

Monthly Technical Report

PROJECT TITLE	Constraining NO _x Emissions Using Satellite NO ₂ Measurements Over The Southeast Texas	PROJECT #	14-014
PROJECT PARTICIPANTS	University of Houston	DATE SUBMITTED	3/5/2015
REPORTING PERIOD	From: Feb. 1, 2015 To: Feb. 28, 2015	REPORT #	1
University of Houston		Invoice #	Amount
		N/A	\$0.00

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 AQR by the 15th of the month following the reporting period shown above.

Detailed Accomplishments by Task

1. Finished WRF simulations and calculated statistics.
2. Prepared 4 sector of NO_x emissions: soil, area, mobile, and point sources
3. OMI NO₂ daily data for 09/2013 were downloaded and examined

Preliminary Analysis

We have finished the WRF simulations, with a total three cases: 1) no observation nudging is performed (No-OA) 2) observation nudging is performed every 3 hour 3) observation nudging is performed every 1 hour. The different OA frequencies were set in the namelist of WRF while the input files of different frequencies were generated by OBSGRID program. The details can be found in the 1st quarterly report.

The statistics for temperature, U and V wind components are shown in Table 1 to 3. The statistics are based on CAMS data. The results are quite consistent across the variables. The OA cases have significantly better IOA than No-OA case, while the differences between the 1Hr-OA and 3Hr-OA are quite small. A further examination of the numbers shows OA cases have smaller wind biases (lower winds) than No-OA case.

Table 1 Statistics of hourly surface temperature

Case	N	Corr	IOA	RMSE	MAE	MB	O_M	M_M	O_SD	M_SD
No-OA	41058	0.83	0.89	2.0	1.5	0.9	27.4	28.3	3.1	2.8
3Hr-OA	41058	0.93	0.96	1.2	0.9	0	27.4	27.4	3.1	3.1
1Hr-OA	41058	0.94	0.97	1	0.8	0	27.4	27.4	3.1	3.1

- N – data points; Corr – Correlation; IOA – Index of Agreement; RMSE – Root Mean Square Error; MAE – Mean Absolute Error; MB – Mean Bias; O – Observation; M - Model; O_M – Observed Mean; M_M – Model Mean; SD – Standard Deviation
- Units for RMSE/MAE/MB/O_M/M_M/O_SD/M_SD: degree C

Table 2 Statistics of hourly surface U wind

Case	N	Corr	IOA	RMSE	MAE	MB	O_M	M_M	O_SD	M_SD
No-OA	43246	0.76	0.84	1.4	1.1	-0.6	-1.3	-1.9	1.6	1.9
3Hr-OA	43246	0.79	0.88	1.1	0.8	-0.3	-1.3	-1.6	1.6	1.6
1Hr-OA	43246	0.81	0.89	1	0.8	-0.3	-1.3	-1.6	1.6	1.6

Table 3 Statistics of hourly surface V wind

Case	N	Corr	IOA	RMSE	MAE	MB	O_M	M_M	O_SD	M_SD
No-OA	43246	0.76	0.8	2.1	1.7	1.2	0.4	1.7	2	2.6
3Hr-OA	43246	0.77	0.88	1.3	1	-0.1	0.4	0.4	2	2
1Hr-OA	43246	0.8	0.89	1.2	0.9	-0.1	0.4	0.4	2	2

- N – data points; Corr – Correlation; IOA – Index of Agreement; RMSE – Root Mean Square Error; MAE – Mean Absolute Error; MB – Mean Bias; O – Observation; M - Model; O_M – Observed Mean; M_M – Model Mean; SD – Standard Deviation
- Units for RMSE/MAE/MB/O_M/M_M/O_SD/M_SD: m/s

Remote Sensing Data Collected

OMI NO₂ daily observations (level 2) from NASA with a nadir spatial resolution of 13×24km for September of 2013 have been downloaded.

Emission Preparation

We are currently working on the National Emissions Inventory (NEI) of 2011. Until the model-ready emission are ready, we will continue working on the NEI of 2008, to get a preliminary estimate of the spatial distribution. They contain 24-hour values averaged over September, 2013 for our 4-km CMAQ model domain covering Southeast Texas.

Identify Problems or Issues Encountered and Proposed Solutions or Adjustments

No problems or issues were encountered during the reporting period.

Goals and Anticipated Issues for the Succeeding Reporting Period

UH will test a few more WRF cases before determining the best WRF configurations. In the meantime, we will work on the emission inventories and generate necessary files ready for CMAQ model. We do not expect significant issues in the next reporting period.

Detailed Analysis of the Progress of the Task Order to Date

The completion of each of the project tasks and the draft and final report reports are expected to be on the schedule from the Work Plan schedule.

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