

AQRP Monthly Technical Report

PROJECT TITLE	Improving the Modeling of Wildfire Impacts on Ozone and Particulate Matter for Texas Air Quality Planning	PROJECT #	AQRP 17-024
PROJECT PARTICIPANTS	Matthew Alvarado (AER) Chantelle Lonsdale (AER) Christopher Brodowski (AER)	DATE SUBMITTED	03/08/2017
REPORTING PERIOD	From: 02/01/2017 To: 02/28/2016	REPORT #	5

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

Preliminary runs of the coupled SAM-ASP model have continued, with the discovery of the correction to why the horizontal dispersion of the plume appeared to be under estimated. In an attempt to reduce computation time, we had run ASP on only 'plume defined' grids, which we defined as any grid box having a concentration of CO greater than 500 ppb. While this assumption was sufficient for the early part of plume simulated chemistry (< 1 hour), once the outer edges of the plume reached this concentration threshold, chemistry stopped despite still technically being a part of the plume. This artificially resulted in an apparent underestimation of horizontal dispersion, when in reality the model ceased to perform chemistry on grid boxes that should have had it continue. Once we reduced this threshold to 200 ppb, simulated values better match that of measurement for CO (Figure 1) and other species, with the exception of PAN. The PAN overestimation will be investigated during the next reporting period.

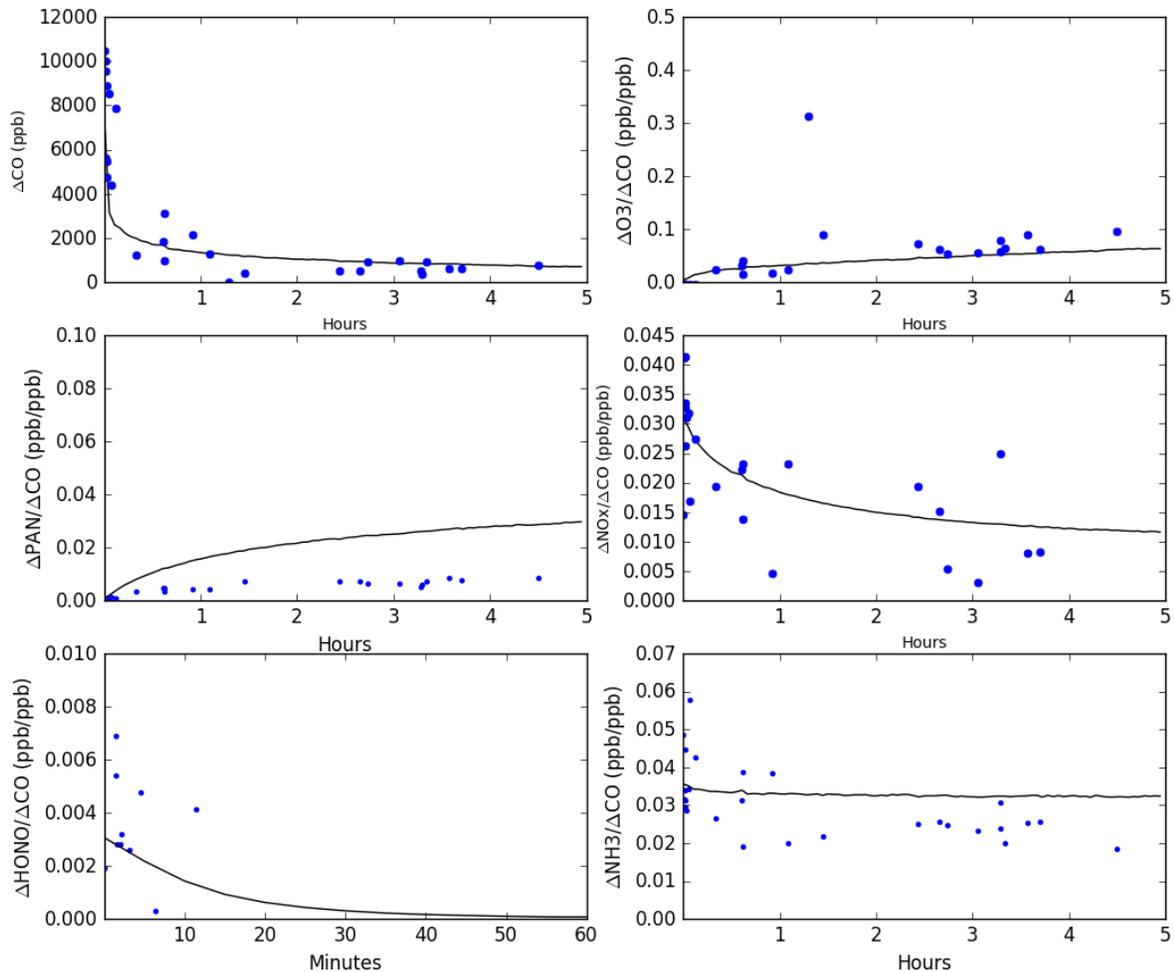


Figure 1: Preliminary SAM-ASP simulation of ΔCO , $\Delta\text{O}_3/\Delta\text{CO}$, $\Delta\text{NO}_x/\Delta\text{CO}$, $\Delta\text{PAN}/\Delta\text{CO}$, $\Delta\text{HONO}/\Delta\text{CO}$ and $\Delta\text{NH}_3/\Delta\text{CO}$ for the Williams Fire (black line) versus observations (blue dots).

In this reporting period we also continued development of an improved parameterization to that of Lonsdale et al. (2014) by setting up the needed SAM-ASP model runs. We have determined that in addition to fuel type, temperature and overhead ozone we will also simulate a range of starting and ending solar zenith angles by running the model with different latitudes, times of day and days of the year in order to capture the full range of photolysis rates and seasonal effects. The layout for performing these model runs has been completed, and the first of these simulations will be run during the next reporting period.

In this reporting period we also continued incorporating fire emissions into the CAMx model by adding the ability for CAMx to read FINN fire emission files directly.

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

In this reporting period we ran additional STILT-ASP simulations for the impacts of fire CO on the southern boundary of the TCEQ modeling domain. Our analysis of these runs will be done in the next reporting period.

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 on adding fires to the CAMx simulations via the Plume-in-Grid module.
- Run SAM-ASP simulations for the parameterization development.

Task 2:

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

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.
- Set up SAM-ASP runs for the new parameterization and chose input variables.

Task 2:

- Examination of boundary condition files for potential episodes of biomass burning influence on going.
- STILT-ASP runs for these episodes ongoing.

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 AQR 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), Recent Advances in Modeling the Near-Source Chemistry of Biomass-Burning Plumes in Photochemical Transport Models, to be presented at the EGU General Assembly 2017, Vienna, Austria, 23-28 April.

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, to be presented at the 8th International GEOS-Chem Meeting, Cambridge, MA, May 1-4.

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

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.

Submitted to AQRP by Matthew J. Alvarado (AER)

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