	Summary of Meteorology Evaluation Results.....
3.2	Uncertainties and Effects on Visibility Modeling.....
	This section will short primarily referring to ENVIRON's MM5 sensitivity report. Section 3.2 is important and should have a description of why point source measurements are different then gridded model average.
4.	Air Quality and Visibility Modeling [Gail/Ralph - 30 pages].....
4.1	Description of the CMAQ and CAMx Models
4.1.1	Description of Model Version.....
4.1.2	Selection of Model Science Options
4.1.3	Description of model boundary conditions and initial conditions.....
4.1.4	Summary of Ambient Monitoring Data
4.1.5	Model Performance Evaluation Approach
	Include description of RAW vs. Processed IMPROVE data is used and since this data base was recently updated, it would make sense to describe concisely what database is being used.
4.2.1	Performance evaluation tools
4.2.2	Subdomains analyzed.....
	A description of what actual or nearby receptors were used should be included somewhere. For example, for the 12km runs a 9X9 receptors grid around the Class I monitored is being used. Also, is the highest, lowest, average, etc value being used for the comparision.
4.2.4	Performance time periods.....
	I interpret this to mean seasonal performance
4.2.5	Description of Performance Metrics
4.2.3	Model performance goals and criteria.....
4.2.6	Averaged Model Performance Metrics, Bias and Error.....
	It would be nice to have a glossary section describing the performance measures, equation, and what they actually mean for the non-statistical reader . I think Ralph or Dennis McNally might have a glossary section that could be used.

- 4.2.7 Spatial Analysis.....
- 4.2.8 Time-Series Analysis at Individual Sites.....
- 4.2.9 Analysis of Best and Worst 20% Days.....
- 4.2 Performance Evaluation of Final 2002 CMAQ in the WRAP States.....
 - 4.2.1 Sulfate (SO₄).....
 - 4.2.2 Nitrate (NO₃).....
 - 4.2.3 Ammonium (NH₄).....
 - 4.2.4 Organic carbon (OC).....
 - 4.2.5 Elemental carbon (EC).....
 - 4.2.6 Other fine PM (soil) and coarse mass (CM).....
- 4.3 Evaluation of CMAQ at Class I Areas for the Best- and Worst-20% Days.....
- 4.4 CAMx Model Evaluation and Comparison to CMAQ.....
 - 4.4.1 Sulfate (SO₄).....
 - 4.4.2 Nitrate (NO₃).....
 - 4.4.3 Ammonium (NH₄).....
 - 4.4.4 Organic carbon (OC).....
 - 4.4.5 Elemental carbon (EC).....
 - 4.4.6 Other fine PM (soil) and coarse mass (CM).....
- 4.5 Sensitivity Analysis.....
- 4.6 Diagnostic Analysis.....
- 4.7 Conclusions Model Performance Evaluation.....

Based on performance etc. some type of recommendation/rational for using and continue to use a certain model(s) is needed. Does the 2002 model performance justify using the model(s) for the projected 2018 analysis.

- 4.8 Uncertainties and Effects on Future Visibility Projection.....

5. Further Analysis of Model Performance in Regard to the Contribution of Natural Emissions to Visibility Impairment [Gail/Zac - 3 pages, details in Appendix]

- 5.1 Background.....
- 5.2 Results of Biogenic Emissions Modeling.....
- 5.3 Conclusions.....

Were there any adjustments for drought included in the Biogenic Emissions?

6. Sensitivity Studies Designed to Evaluate Uncertainties in Fire Emissions [Gail/Mohammad - 6 pages, details in Appendix]

- 6.1 Introduction and Summary of Previous Modeling.....

6.2 Wild Fire Vertical Plume Rise Sensitivity

6.3 Small Fire (less than 100 acre) Sensitivity

6.4 Conclusions

7. Computational Platforms [Zion - 4 pages]

7.1 Description of Hardware and Software Used

7.2 Summary of Procedures for Modeling

7.3 Computational Performance Benchmarks

7.4 Technology Transfer.....

8. Conclusions [All - 4 pages]

8.1 [].....

I assume that there will be a discussion on further improvement and next steps included in this section.

References

Appendicies

A-1. Emissions Quality Assurance Zac

A-2. CMAQ Model Performance Evaluation Gail.....

A-3. Comparison of CAMx and CMAQ Ralph.....

A-4. Fires Sensitiv Simlations Gail.....

A-1. Clean Condition Sensitivity Simulation Gail

