

AQRP Monthly Technical Report

PROJECT TITLE	Improving Estimates of Wind-Blown Dust from Natural and Agricultural Sources	PROJECT #	20-011
PROJECT PARTICIPANTS	Chris Emery, Tejas Shah, Uarporn Nopmongcol, Greg Yarwood (Ramboll)	DATE SUBMITTED	5/5/2021
REPORTING PERIOD	From: April 1, 2021 To: April 30, 2021	REPORT #	10

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

Task 1: Review Current CAMx WBDUST Estimates

This task was completed in September 2020.

Task 2: Review Alternative Methods and Datasets

Task 2.1 was completed in November 2020.

Task 2.2 was completed in February 2021.

Task 3: Update the WBDUST Model and Evaluate Impacts in CAMx MP

Continued to apply CAMx with the 2016 EPA Modeling Platform to assess alternative windblown dust estimates from previous and updated (from Tasks 2.1 and 2.2) versions of the WBDUST model. See below for a summary of our ongoing analysis.

Task 4: Project Reporting and Presentation

Developed March MTR and FSR and submitted to AQRP on March 3 and 22, respectively.

Developed and submitted the fourth quarterly progress report on April 30. Began assembling the project final report from Task 1 and 2 memoranda.

Preliminary Analysis

We continued to test adjustments to the WBDUST model with CAMx for the March-April 2016 period using the national 2016 EPA modeling platform at 12 km grid resolution. We continued to run CAMx with only windblown dust (WBD) emissions and simulated the inert dispersion of un-specified fine and coarse PM. This model configuration allowed us to run and analyze many WBD sensitivity runs quickly.

Previous monthly reports summarize 6 initial test runs (Runs 0 through 5). Runs 0 through 4 exhibited large WBD under predictions, so Run 5 was conducted to test if WBDUST was at all capable of emitting sufficient dust routinely and over broad areas of the western US. We verified from Run 5 that removal of key limitations in the WBDUST formulation (i.e., vegetative and drag partitioning effects) led to large PM overpredictions at all IMPROVE sites. During

April we conducted 4 additional runs adjusting key parameters and/or formulations to find an agreeable medium between large under predictions from Runs 3/4 and large over predictions in Run 5. These cases involved:

- Run 6: reinstate vegetative scaling that was removed in Run 5, but continue to ignore drag partitioning to maximize WBD emissions;
- Run 7: reinstate drag partitioning but make it dependent on use landuse-specific leaf area index (LAI) rather than grid cell total LAI, and use landuse-specific minimum default surface roughness for wind stress over the complex roughness approach of Foroutan et al. (2017) described in the Task 2.1 memorandum;
- Run 8: Increase the drag partitioning parameter for barren soil (tilled croplands);
- Run 9: Reinstate the drag partitioning parameter for barren soil to the original value, and reduce the area of tilled cropland from 100% to 25% to account for the fact that not all croplands are instantly cultivated on any given day nor remain barren for the entirety of the 2-3 month planting seasons.

Reinstating vegetative scaling in Run 6 reduced WBD over predictions relative to Run 5 but coarse PM remained far too high, indicating that drag partitioning was the key factor controlling WBD emissions. Changes to drag partitioning and surface roughness in Run 7 improved WBD results greatly with good agreement against measured coarse PM concentrations throughout the desert southwest US (AZ, NM, UT, CO). However, WBD events from croplands in the central plain states (TX, OK, KS) remained over predicted. Runs 8 and 9 attempted to adjust WBD from tilled croplands downward. Run 8 again resulted in widespread under predictions but Run 9 improved WBD agreement in crop-heavy states while not impacting already good performance in desert southwest states. Therefore, the WDUST configuration tested in Run 9 represents our final formulation.

Data Collected

No data collected during the reporting period.

Identify Any Problems or Issues Encountered and Proposed Solutions or Adjustments

None during the reporting period.

Goals and Anticipated Issues for the Succeeding Reporting Period

Complete model testing of WBDUST updates using the CAMx model. Model results using original and alternative windblown dust estimates will be evaluated against ambient measurements. Continue to develop the project final report. No anticipated issues for the succeeding reporting period.

Detailed Analysis of the Progress of the Task Order to Date

This project initiated on July 28 with the execution of the AQR Task Order. All remaining tasks remain on schedule and budget according to our work plan.

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 (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

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

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
Chris Emery, Ramboll