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**	6/10/2021
REPORTING PERIOD	**From:** May 1, 2020 **To:** May 31, 2020	**REPORT #**	11

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 NO_2 and SO_2 amounts with the high-resolution WRF-CAMx model

The Ramboll modeling team prepared and completed the final CAMx simulation for the entire 2019 ozone season, which includes lightning NOx emissions.

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

UW-Madison added a correction for NO_2 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).

The UW-Madison team has been in regular contact with project collaborator Dr. Daniel Goldberg concerning our cross-check comparison of TROPOMI NO_2. To better understand TROPOMI results, additional comparison was conducted with OMI NO_2 column amounts.

The UW-Madison team has documented 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 team paper led by Dr. Goldberg on the inter-comparison of satellite observations of NO_2, 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

Dr. Goldberg has recalculated the TROPOMI air mass factor (AMF) using CAMx model output, both with and without a correction for lightning NOx in the free troposphere per Silvern et al. (2018). He has applied the EMG method to the five cities and five power plants of focus.

The UW-Madison team is continuing work on the direct comparison of satellite observations of NO_2 with emissions and model column NO_2 amounts in urban areas and at power plant locations.

Preliminary Analysis

In applying the EMG method, Dr. Goldberg finds the EMG method is most robust in quantifying NO_X pollution from the Dallas-Ft Worth metropolitan area, and less robust when quantifying NO_X pollution from smaller cities and power plants. The UW-Madison team have found a clear positive relationship between population and the correlation between TROPOMI NO_2 and emissions, which is in line with Dr. Goldberg's analyses.

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 deliver CAMx model concentrations and emissions to the UW-Madison team. Ramboll will also evaluate model performance at surface monitors for the final CAMx simulation.

The UW-Madison team will download and begin comparison of the CAMx output, new emissions, and TROPOMI NO_2.

The Ramboll and UW-Madison teams, with Dr. 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. Our preliminary analysis suggests onroad emissions are better characterized than power plant 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