

AQRP Monthly Technical Report

PROJECT TITLE	Improving Urban Representation in the High-Resolution WRF-CAMx Model and Evaluating the Effects on PBL and Ozone Prediction	PROJECT #	26-015
PROJECT PARTICIPANTS	Yuxuan Wang, James Flynn	DATE SUBMITTED	10/10/2026
REPORTING PERIOD	From: 09/01/2026 To: 09/30/2026	REPORT #	2

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: Work Plan

- Work plan was submitted and approved. This task was completed.

Task 2: Monthly Technical Reports

- Ongoing

Task 3: Urban Classification in WRF

- Prepared a new WRF modeling domain covering the urban Houston region

In the previous AQRP project ([24-021](#)), the Weather Research and Forecasting (WRF) modeling domain 3 (d03) was extended toward the Gulf to better understand offshore air quality over Galveston Bay and the Gulf. However, the previous domain did not fully cover the urban Houston region. Therefore, a new d03 domain was developed for the current study to provide more comprehensive coverage of urban Houston while retaining most of the offshore area covered by the previous configuration. **Figure 1** shows the new WRF domains showing the contiguous United States (d01: 12 km x 12 km), Southeast Texas (d02: 4 km x 4 km), and Houston-Galveston (d03: 1.33 km x 1.33 km) regions.

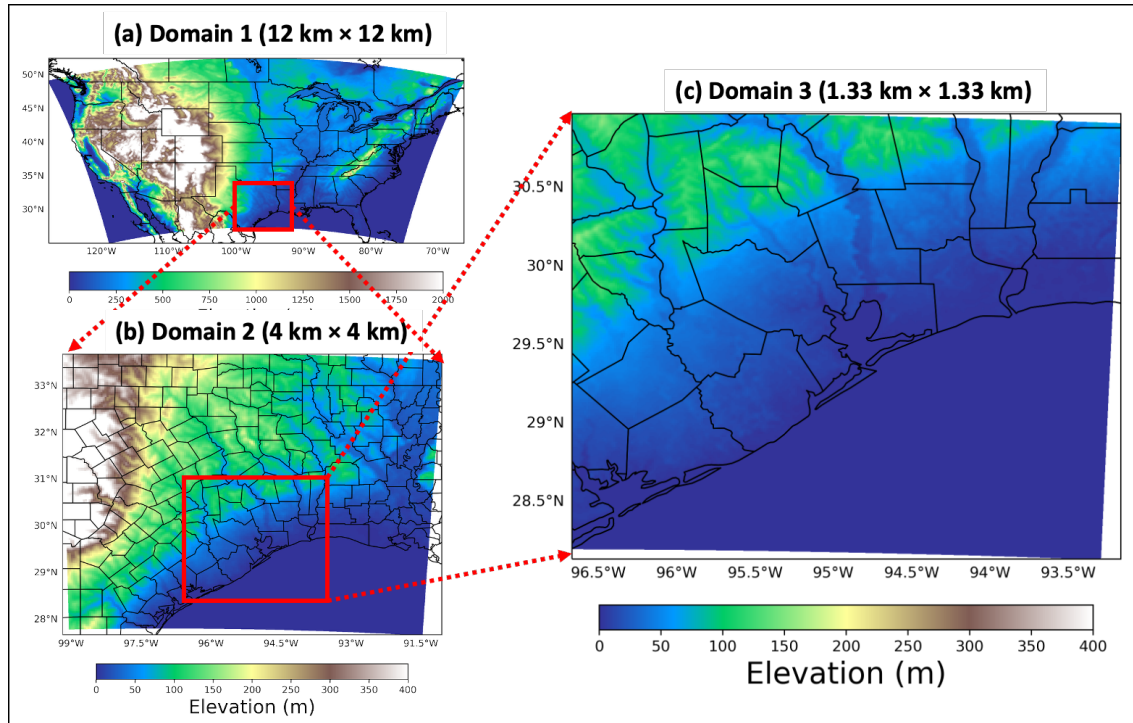


Figure 1 WRF domains showing (a) d01 (contiguous United States, 12 km x 12 km horizontal resolution), (b) d02 (Southeast Texas, 4 km x 4 km resolution), and (c) d03 (Houston-Galveston, 1.33 km x 1.33 km resolution) regions.

- Compilation of the latest versions of WPS and WRF

For this study, the latest versions of the WRF Preprocessing System (WPS, version 4.7.0) and the Weather Research and Forecasting (WRF) model (version 4.8.0) will be used. So, we downloaded and successfully compiled the new versions of both WPS and WRF.

- Implementation of Local Climate Zone (LCZ) in WRF

A test simulation was initiated using WRF version 4.8.0 with LCZ classification implemented through WPS version 4.7.0. The standard single urban category in the WRF was replaced with an LCZ-based urban classification framework.

First, the LCZ classification was implemented in WPS using high-resolution urban morphology and land-cover information from the CGLC-MODIS-LCZ_100m global dataset. This CGLC-MODIS-LCZ dataset is based on the Copernicus Global Land Service Land Cover (CGLC) product, resampled to MODIS IGBP classes (CGLC-MODIS), and the global LCZ map. In the WPS, the *geog_data_res* parameter in *namelist.wps* was configured to use the CGLC-MODIS-LCZ dataset, with standard MODIS land-cover data available as a fallback for areas outside the primary dataset's coverage. The generated geographical files (*geo_em*) for each domain now contain 61 land-use categories, including the 10 LCZ classes.

Second, the meteorological input files generated by the WPS were used to initialize WRF. In the WRF configuration, the *use_wudapt_lcz* parameter was set to 1 to enable LCZ-based urban modeling, since its default is 0. The configuration was also checked to ensure that WRF reads the *URBPARAM_LCZ.TBL* file containing the urban parameter specifications required for the 10 LCZ classes.

The vertical-layer configuration was also adjusted to incorporate building-height information from the LCZ data. For domain d03, the maximum building height within a 1.33 km grid cell was estimated at ~38 m. Accordingly, the vertical grid was examined and adjusted to ensure that the lowest model levels were appropriately aligned with the building heights. This adjustment is intended to help prevent model initialization or runtime failures related to the representation of urban structures.

Finally, after all the modifications described above, a two-day WRF test simulation was initiated. Once the simulation is complete, we will analyze the model outputs to verify that the LCZ classification has been implemented correctly and that the revised vertical-layer configuration is appropriate. Once all the issues are considered, we will proceed with the monthly simulations.

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

Goals: Continue working on Task 3.

Anticipated Issues: None.

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.

**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
Yuxuan Wang