

AQRP Monthly Technical Report

PROJECT TITLE	New Satellite Tools to Evaluate Emission Inventories: Is a 3-D Model Necessary?	PROJECT #	20-020
PROJECT PARTICIPANTS	University of Wisconsin – Madison Ramboll	DATE SUBMITTED	5/10/2021
REPORTING PERIOD	From: April 1, 2020 To: April 30, 2020	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

During this reporting period, work was carried out on Tasks 1 - 3.

Task 1: Simulate NO₂ and SO₂ amounts with the high-resolution WRF-CAMx model

The Ramboll modeling team prepared and completed additional CAMx sensitivity simulations, including adding lightning NO_x emissions.

Task 2. Compare model simulations with TROPOMI and near-surface observations

The UW-Madison has completed running WHIPS to grid NASA Standard Product OMI NO₂, as a cross-check between differing satellite instruments and retrievals. CAMx column amounts have been processed with and without the OMI averaging kernel for comparison with emissions data.

The UW-Madison team has been in regular contact with project collaborator Dr. Dan Goldberg to assure methodological consistency in calculating model column amounts for comparison with satellite observations. The UW-Madison team is documenting these different methodologies to provide guidance to the wider air quality modeling community in the use of satellite data for model evaluation, and for inclusion in a paper (not yet started) led by Dr. Dan Goldberg on the inter-comparison of satellite observations of NO₂, NO_x emissions, and the CAMx modeling conducted by Ramboll for this project.

Task 3. Compare satellite data and emissions for power plants and urban areas

The UW-Madison team is continuing work on the comparison of satellite observations of NO₂ with emissions and model column NO₂ amounts in urban areas and at power plant locations.

Preliminary Analysis

None.

Data Collected

None.

Identify Any Problems or Issues Encountered and Proposed Solutions or Adjustments

None.

Goals and Anticipated Issues for the Succeeding Reporting Period

Ramboll will prepare and complete a final CAMx simulation that includes lightning NO_x emissions and potentially adjustments to mobile source NO_x emissions.

UW-Madison will add a correction for NO₂ contributions to the model column from lightning in the free troposphere (~3km and above), which were not included in the original CAMx simulations but may be estimated from *Silvern et al.* (2018; <https://doi.org/10.1029/2018GL077728>). UW-Madison will continue work on the analyses of column NO₂ for the 5 cities and 5 power plants of focus.

The Ramboll and UW-Madison teams, with Dr. Dan Goldberg, have discussed the vertical sensitivity of the TROPOMI retrieval, which the retrieval derives from a global model, and how well it may capture the emission plumes from power plants. We hope this will be clarified as we compare TROPOMI and OMI column amounts and the applications of the differing averaging kernels to the CAMx simulations.

We had planned to expand our analysis to SO₂ to a limited extent as resource and data integrity allow. Our NO₂ analysis has highlighted nuances in satellite retrieval algorithms and in processing model column estimates, and our team has agreed that expanding our analysis to include SO₂ would not be simple, and would require resources and time beyond what is available between now and the end of the grant period. As such, our focus will remain on the analysis of observed and modeled NO₂ with emissions.

Detailed Analysis of the Progress of the Task Order to Date

None.

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 Tracey Holloway

Principal Investigator Tracey Holloway