

AQRP Monthly Technical Report

PROJECT TITLE	Refining ammonia emissions using inverse modeling and satellite observations over Texas and the Gulf of Mexico and investigating its effect on fine particulate matter	PROJECT #	22-019
PROJECT PARTICIPANTS	University of Houston	DATE SUBMITTED	11/10/22
REPORTING PERIOD	From: Oct. 01, 2022 To: Oct. 31, 2022	REPORT #	3

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

Task1: Preparation of comprehensive satellite, in situ, and modeling data for the iterative Finite Difference Mass Balance (iFDMB) method:

The UH-AQF modeling team evaluated Weather Research & Forecasting (WRF) model performance against Meteorological Assimilation Data Ingest System (MADIS) observations for 2019 over the modeling domain. To do so, the team developed a python code to download and prepare the MADIS observations to evaluate WRF results. The evaluation showed that the performance of WRF in simulating meteorological parameters is reasonable. Furthermore, CrIS satellite observations have been gathered using a python code developed within the framework which will be used to perform the inverse modeling. The UH-AQF modeling team has also worked on emissions modeling setup by gathering National Emissions Inventory (NEI) 2017 modeling platform, preparing meteorological data in the format required by Community Multiscale Air Quality (CMAQ) using the Meteorology-Chemistry Interface Processor (MCIP), and setting up the Sparse Matrix Operator Kernel Emissions (SMOKE) scripts and modeling domain within the NEI 2017 platform.

Task2: Development of the Reduced-Complexity CMAQ Model (RCCM) for NH₃ and refinement of NH₃ emissions using iFDMB with the combination of CMAQ model and CrIS satellite observations:

No activities during the reporting period.

Task3: Investigation of PM_{2.5} concentrations using the updated emission inventory:

No activities during the reporting period.

Preliminary Analysis

The statistical evaluation of WRF model performance against MADIS data is shown in Table 1 for temperature, U-component, and V-component of wind. Also, Figure 1 depicted the spatial plot of temperature simulated by the WRF model in August.

Table 1: Statistical evaluation of WRF model performance against MADIS data for 2019 (hourly dataset)

Variable	R	IOA	RMSE	MAE
Wind Speed in x direction (U10)	0.66	0.79	1.89	1.51
Wind Speed in y direction (V10)	0.78	0.86	2.19	1.74
Temperature at 2 meters (T2)	0.95	0.96	2.94	2.26

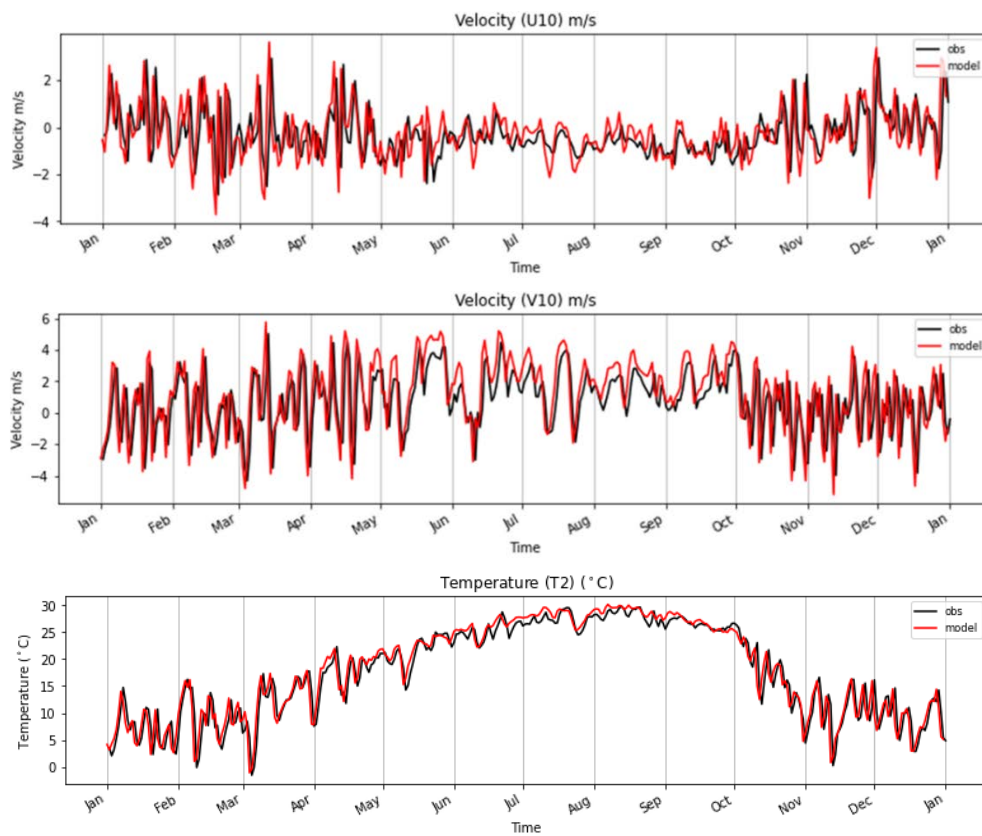


Figure 1: Timeseries plots for evaluating WRF model performance against MADIS data in 2019. U10, V10: wind speed in x and y directions, respectively, T2: Temperature.

Data Collected

CrIS observations data for 2019 have been collected.

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

UH-AQF team will finish modeling emissions for the modeling period.

Detailed Analysis of the Progress of the Task Order to Date

None during the reporting period.

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.

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
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