

AQRP Monthly Technical Report

PROJECT TITLE	Improving the Modeling of Wildfire Impacts on Ozone and Particulate Matter for Texas Air Quality Planning	PROJECT #	AQRP 16-024
PROJECT PARTICIPANTS	Matthew Alvarado (AER) Chantelle Lonsdale (AER) Christopher Brodowski (AER)	DATE SUBMITTED	07/10/2017
REPORTING PERIOD	From: 06/01/2017 To: 06/30/2017	REPORT #	9

A Financial Status Report (FSR) and Invoice will be submitted separately from each of the Project Participants reflecting charges for this Reporting Period. I understand that the FSR and Invoice are due to the AQRP by the 15th of the month following the reporting period shown above.

Detailed Accomplishments by Task

Task 1: Develop improved parameterization and assess the impact on Texas air quality

In this reporting period we re-ran 100 SAM-ASP simulations for each fuel type to account for the wind speed and direction bug found in the previous reporting period, and redeveloped the GEM parameterizations based on these runs. We also wrote code to output the predictions of the GEM parameterization to a NetCDF file for easier QA/QC and as a second way to access the parameterization results in the CAMx model code. We also began documenting the GEM parameterization in preparation for the draft Final Report.

We also began the CAMx code changes to incorporate the parameterization results into the CAMx plume-in-grid (PiG) module. We plan to create a duplicate PiG module that only runs on the FINN fire sources, read in directly using the code we have already added to CAMx. Our plan requires three adjustments to this PiG module: (1) adjustments to the piginit.f file to initialize the puffs for the fire sources correctly so that they only track CO; (2) Writing a new subroutine to get the correct enhancement ratios for O₃, NO_x, PAN, and HNO₃ from the GEM parameterization based on the current grid conditions (our current plan is to use the GEM NetCDF output discussed above in this interface); and (3) add code to pigdrive.f to calculate the mass “dumped” to the grid of non-CO species based on the calculated mass transfer of CO and the enhancement ratios obtained from the new subroutine.

Task 2: Investigate the impact of long-range transport of BB pollution on Texas air quality

We have performed STILT-ASP runs without chemistry for additional receptors along the boundary of the TCEQ 2012 CAMx modeling episode files in order to look at issues related to potential numerical diffusion of biomass burning plumes in the GEOS-Chem boundary conditions. However, we have not yet completed the analysis of these new results.

Preliminary Analysis See the accomplishments described above.

Data Collected None.

Identify Problems or Issues Encountered and Proposed Solutions or Adjustments

Nothing to report

Goals and Anticipated Issues for the Succeeding Reporting Period

Task 1:

- Continue work to add parameterization as a subroutine within CAMx.
- Continue work on adding fires to the CAMx simulations via the Plume-in-Grid module.
- Draft Final Report

Task 2:

- Analyze additional STILT-ASP simulations to evaluate the contribution of fires to the observed CO during episodes where biomass-burning emissions impacted the boundary conditions.
- Draft Final Report

Detailed Analysis of the Progress of the Task Order to Date

As of the end of this reporting period, the following milestones have been completed for each task:

Task 1:

- Coupling of SAM-ASP completed.
- Preliminary runs and evaluation against Alvarado et al. (2015) completed, with dilution error identified and fixed.
- Verified that our CAMx simulation can reproduce the 2012 TCEQ modeling episode.
- Wrote code for CAMx to read FINN fire emission files directly.
- Built a Gaussian Emulator Machine (GEM) based on the original biomass-burning parameterization of Lonsdale et al. (2014) as a test case for the updated parameterization to be developed in this project.
- Ran SAM-ASP simulations for the new parameterization and chose input variables.
- Developed first GEM based on the SAM-ASP runs and investigated results.
- Revised GEM parameterization based on above analysis.
- Designed the file structure of parameterization that is to be read into CAMx
- Fixed SZA and wind speed/direction bugs and reran parameterization runs for all fuel types.
- Wrote documentation on the parameterization.
- Identified method for incorporating parameterization into CAMx.

Task 2:

- Examined of boundary condition files for potential episodes of biomass burning influence.
- Performed STILT-ASP simulations along TCEQ grid boundary and compared predicted CO levels to GEOS-Chem values.
- Expanded number of receptors for no-chemistry STILT-ASP runs along boundaries, focusing on CO plumes.

Do you have any publications related to this project currently under development? If so, please provide a working title, and the journals you plan to submit to.

Yes No

Do you have any publications related to this project currently under review by a journal? If so, what is the working title and the journal name? Have you sent a copy of the article to your AQRP Project Manager and your TCEQ Liaison?

Yes No

Do you have any bibliographic publications related to this project that have been published? If so, please list the reference information. List all items for the lifetime of the project.

Yes No

Do you have any presentations related to this project currently under development? If so, please provide working title, and the conference you plan to present it (this does not include presentations for the AQRP Workshop).

Yes No

C. Lonsdale, C. Brodowski, M. Alvarado, J. Henderson, J. Pierce, E. Ramnarine, J. Lin, and A. Kochanski (2017), New Developments in the Eulerian and Lagrangian Modeling of the Chemistry of Biomass-Burning Plumes, to be presented at the 15th CMAS Conference, Chapel Hill, NC, 24-26 Oct.

Do you have any presentations related to this project that have been published? If so, please list reference information. List all items for the lifetime of the project.

Yes No

C.M. Brodowski, M.J. Alvarado, C.R. Lonsdale, J.C. Lin, A.K. Kochanski (2017), An Eulerian vs. Lagrangian Comparison of Modeled Carbon Monoxide in Texas during Biomass Burning Events, presented at the 8th International GEOS-Chem Meeting, Cambridge, MA, May 1-4.

Lonsdale, C. R., C. Brodowski, M. Alvarado, J. Henderson, J. R. Pierce, and J. Lin (2016), Regional Modeling of Biomass-Burning Aerosol Impacts, Abstract GC51E-1225, presented at the 2016 AGU Fall Meeting, San Francisco, CA, Dec. 12-16.

C. Lonsdale, C. Brodowski, M. Alvarado, J. Henderson, J. Pierce, E. Ramnarine, J. Lin, and A. Kochanski (2017), Recent Advances in Modeling the Near-Source Chemistry of Biomass-

Burning Plumes in Photochemical Transport Models, presented at the EGU General Assembly 2017, Vienna, Austria, 23-28 April.

Submitted to AQRP by Matthew J. Alvarado (AER)

Principal Investigator Matthew J. Alvarado (AER)