AQRP Monthly Technical Report

PROJECT TITLE	Novel Observations and Quantified Source Apportionment of Ozone, Particulate Matter and Contributing Precursors in the El Paso Area	**PROJECT #**	24-024
PROJECT PARTICIPANTS	Pawel Misztal, Lea Hildebrandt-Ruiz, David Sullivan, Elena McDonald-Buller, Yosuke Kimura	**DATE SUBMITTED**	01/10/2025
REPORTING PERIOD	**From:** 12/01/2024 **To:** 1/09/2025	**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

Task 1:

- Analyzed wind patterns (see previous MTRs) and available data to guide mobile track design and optimization
- Discussed and optimized driving routes on modeling results (see previous MTRs and Task 2b below)
- Assembled waypoints and areas of interests (e.g. TCEQ sites, City of El Paso sites, certain sources of interests such as rail depots and warehouses onto one map including planned driving routes (Figure 1). The full map can be accessed here https://www.google.com/maps/d/u/0/edit?mid=13ewCnkAXJYB_n6KrBb7oeXLXQkUnYqQ&ll=31.7953248119333%2C-106.54676681688365&z=11
- Prepared the mobile van for measurements, secured and strapped instruments, batteries charged, and secured (3 independent circuits), inspected the van and pumped the wheels to recommended pressures.
- Booked AirBnB near UTEP for the measurement team and van's stationary measurements.
- Coordinated sighting of the UTEP site.
- Explored RV parks for potential charging of the van while taking stationary measurements overnight.
- Purchased consumables for the field.
- Perfomed practice drives on battery circuits before setting off to El Paso.
- All core and standby team members applied and received travel authorizations.
- The team schedule and logistics finalized. https://docs.google.com/spreadsheets/d/1mEcRr9zG51ok5nnde08AkZiTP3Jueps8Fm_FuG_bsb0/edit?gid=0#gid=0

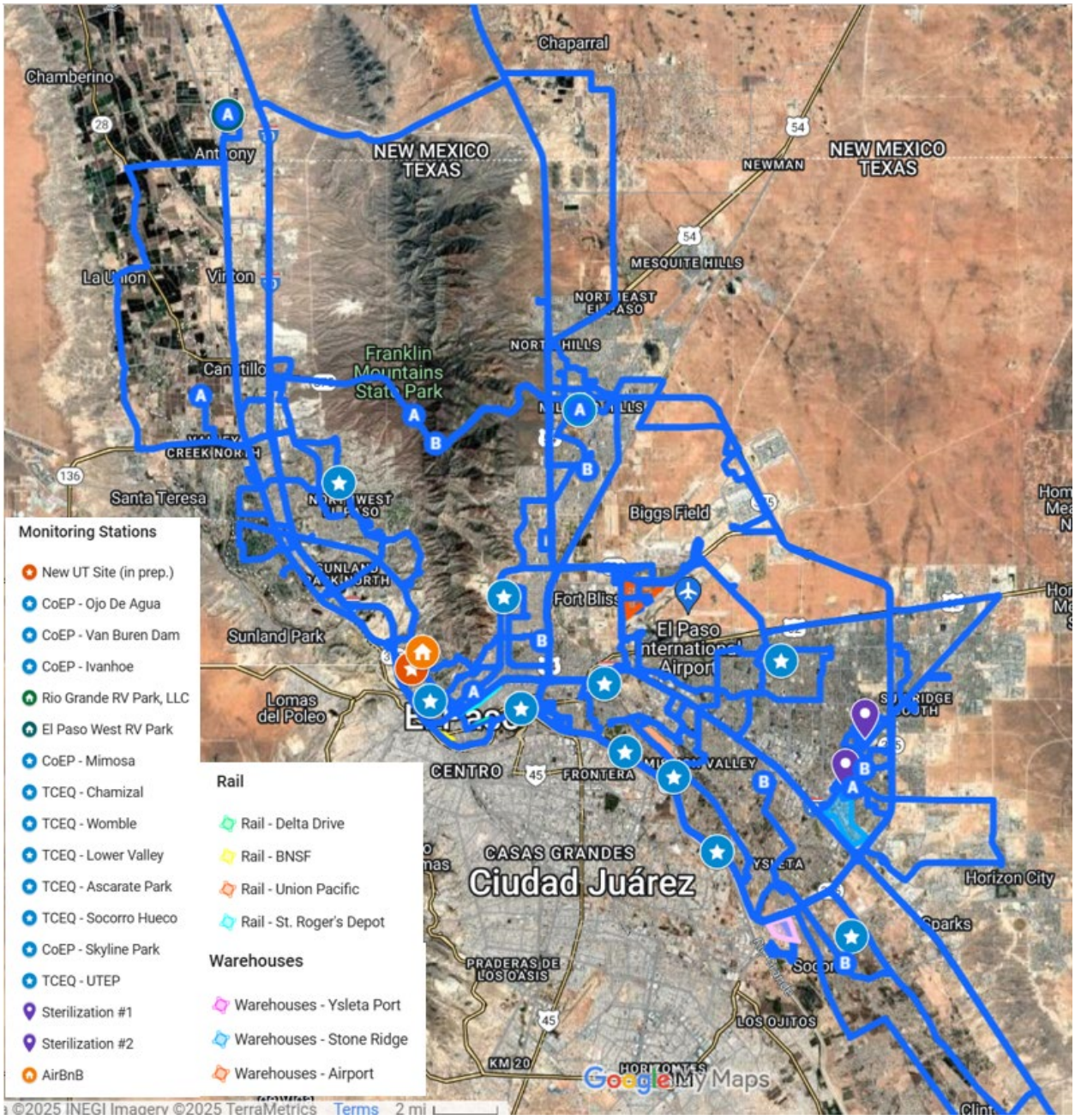


Figure 1. Planned driving routes overlayed on the TCEQ & City of El Paso air monitoring stations, points of interests, anchor points. Red star shows the new UTEP/UTA site and orange house represents AirBnB close to the campus.

Task 2a:

- Wind direction and toluene patterns examined at different monitoring stations.
- While stations far from the border did not exhibit clear directionality of toluene concentrations, the analysis on the near-border Chamizal Station showed distinct increases in toluene during southerly winds, indicating a potential foreign origin (Figure 2)

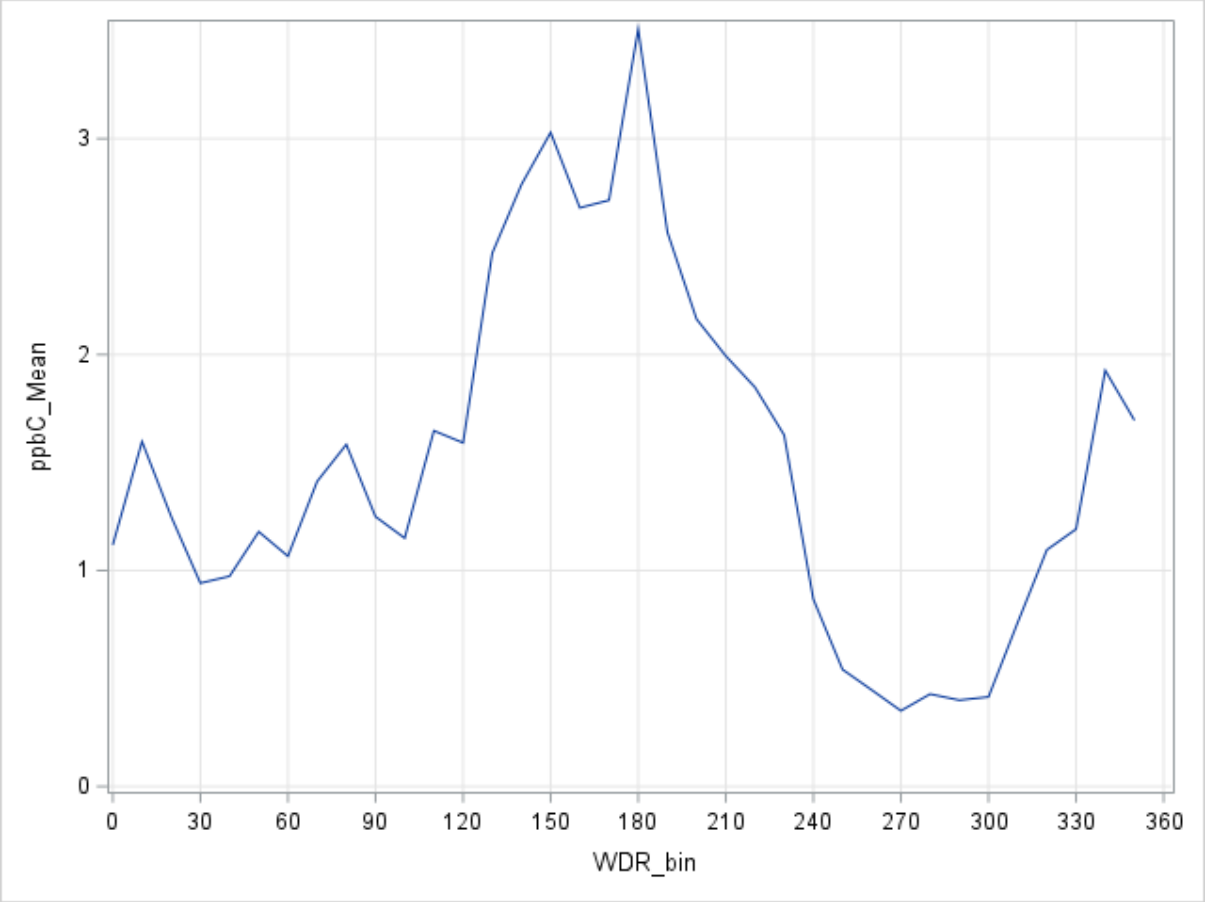


Figure 2. Wind directionality of the average toluene concentration at Chamazal monitoring station for Jan. 2022 to June 2024 at Chamizal Station.

Task 2b:

Emissions of carbon monoxide, nitrogen oxides (NO_x), total volatile organic compounds (VOC), sulfur dioxide (SO_2), fine particular matter ($PM_{2.5}$), toluene, and ethylene oxide (EtO) within the 4-km domain (Figure 4) were obtained from the EPA 2022v1 emissions modeling platform (https://www.epa.gov/air-emissions-modeling/2022v1-emissions-modeling-platform) and processed with 1-km grid cell resolution. Daily average emissions from all source categories collectively by pollutant during January-March of 2022 are shown in Figure 5. Similar maps of VOC emissions by individual source categories are shown as an example in Figure 6 and are available for other pollutants via: https://utexas.box.com/s/vogirq92qu8gb42pctgjplekuumgon03. Quality assurance of the emissions processing is ongoing. Additional information, including identification of specific industrial point source contributions, is being developed to assist the observation team.

Task 3:

- The campaign started on Jan 3 when the team set off from Austin to El Paso. As the van is electric with ~110 miles range, it took the team 1.5 days to reach El Paso on Jan 4 evening.
- Initial days of the campaign have gone smoothly and minor challenges were solved on the fly. The major challenge was unexpectedly cold weather in El Paso often with subzero temperatures (< 0 °C) and strong winds.
- To keep the instruments comfortable the electric van provided heat from A/C system requiring much energy and fast charging. The energy requirements for charging the van were fulfilled at the RV stations (Santa Teresa, NM) and Roadrunner RV in East El Paso where the team initially kept the van overnight. We have been continuously measuring during mobile and stationary measurements as of now with 0% downtime.
- We sighted the UTEP site which looks perfect for stationary measurements. The power was not yet available during sighting but it has been coordinated to house the van during the second week of campaign assuming there is power. The trailer to house auto-GC was delivered and installed on January 9th.
- The team initially stayed in West El Paso and since January 7th at AirBnB in the vicinity of the UTEP campus. The Airbnb allowed for charging the van and powering instruments and has been a good anchor point for mobile measurements.
- The initial findings are fascinating. We completed a large portion of the planned tracks and fingerprinted numerous sources downwind as well as collocated with several monitoring stations. Example pictures are shown in Figure 3. As we were driving down on trans-mountain track, we saw burning plume of a house on fire. As we drove to the plume the Vocus observed very high concentrations of various burning markers (furan, furfural, acetonitrile, benzene) as well as high PM concentrations on HR-TOF-AMS. Other sources included waste water treatment plants (high alkyl mercaptans, low aerosol), oil and gas refineries (benzenes, naphthalenes, etc.). The notable increases in ethylene oxide were observed downwind of a sterilization facility in East El Paso. Further campaign is ongoing with the team returning to Austin on January 20th.

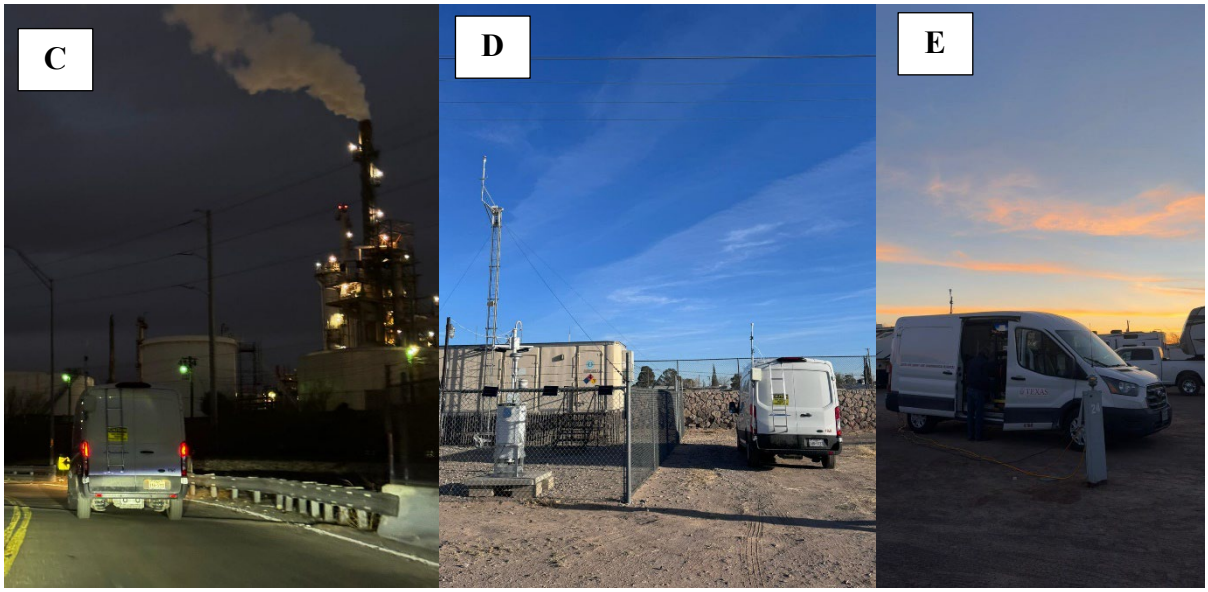


Figure 3. Photographs showing the UT mobile lab in (A) driving down the trans mountain drive; (B) near the house fire; (C) near refineries; (D) colocation with Chamizal TCEQ station; (E) charging and measurement at Roadrunner RV.

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

The measurement team is currently measuring in the field campaign in El Paso. As the winds so far were northerly and easterly, we prioritized tracks focused on intra El Paso sources. As the wind is predicted southerly in the next days we will measure along the US – Mexico border to confirm higher toluene as well as source apportionment of foreign advections.

The modeling team is continuing to process emissions data to support the field campaign. The El Paso-Juarez Comprehensive Air Quality Model with Extensions (CAMx) platform, which leverages the US Environmental Protection Agency (EPA) Office of Air Quality Planning and Standards (OAQPS) 2022 modeling platform (https://registry.opendata.aws/epa-2022-modeling-platform/) is being developed. The next activities will include windowing the outer West Texas domain and preparing three-dimensional boundary conditions and meteorological fields from the Weather Research and Forecasting Model (v4.4.2) from the 12-km CONUS simulation.

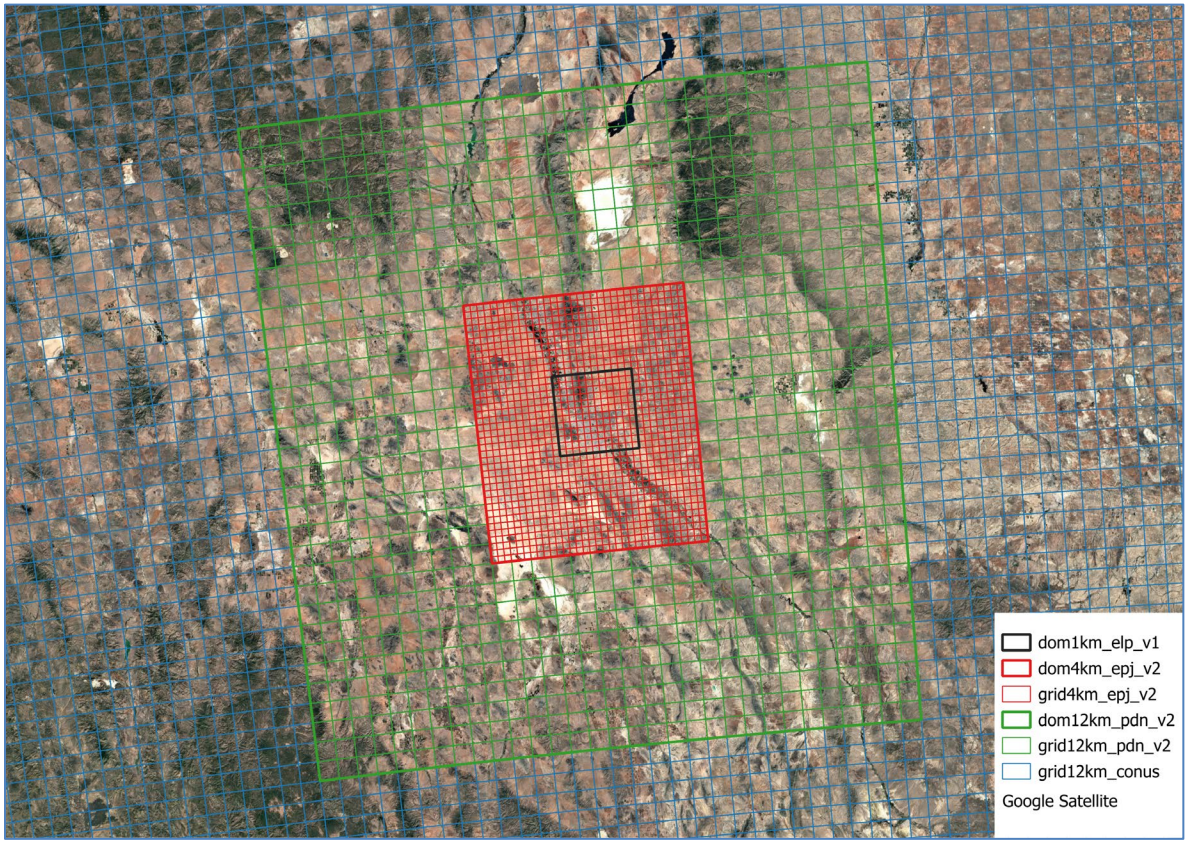


Figure 4. 12-km West Texas domain (green) with 4-km nested domain (red) and 1-km El Paso-Juarez innermost domain (black). The 12-km West Texas domain will be windowed from the existing 12-km CONUS grid of the EPA OAQPS 2022 modeling platform (blue).

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**

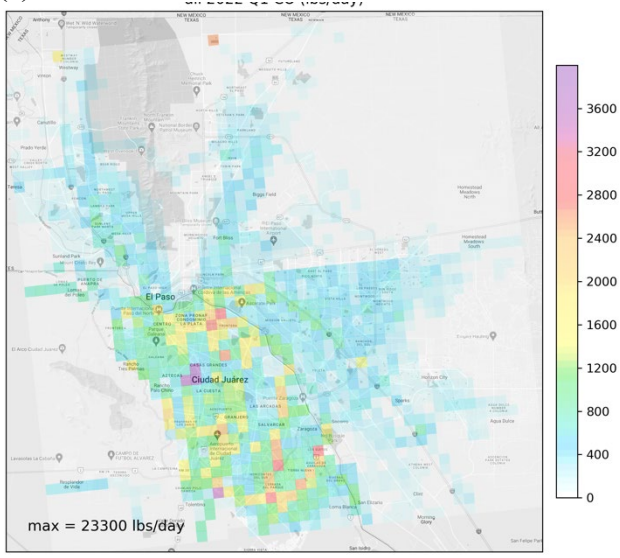
Describe any possible concerns/issues (technical or non-technical) that AQRP should be made aware of.

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?

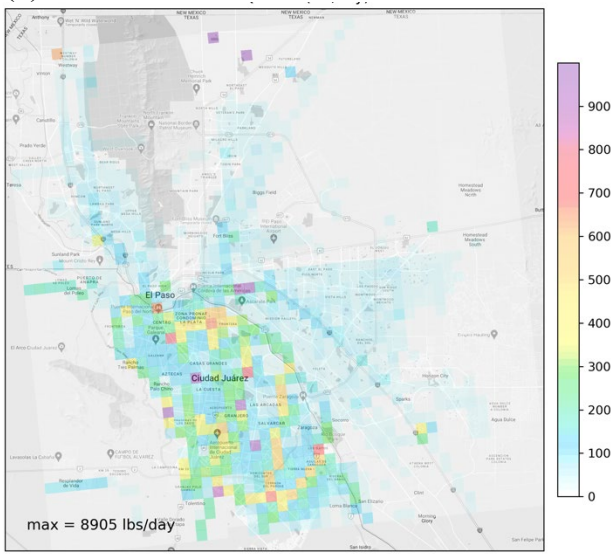
☒ **Yes** ☐ **No**

Submitted to AQRP by
Pawel Misztal

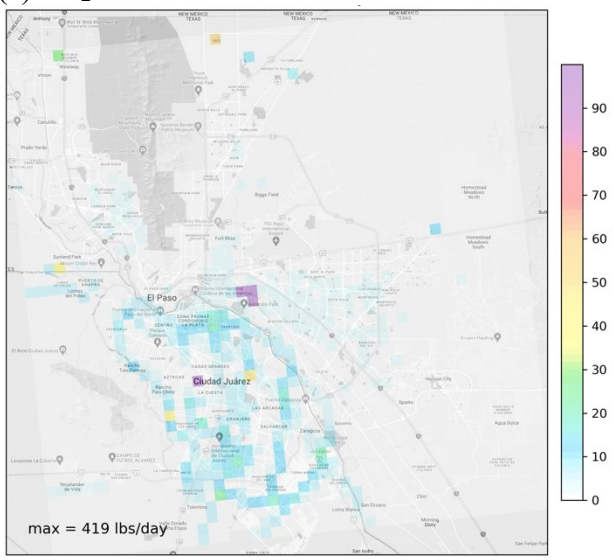
(a) CO



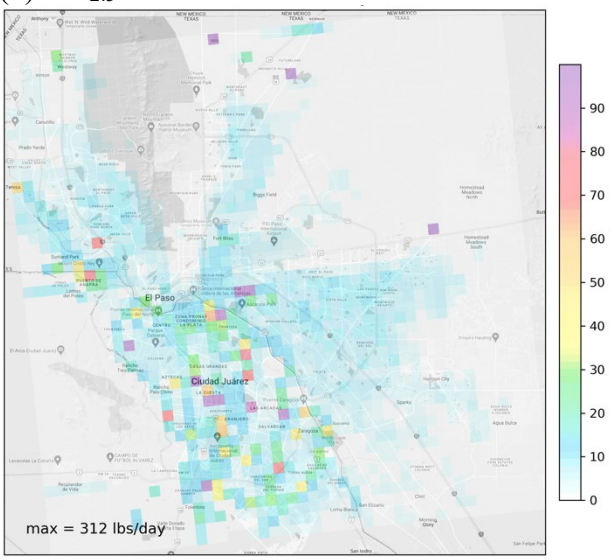
(b) NOx



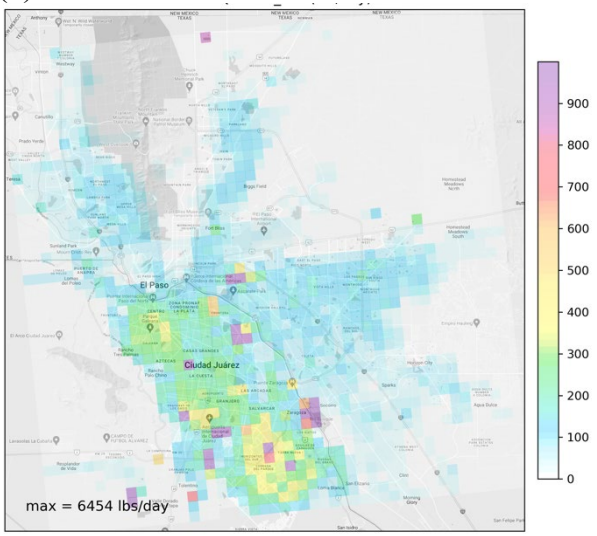
(c) SO_2



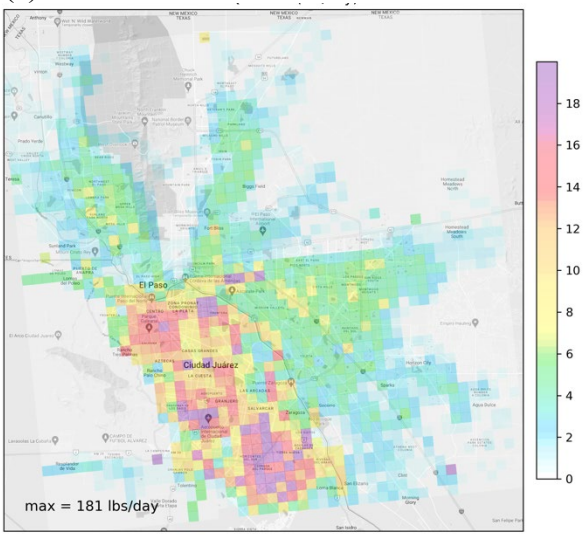
(d) $PM_{2.5}$



(d) VOC



(e) Toluene



(f) Ethylene oxide

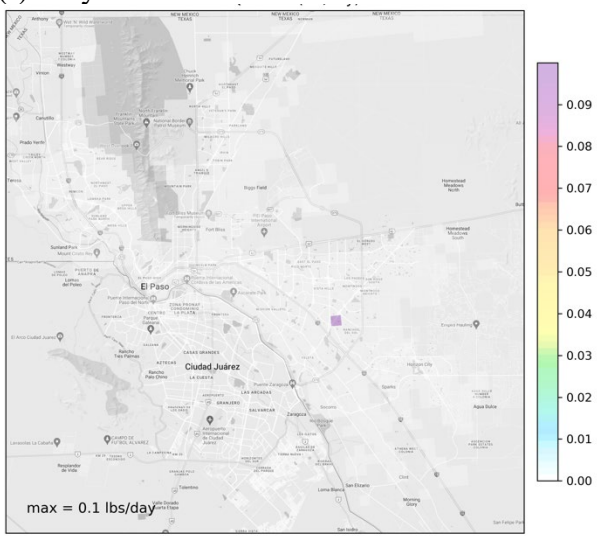
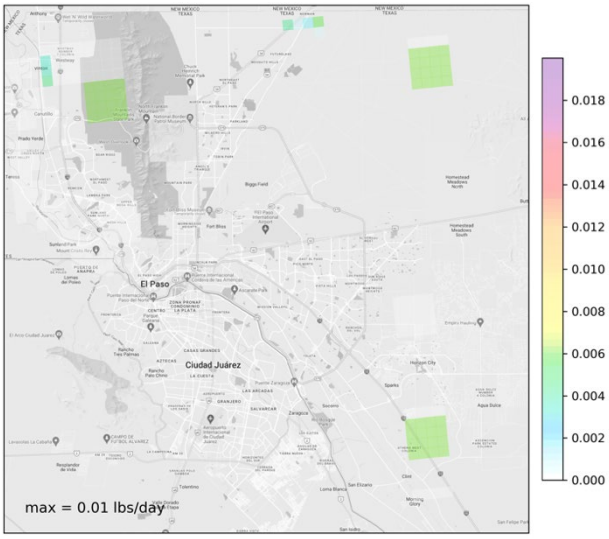
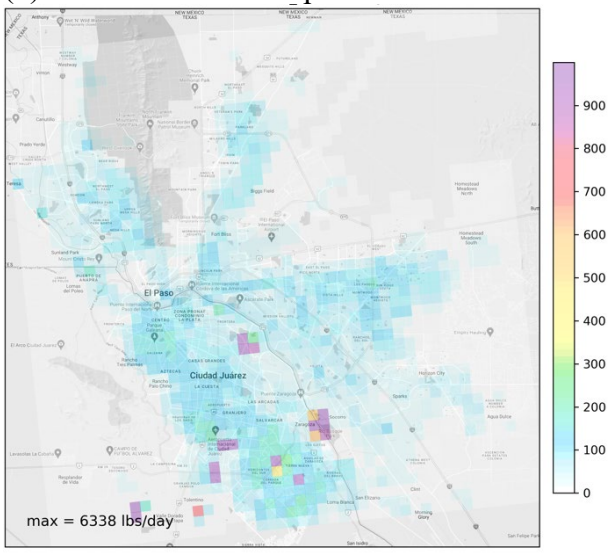


Figure 5. Daily average emissions (lbs/day) of (a) CO, (b) NOx, (c) SO_2, (d) VOC, (e) toluene, and (f) ethylene oxide from all contributing source categories in the EPA 2022 inventory within the 4-km domain. Emissions are shown at 1-km grid cell resolution. Note differences in scales between plots.

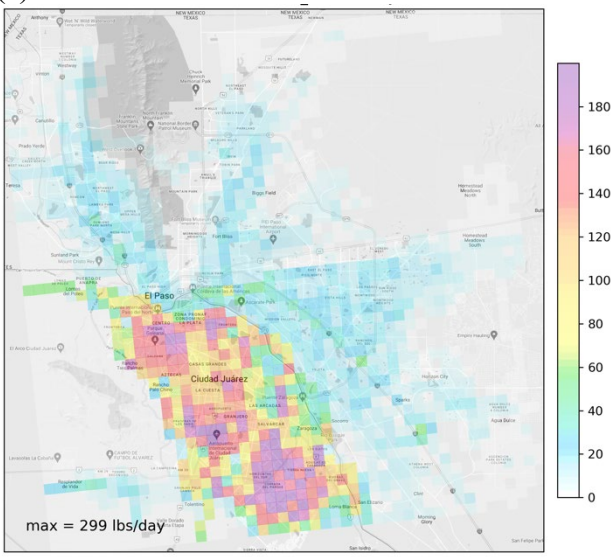
(a) VOC: Nonpoint oil and gas



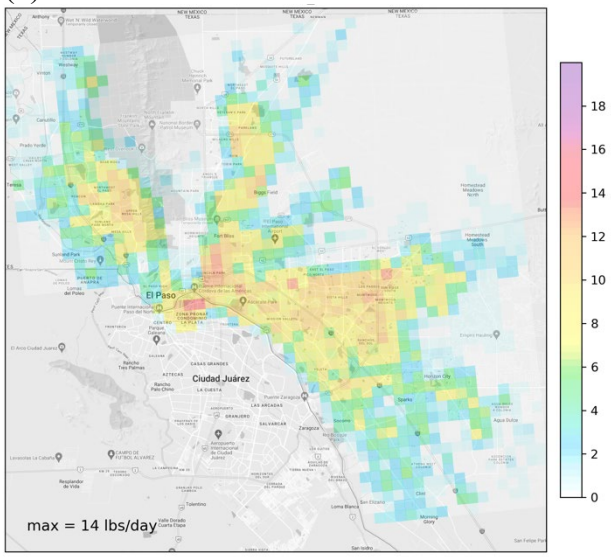
(b) VOC: All other nonpoint sources



(c) VOC: Onroad



(d) VOC: Nonroad



(e) VOC: Point

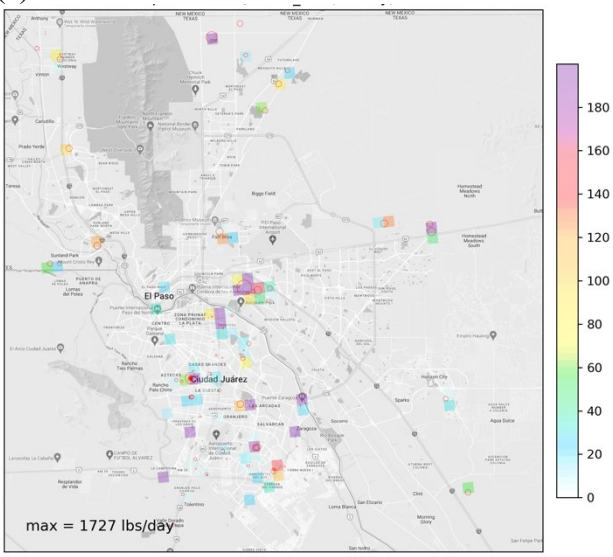


Figure 6. Daily average VOC emissions (lbs/day) from (a) nonpoint oil and gas, (b) all other nonpoint, (c) onroad, (d) nonroad, and (e) point sources in the EPA 2022 inventory within the 4-km domain. Emissions are shown at 1-km grid cell resolution. Locations of point sources in Figure 3e are also shown sized by relative magnitude of VOC emissions. Note differences in scales between plots.