

AQRP Monthly Technical Report

PROJECT TITLE	Using Satellite Observations to Quantify Surface PM_{2.5} Impacts from Biomass Burning Smoke	PROJECT #	20-005
PROJECT PARTICIPANTS	Matthew Alvarado, Archana Dayalu	DATE SUBMITTED	08/31/2021
REPORTING PERIOD	From: 08/01/2021 To: 08/31/2021	REPORT #	13

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 for reporting period

In this final reporting period, we presented our final results to the AQRP at the annual workshop on 18 August 2021. We also finalized the AQRP report and all associated deliverables, and delivered the link to AQRP on 31 August 2021. The deliverables directory is named `DELIVERABLE_AQRP2021_20_005.tar.gz` and a link was provided to download from AER's repository on Amazon Web Services. The deliverables directory is structured as below. *Note that directories in red font indicate placeholder/empty directories. As the sizes of many of the publicly available raw datasets were prohibitively large, we instead provide instructions for download in the Final Report. We provide example placeholder directories for adding on to the existing data set in the future. All relevant final processed end-user data for this specific study is provided in the "end_user_data" and "TCEQ_monitor_data" directories.*

README

AQRP_20-005_Final_Report_R2.0.pdf

AQRP_Final_Presentation.pptx

tx_dates_smoke_only.csv

data/

 end_user_data/ TCEQ_monitor_data

 dump/ GOES/ NOAA_HMS/ TROPOMI_UVAI/ IASI_NH3_CO/

 TCEQ_2020_OMI_BrC_Processor/

tables/ <static table archive>

figures/ <static figure archive>

scripts/

 AQRP_Task1_read_processing.ipynb

 AQRP_Task2_read_processing.ipynb

 GAMS.r

 grand_merge_task1_2.py

 merge_iasi_omi.r

 NH3_CO.ipynb

```
regrid_iasi_nh3_co.r
subset_aod_smoke_flags.ipynb
smoke_vis_tool.py
task_1_2_analysis.py
task_1_2_figs_daily.py
task3_process_tceq_monitor.r
tx_dates_smoke_only.csv
```

Data Collected

None

Identify Any Problems or Issues Encountered and Proposed Solutions or Adjustments

None

Goals and Anticipated Issues for the Succeeding Reporting Period

N/A

Detailed Analysis of the Progress of the Task Order to Date

We have selected 93 dates between January and July 2020 with suspected smoke intrusions in the Texas area. For these dates:

- We have merged all the Task 1 and 2 components thus far and placed them on a common grid.
- We have performed aggregate, seasonal, and daily analysis of the 93-day smoke data set, incorporating multiple auxiliary products (NH₃, CO, OMI BrC, AOD, PH) where relevant.
- We have developed a Smoke Confidence Index within a standalone data set that enables a user to perform multiple calculations including FMS, PH, etc.
- We have calculated PH from AOD bins based on Cheeseman et al. (2020) MAIAC PH/AOD relation.
- We have performed FMS analyses, aggregated over all times as well as broken down by day and measurement hour.
- We have developed a python-based GUI to visualize daily results from a user-selected date.
- We have subset relevant data for Surface PM_{2.5} estimates (Task 2.2, Task 3)
- We have daily PM_{2.5} data from TCEQ surface stations.
- We found GOES AOD and other satellite smoke predictors had little correlation ($r < 0.2$) with hourly surface PM_{2.5} in Texas urban areas, and so statistical models gave generally poor predictions (adj. $R^2 < 0.35$, standard deviation of residuals of $\sim 5 \mu\text{g}/\text{m}^3$).
- We completed the final project report, a final presentation, and synthesized all relevant project deliverables.
- We presented our result at the 2021 AQRP Workshop on 18 August 2021.

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

Working title: Identification and evaluation of biomass burning events: a data assimilation approach over Texas

Journal: Journal of the Air and Waste Management Association

A draft of this manuscript will be provided to AQRP prior to submission.

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 (ie: publications that cite the project) 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

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

Identifying Smoke-Impacted Regions using the Optical Properties of Brown Carbon Aerosol, oral presentation at the CMAS Fall Meeting

Identifying Smoke-Impacted Regions using the Optical Properties of Brown Carbon Aerosol, poster at AGU Fall Meeting

From OMI to TEMPO: Opportunities for enhanced identification of biomass burning using the optical properties of Brown Carbon aerosol, poster presented at TEMPO June 2021 Science Team Meeting

Identifying Smoke-Impacted Regions using the Optical Properties of Brown Carbon Aerosol, oral presentation at Air & Waste Management Association 114th Annual Conference and Exhibition

Using Satellite Observations to Quantify Surface PM_{2.5} Impacts from Biomass Burning Smoke, oral presentation at 2021 Air Quality Research Program (AQRP) Workshop, 18 August 2021.

Have any personnel changes occurred that were not listed in the original proposal? If so, please include a detailed description of the personnel change(s) below.

Yes **No**

Qiang Sun resigned from AER at the beginning of February.

Are any delays expected in the progress of the research? If so, please include a detailed description of the potential delay below.

Yes **No**

Describe any possible concerns/issues (technical or non-technical) that AQRP should be made aware of.

None

Are you anticipating using all the available funds allocated to this project by the end date? If not, why and approximately what is the amount to be returned?

Yes **No**

Submitted to AQRP by
Matthew James Alvarado