

# AQRP Monthly Technical Report

<b>PROJECT TITLE</b>	Novel Observations and Quantified Source Apportionment of Ozone, Particulate Matter and Contributing Precursors in the El Paso Area	<b>PROJECT #</b>	24-024
<b>PROJECT PARTICIPANTS</b>	Pawel Misztal, Lea Hildebrandt-Ruiz, David Sullivan, Elena McDonald-Buller, Yosuke Kimura	<b>DATE SUBMITTED</b>	8/10/2025
<b>REPORTING PERIOD</b>	<b>From:</b> 7/1/2025 <b>To:</b> 7/31/2025	<b>REPORT #</b>	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 15<sup>th</sup> of the month following the reporting period shown above.

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## Detailed Accomplishments by Task for reporting period

### Task 2b:

During the month of August, the modeling team evaluated predictions from the Comprehensive Air Quality Model with Extensions (CAMx) platform for El Paso and Juárez against measurements at ambient monitoring stations for the 2022 base year. Interannual trends in measured pollutant concentrations between 2021-2024 were also characterized. Dominant sources of PM<sub>2.5</sub> and toluene emissions in El Paso and Juárez were identified in the U.S. Environmental Protection Agency (EPA) 2022v1 inventory and used to identify potentially missing or underrepresented sources. A CAMx simulation with the Reactive Tracer (RTRAC) algorithm indicated the potential importance of international on-road, area, and industrial point source emissions to elevated toluene concentrations in El Paso, with variability in the contributions from domestic sources between locations depending on prevailing meteorology. The modeling team worked on Quality Assurance/Quality Control (QA/QC) activities in accordance with the Quality Assurance Project Plan (QAPP) and the draft final report. Collaborative assessments also began, which are overlaying model predictions with mobile measurements collected during this study to examine spatial patterns.

### Task 3 and Task 4: Completed

All proposed mobile and stationary measurements were successfully conducted during the winter and summer campaigns. No additional field deployments occurred in August. The observational effort is now focused entirely on post-campaign data analysis and integration in preparation for the final report.

### Task 5:

The observation team concentrated on final quality assurance and quality control of datasets from both campaigns, following the workflows developed during the winter deployment to ensure consistency for seasonal comparisons. This included final processing and application of instrument calibrations, review of time-series alignment between mobile and stationary platforms, geolocation data, and harmonization of gas-phase and particle-phase datasets with regulatory monitoring data. Co-located comparisons between the Vocus proton transfer reaction

time-of-flight mass spectrometer (Vocus PTR-TOF-MS) and the University of Texas at El Paso (UTEP) auto-gas chromatograph (Auto-GC) were completed, confirming excellent agreement for key volatile organic compounds (VOCs) (e.g., toluene within 5%), providing confidence in cross-instrument calibration.

#### **Task 6:**

During this reporting period, the observation team focused on completing quality assurance and quality control of datasets from both the winter and summer campaigns, integrating mobile, stationary, and long-term regulatory monitoring records. Much of the period was devoted to synthesizing results and preparing the draft final report.

Integrated analyses indicate that PM<sub>2.5</sub> in El Paso is dominated by crustal dust (>30% of mass), with substantial contributions from light-duty and heavy-duty vehicle emissions (~15% and ~13%, respectively), biomass burning, and secondary inorganic aerosols (ammonium sulfate ~12%, ammonium nitrate ~4%). VOC mapping and diurnal analyses reveal that aromatic hydrocarbons are key ozone and secondary aerosol precursors, with elevated nighttime levels from transboundary drainage flows out of Juárez and higher afternoon C<sub>8</sub>/toluene ratios linked to local traffic. Reduced sulfur compounds (e.g., ethanethiol + DMS) are localized to wastewater treatment and agricultural sources. More maps not previously shown are included in the Appendix Figure A1 with VOC attributions in Appendix Table A1. The maps show spatial patterns for 42 prominent VOCs. Toluene showed spatial similarities in both seasons and similar patterns were observed for various aromatics. Some VOCs such as burning markers and biogenics often showed different seasonal patterns. The spatial distributions of observed VOC concentrations are also reflected by how emission sources were distributed and wind patterns. Observational integration focused on analyzing plumes together using speciated particulate matter with a diameter of 1 micrometer or less (PM<sub>1</sub>) data from high-resolution aerosol mass spectrometer (HR-TOF-AMS) and the comprehensive VOC data.

The combined observational and CAMx RTRAC modeling results suggest that ozone formation in the El Paso–Juárez region is largely VOC-limited, with both local and cross-border VOC emissions playing critical roles in episodic high-ozone events. This conclusion is supported by observed spatial-temporal patterns, model sensitivity to VOC inputs, and prior studies in the region. Further source apportionment on both gas-phase and speciated PM<sub>1</sub> data would help understand contributions of each source category and quantify the degree of influence of transboundary sources from Juarez and New Mexico.

These findings highlight the importance of binational strategies targeting dust suppression, vehicular emissions, and industrial VOC controls to improve compliance with updated PM<sub>2.5</sub> and ozone standards.

#### **Preliminary Analysis**

As described above.

#### **Data Collected**

No

#### **Identify Any Problems or Issues Encountered and Proposed Solutions or Adjustments**

None

#### **Goals and Anticipated Issues for the Succeeding Reporting Period**

The modeling and observation teams will complete remaining analyses and respond to comments from the AQRP and TCEQ review of the draft final report. A presentation will be prepared and given at the AQRP workshop on August 26, 2025. The final project report will be submitted on August 31st.

### **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.**

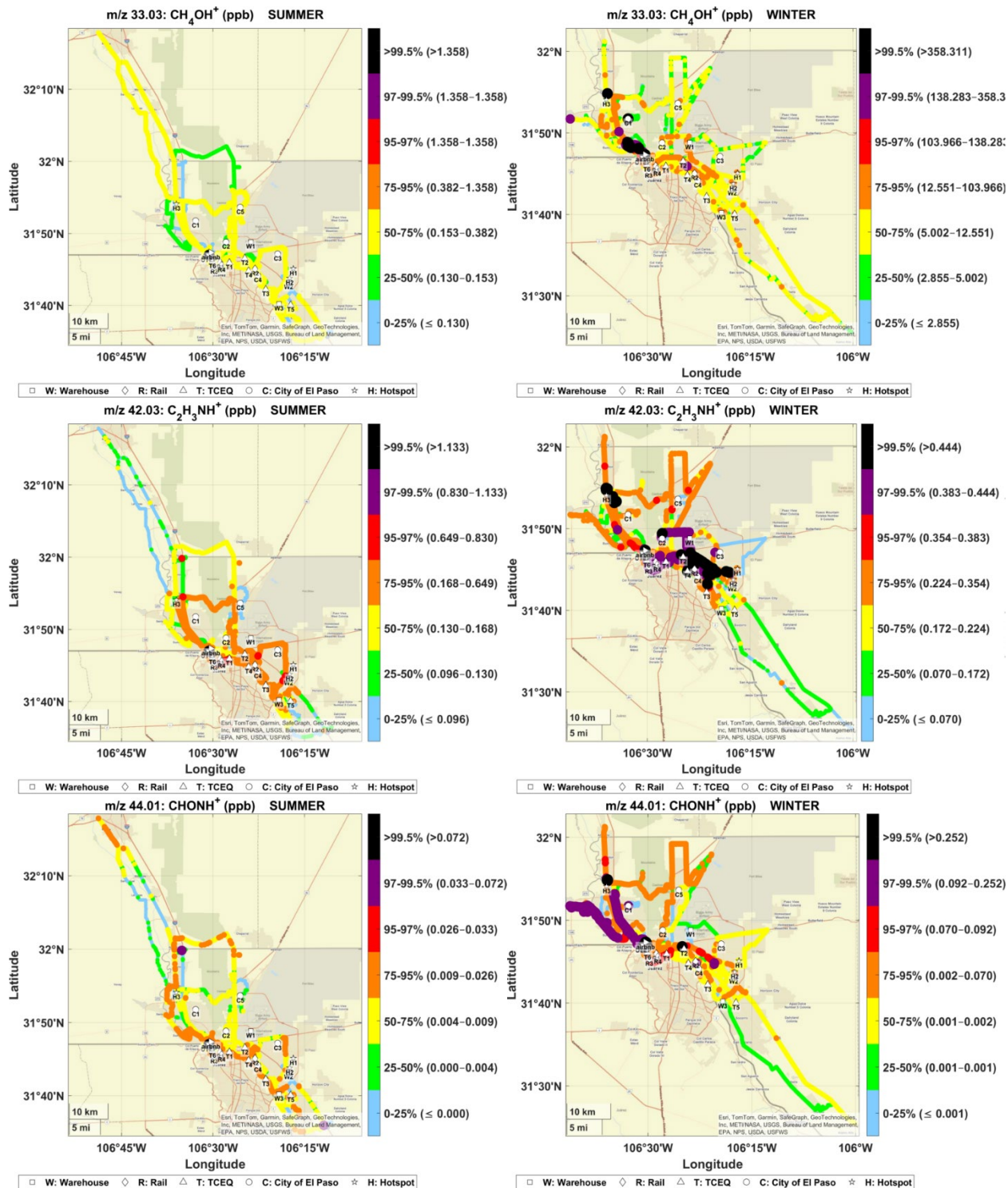
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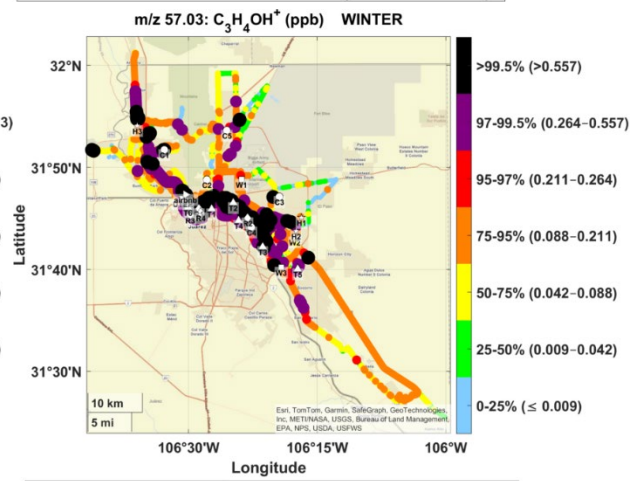
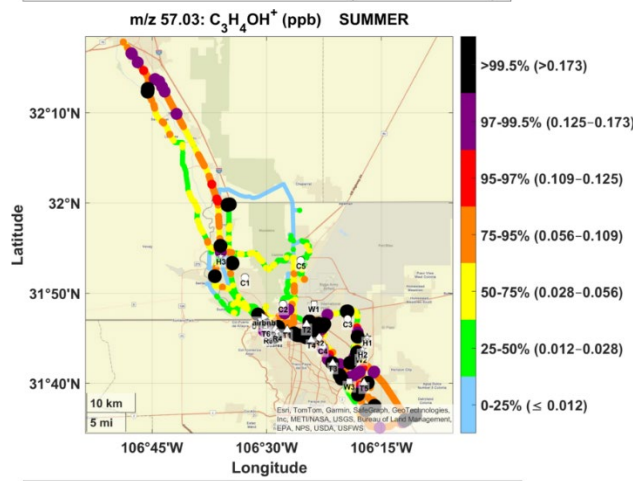
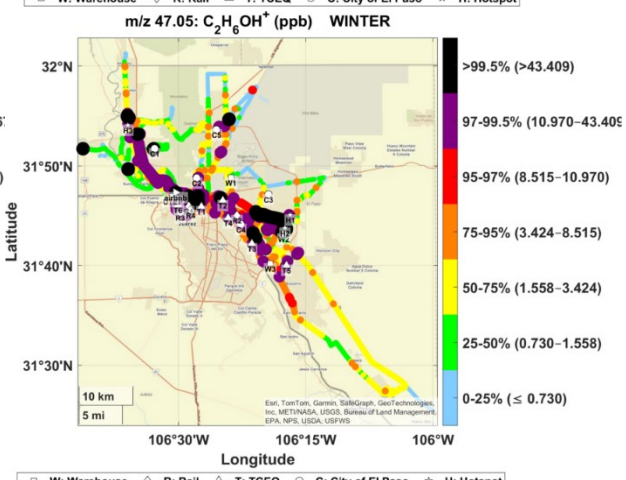
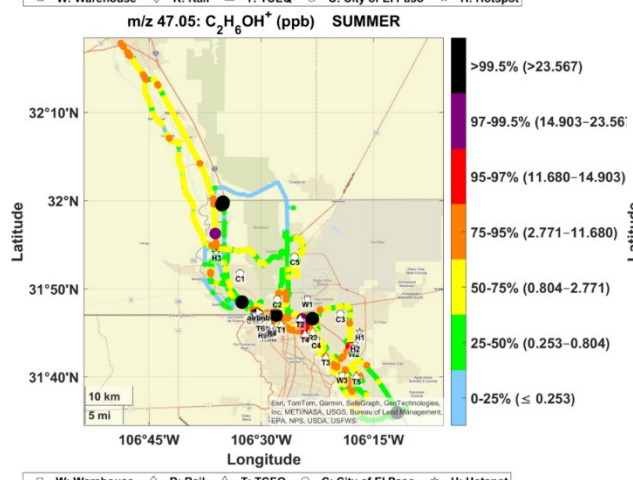
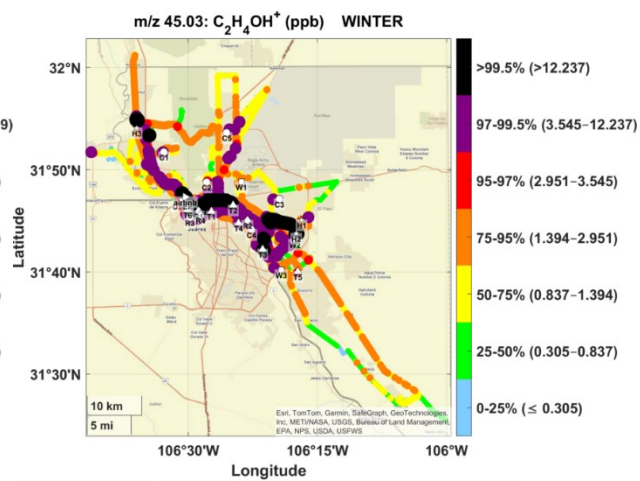
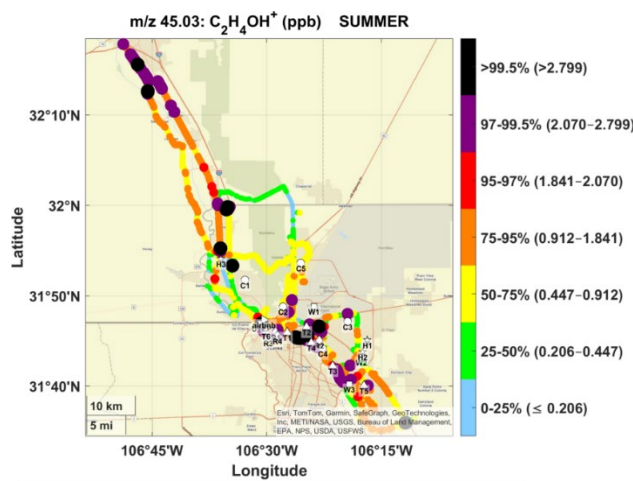
**Describe any possible concerns/issues (technical or non-technical) that AQRP should be made aware of.**

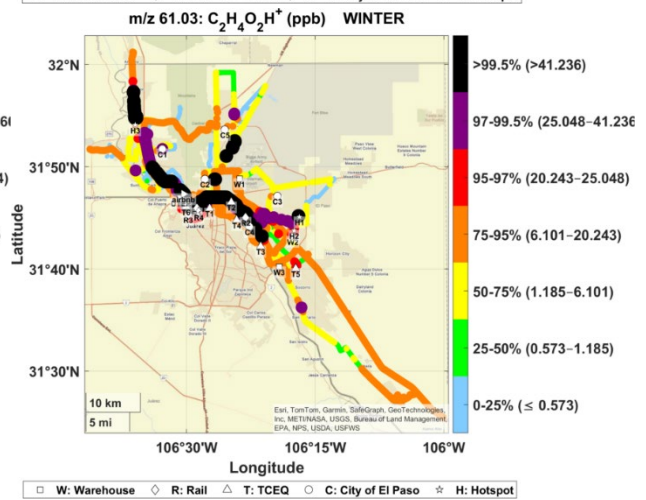
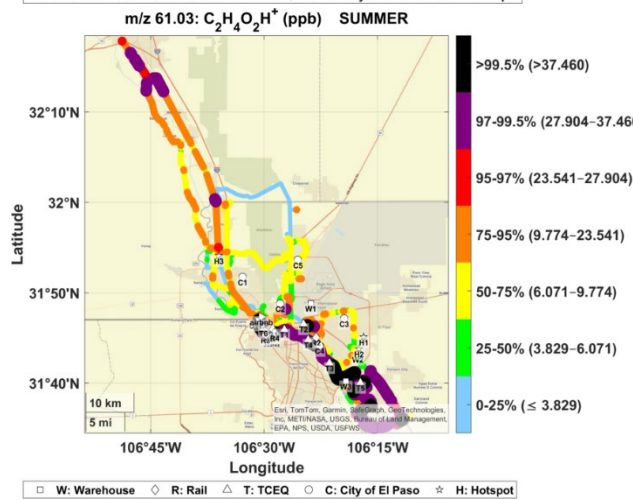
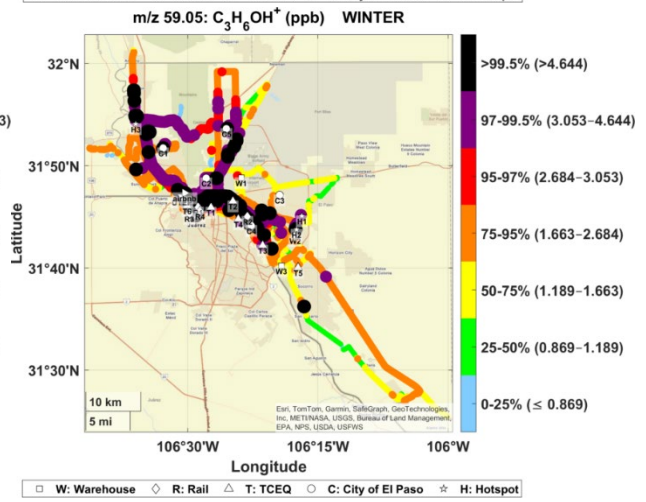
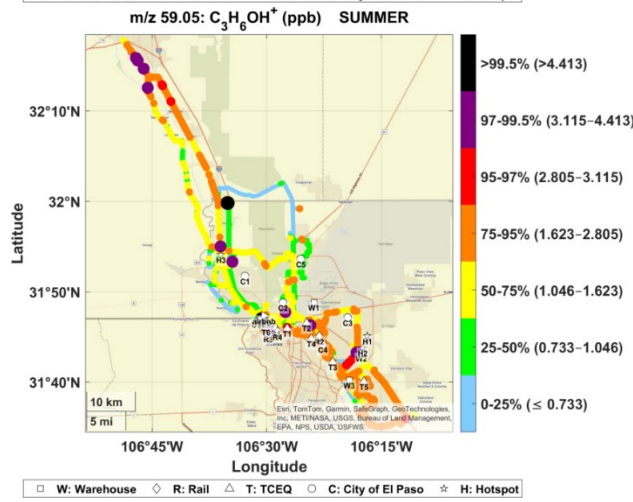
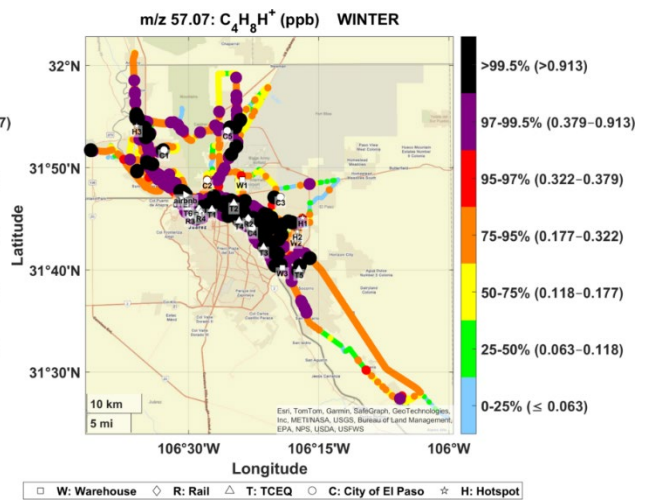
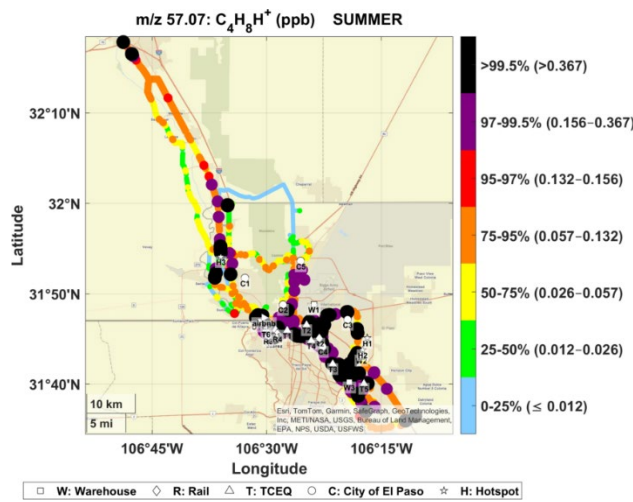
**Are you anticipating using all the available funds allocated to this project by the end date? If not, why and approximately what is the amount to be returned?**

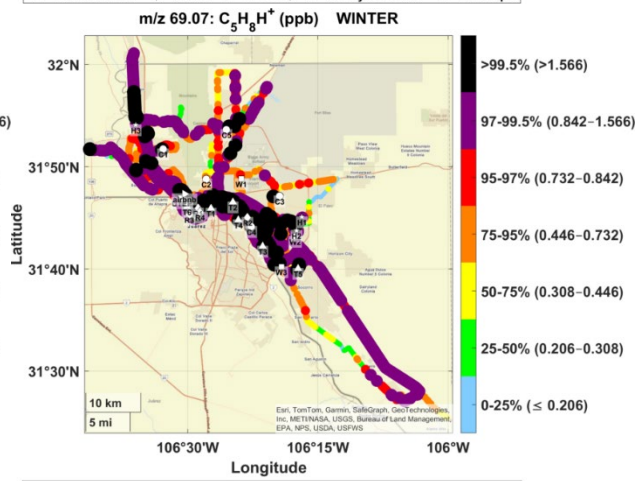
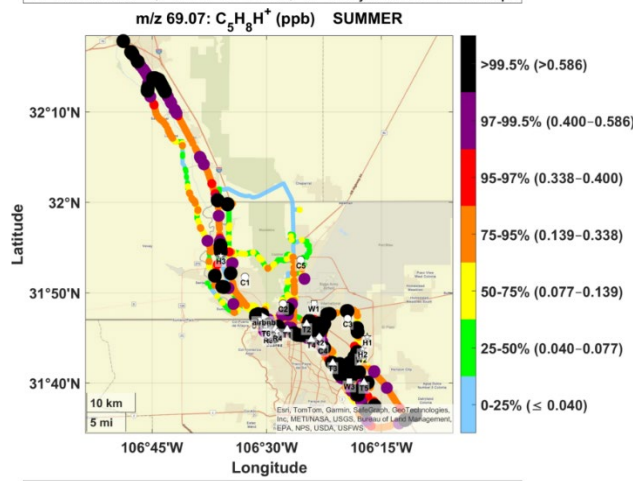
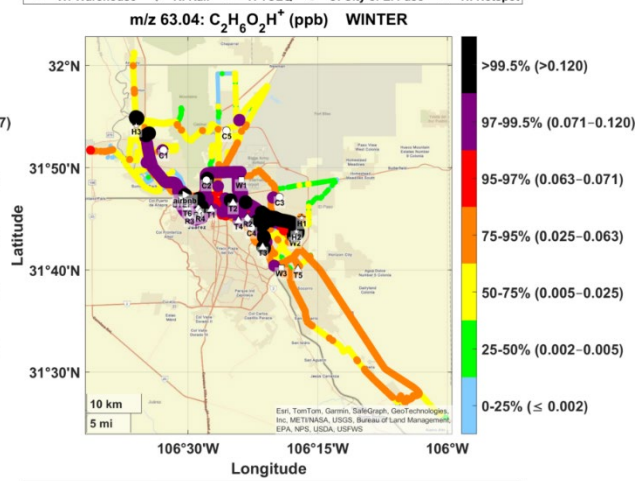
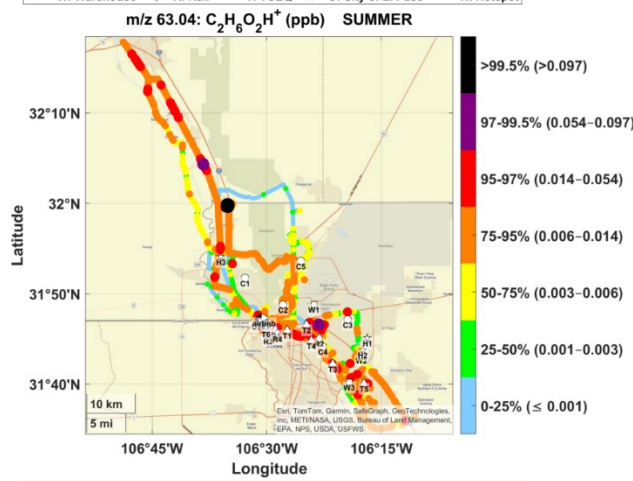
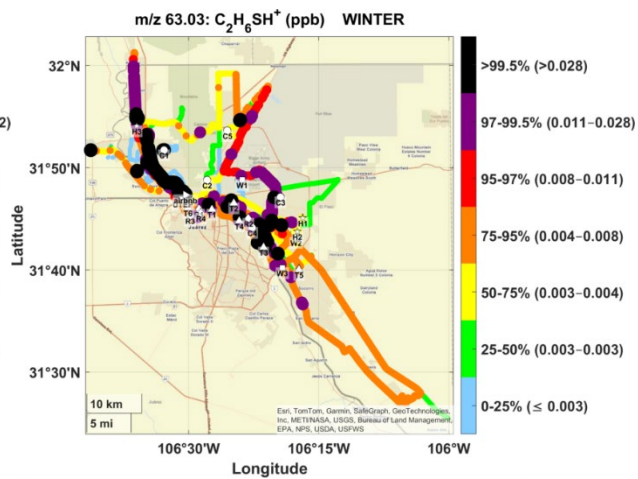
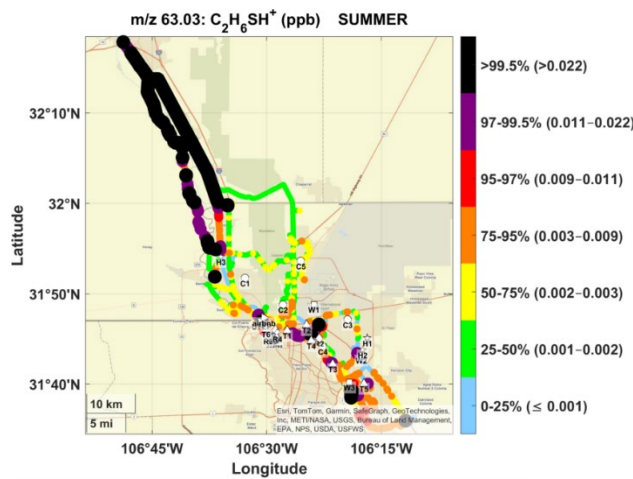
Yes       No

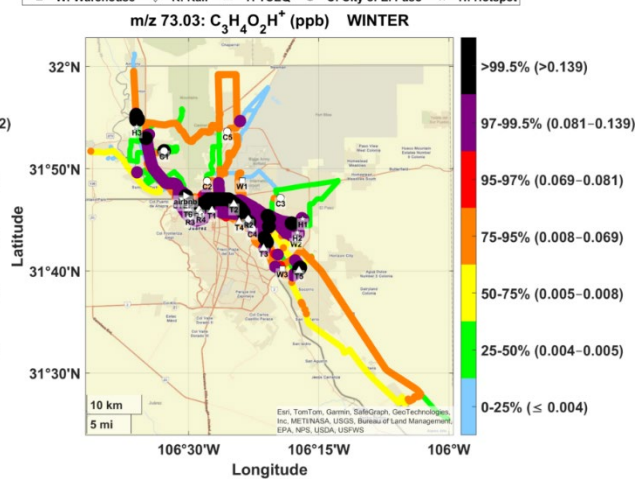
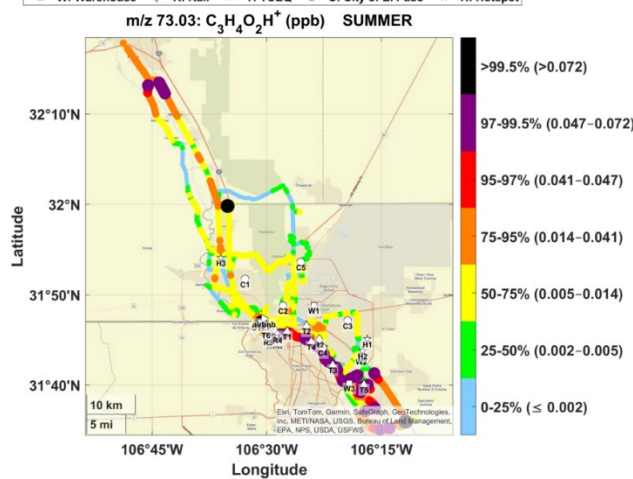
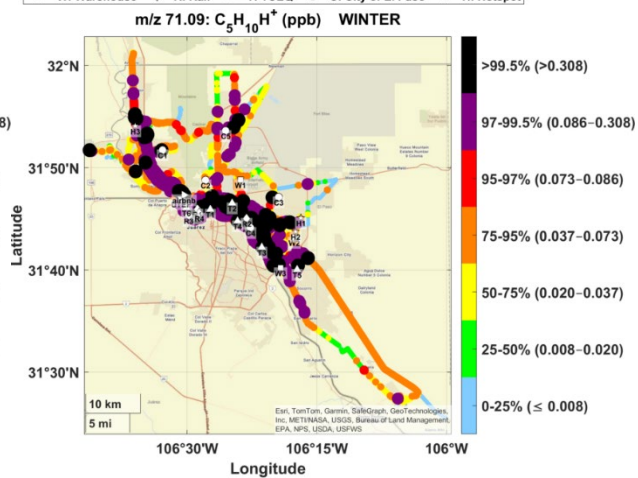
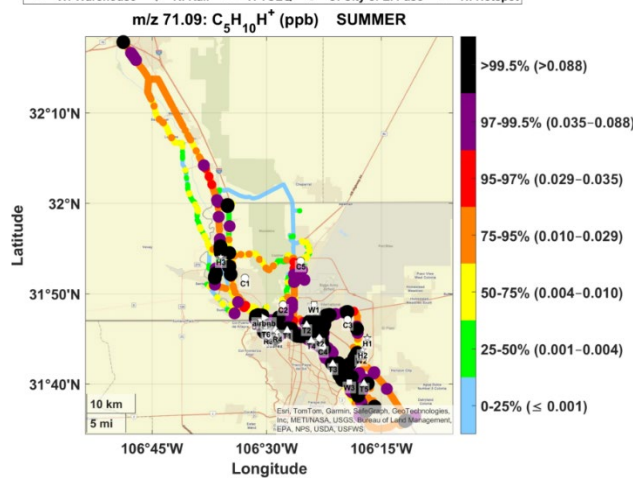
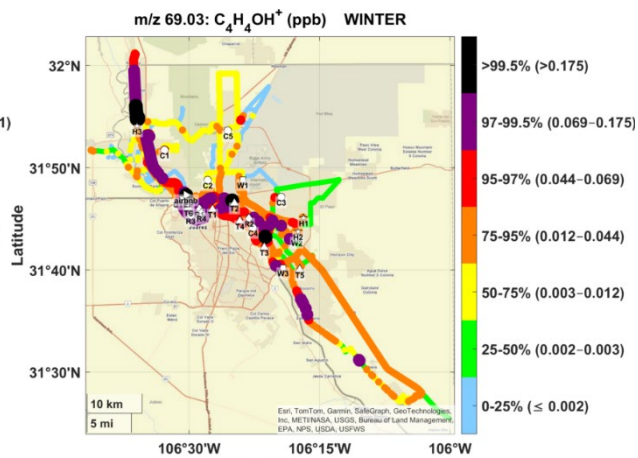
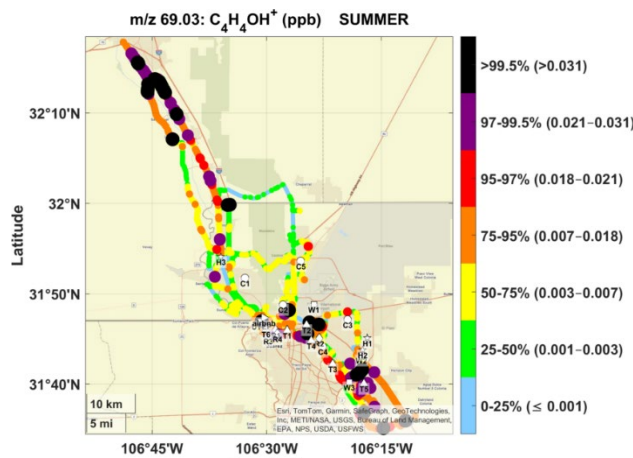
**Appendix A.** Spatial observation maps (percentile and ppb) for prominent ions in summer and winter.

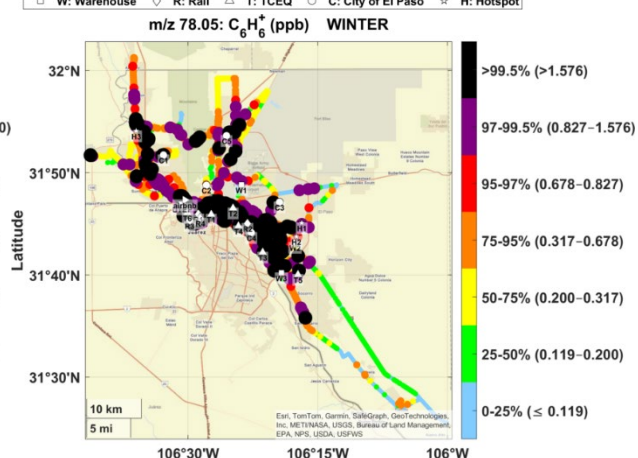
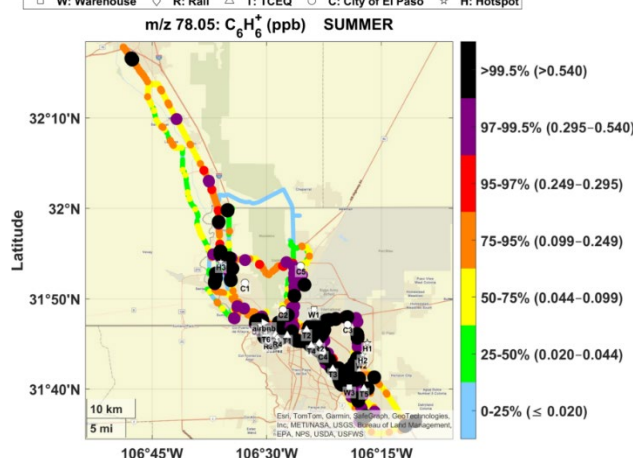
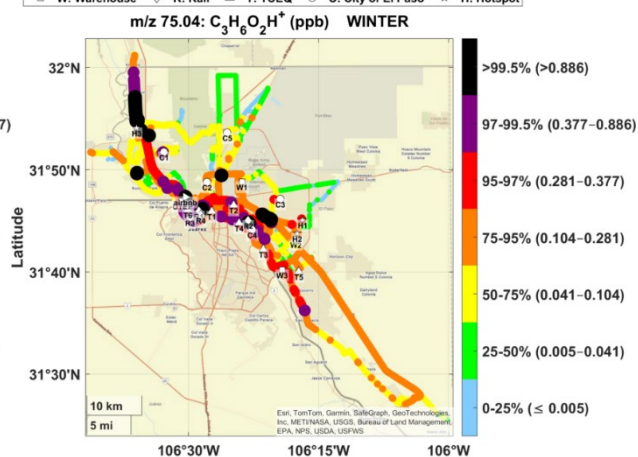
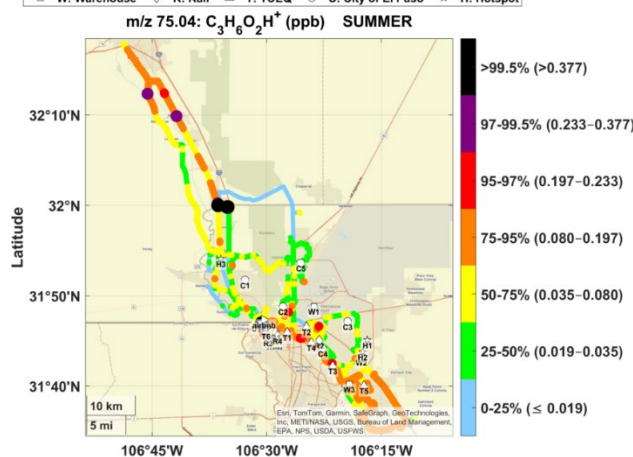
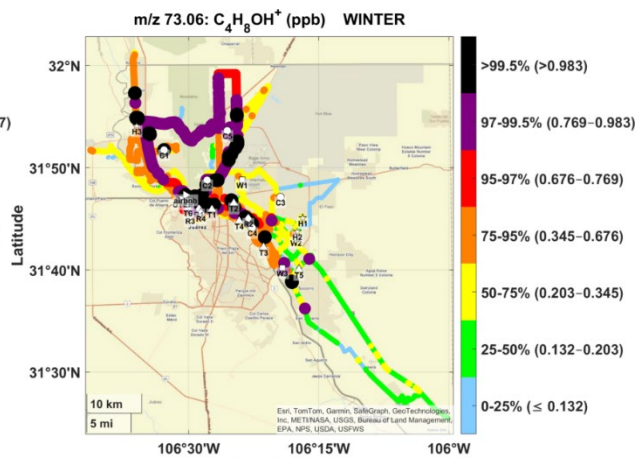
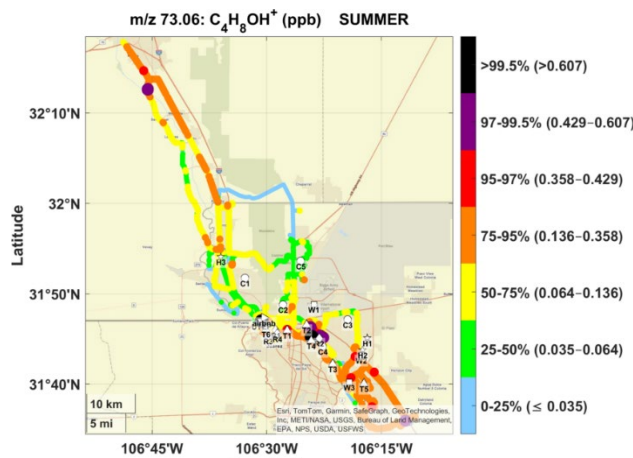


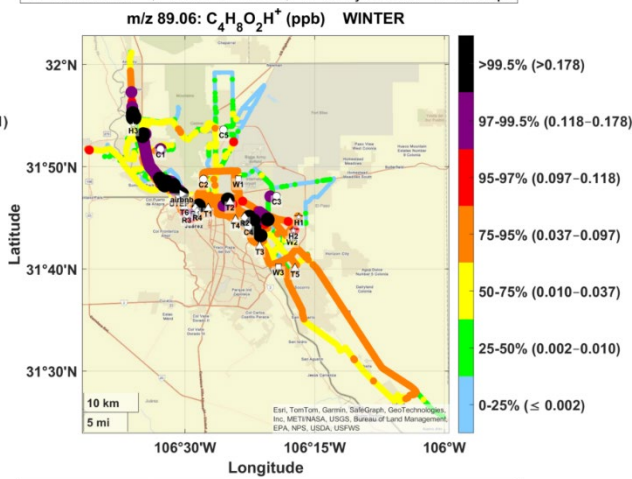
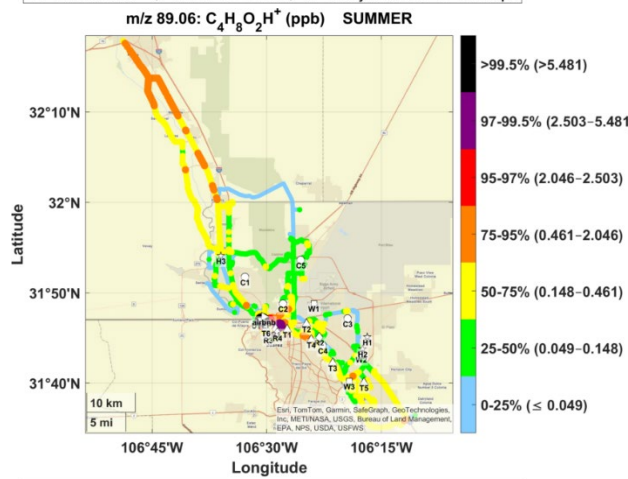
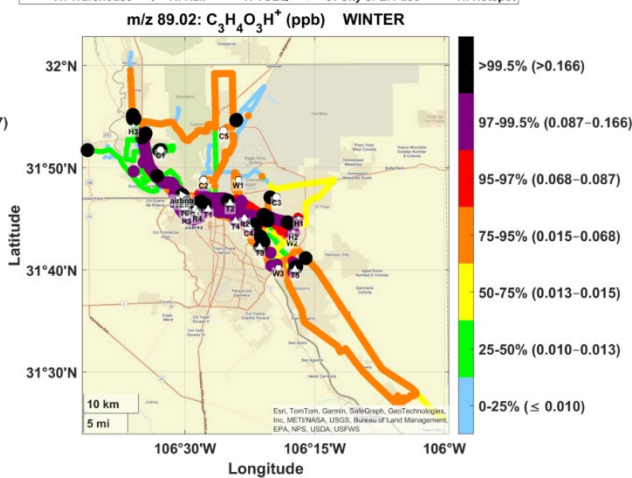
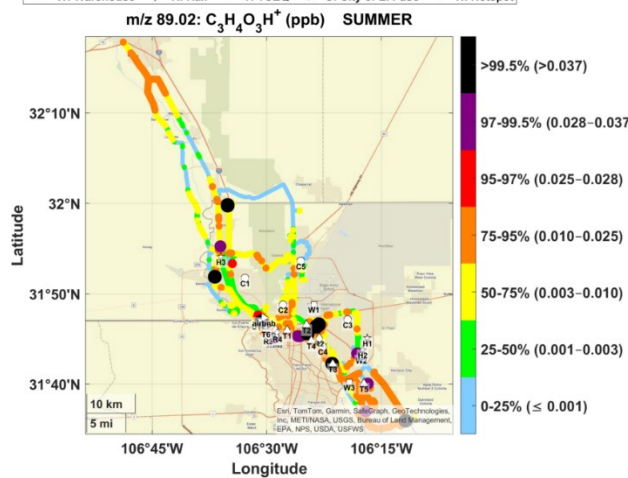
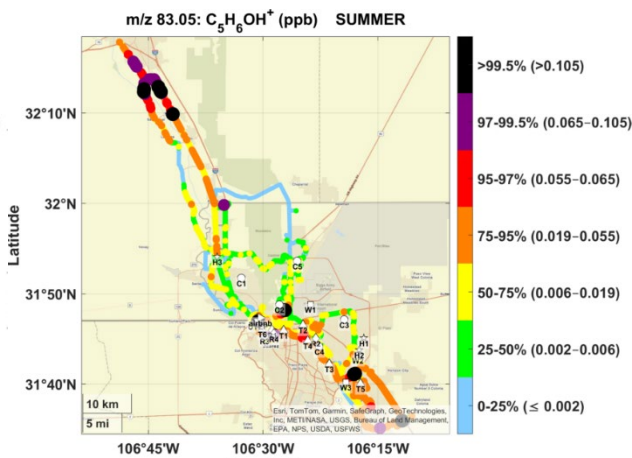
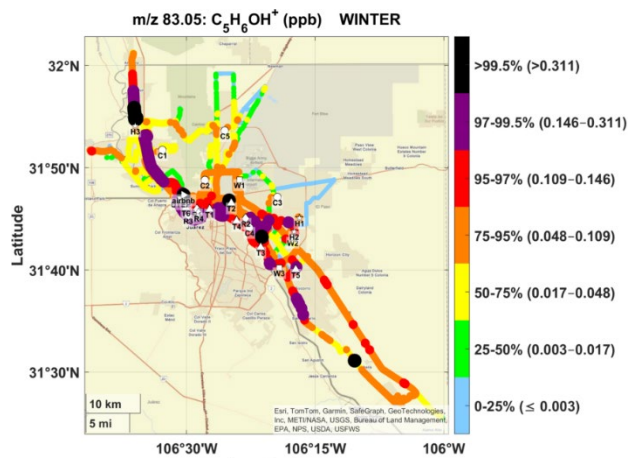


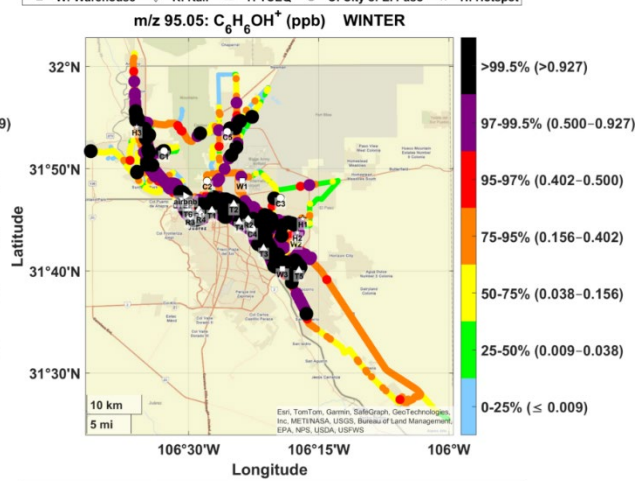
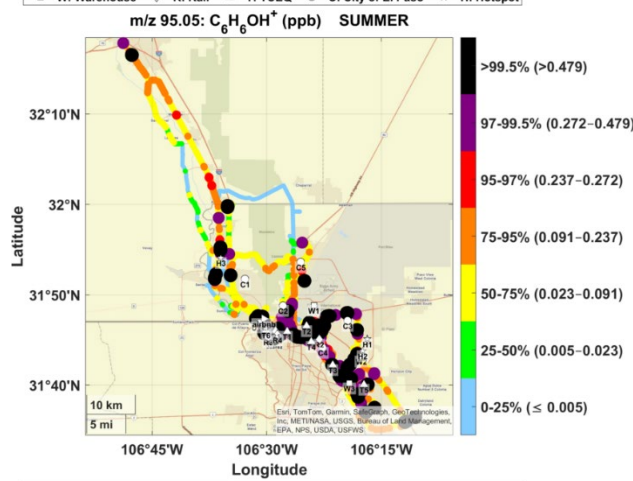
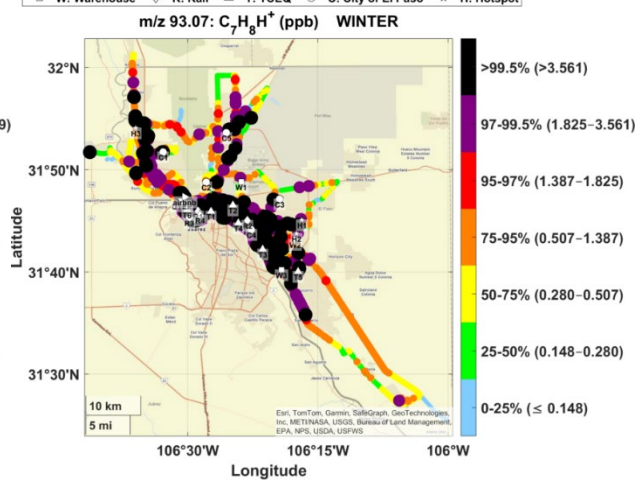
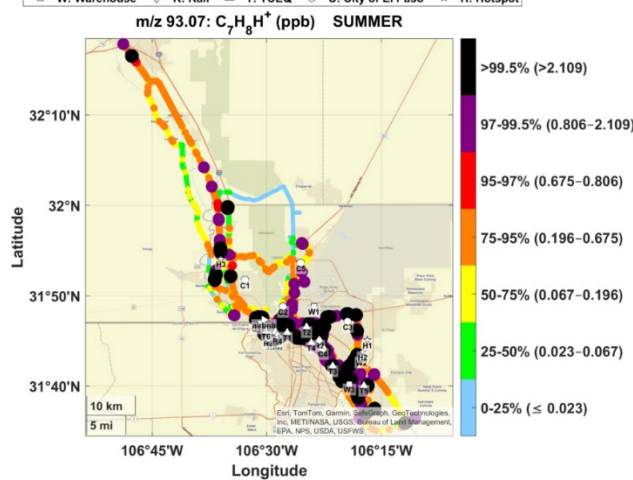
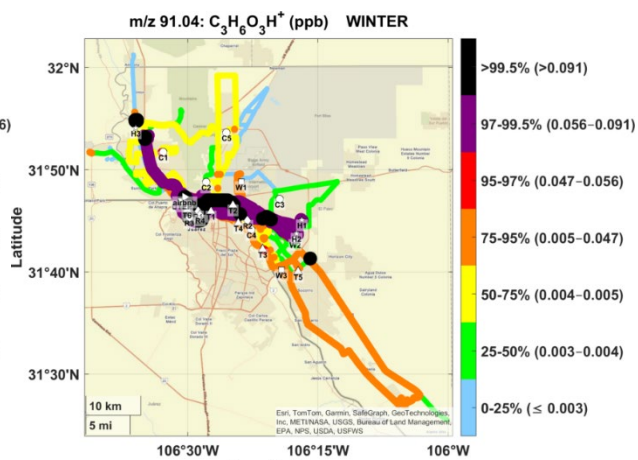
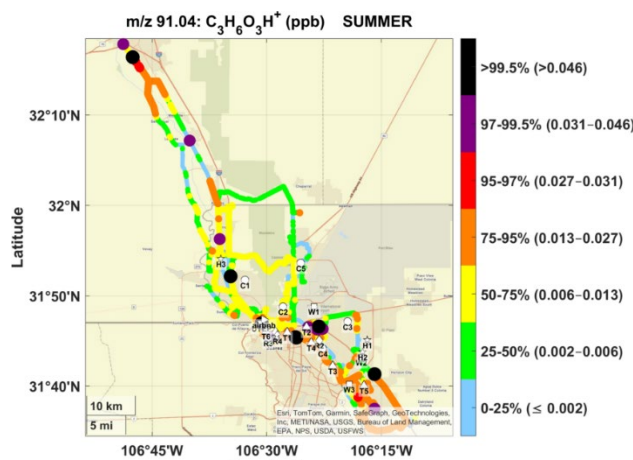


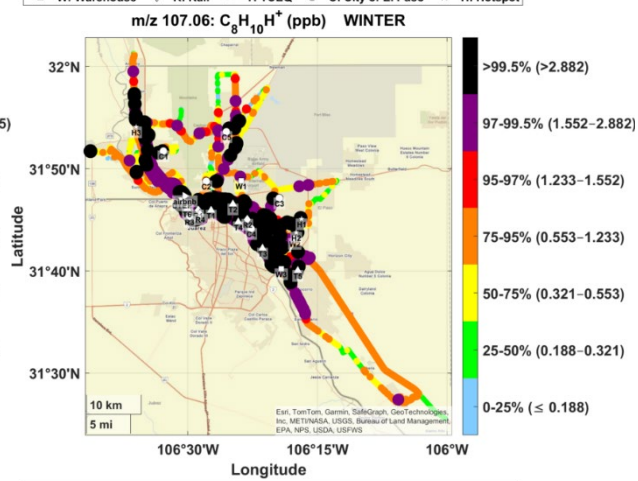
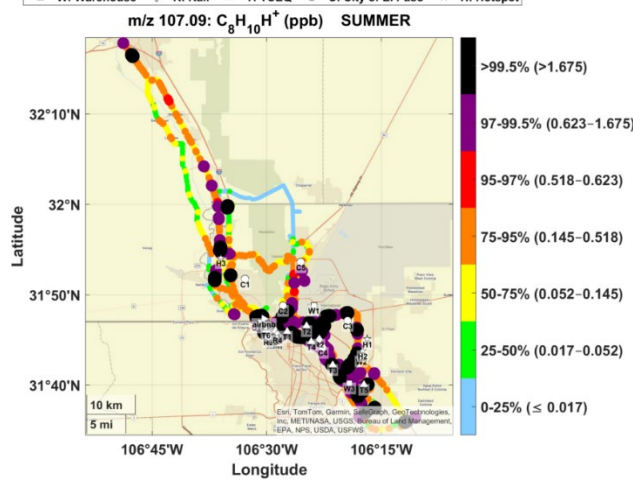
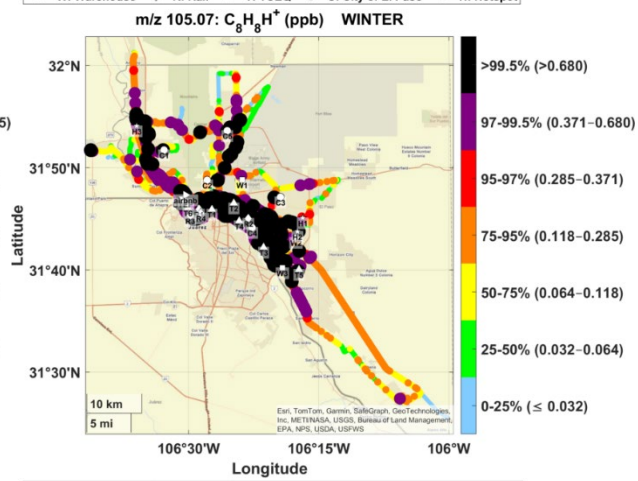
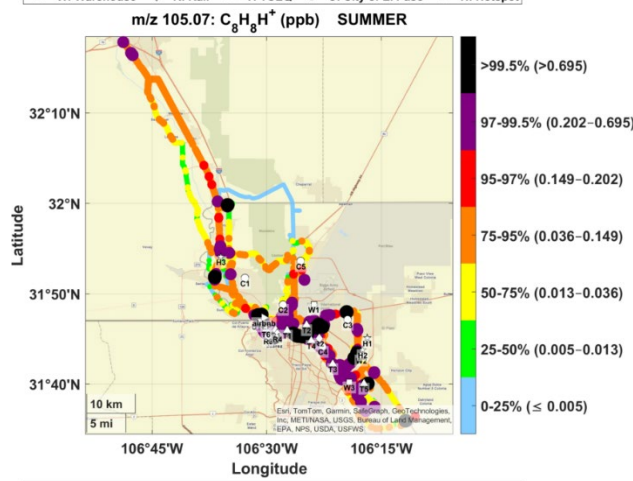
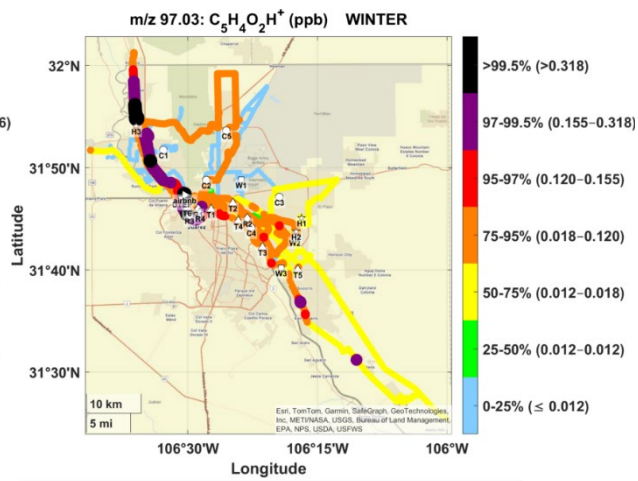
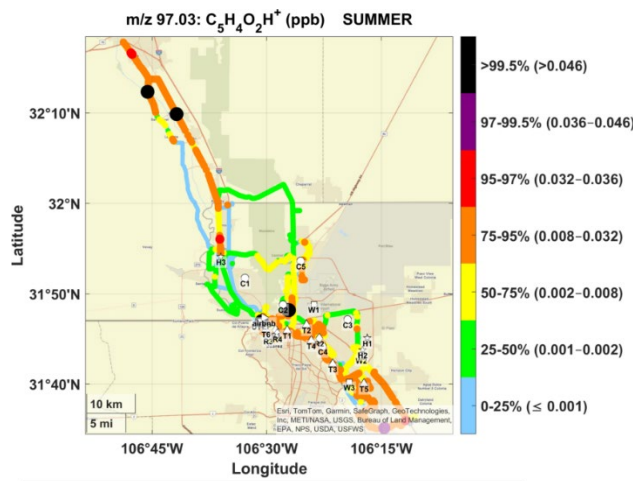


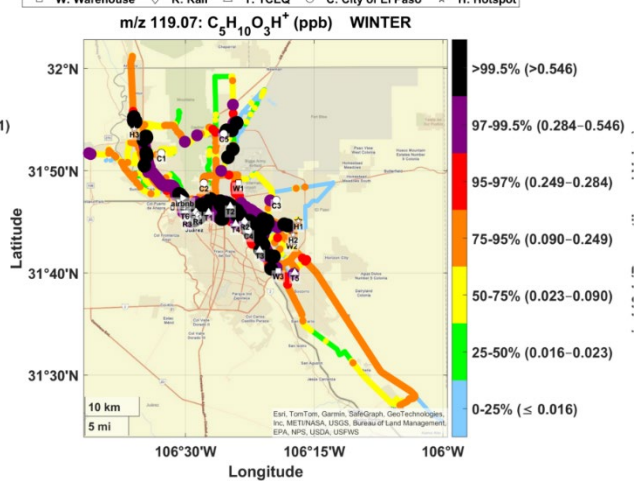
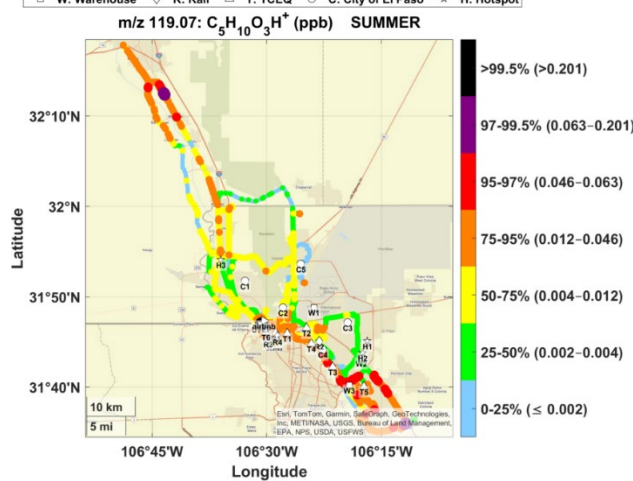
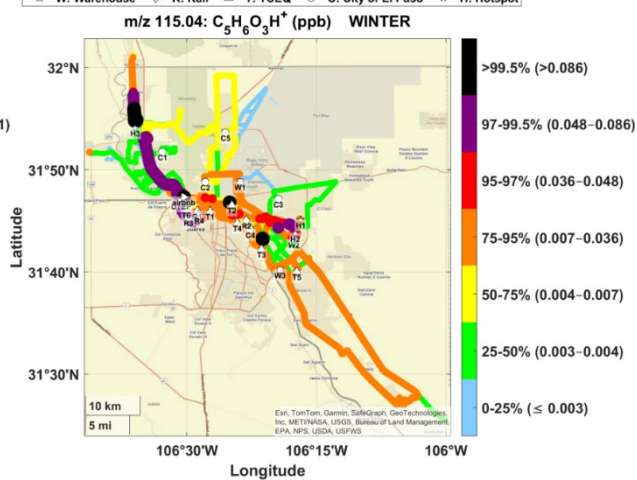
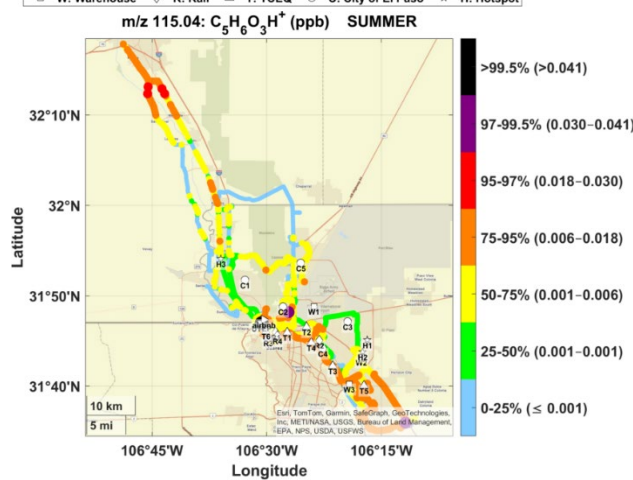
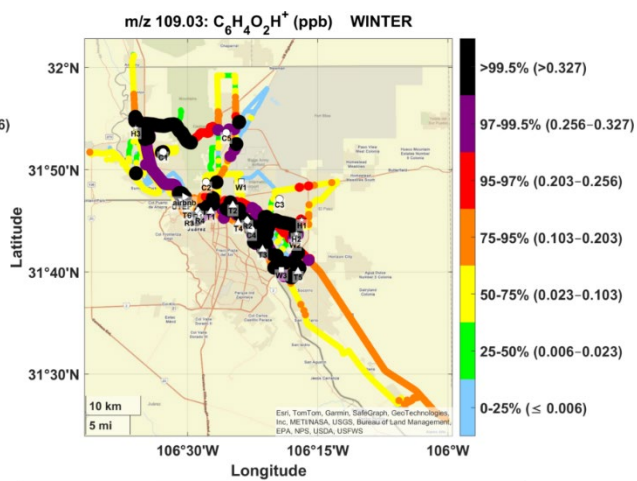
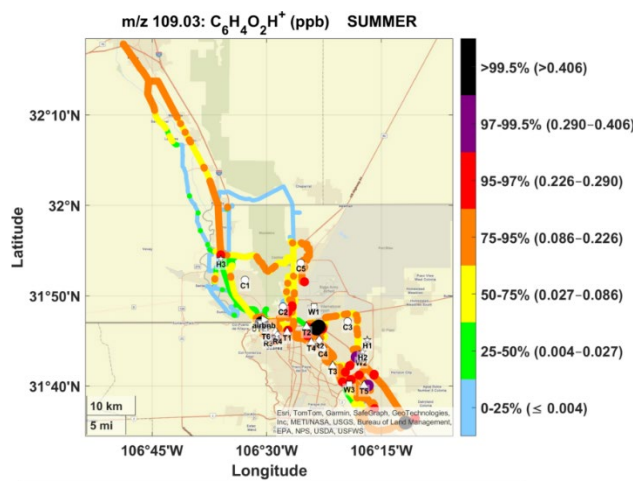


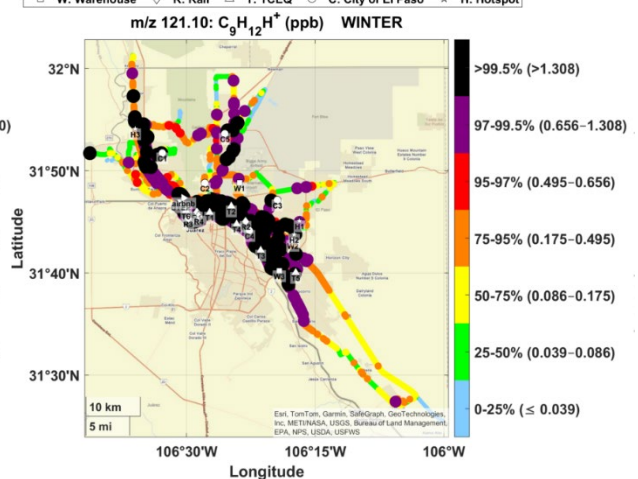
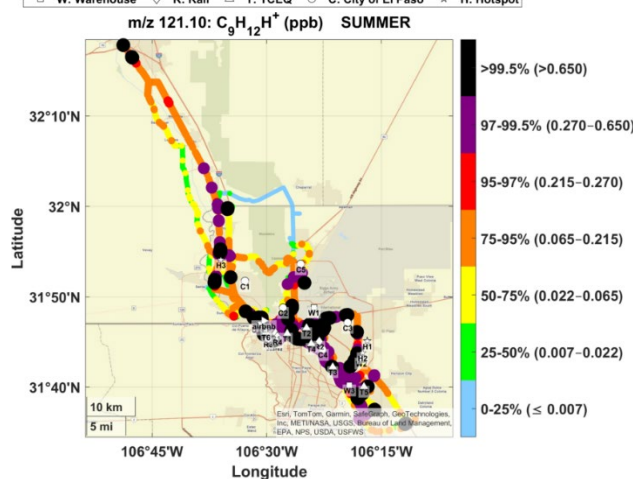
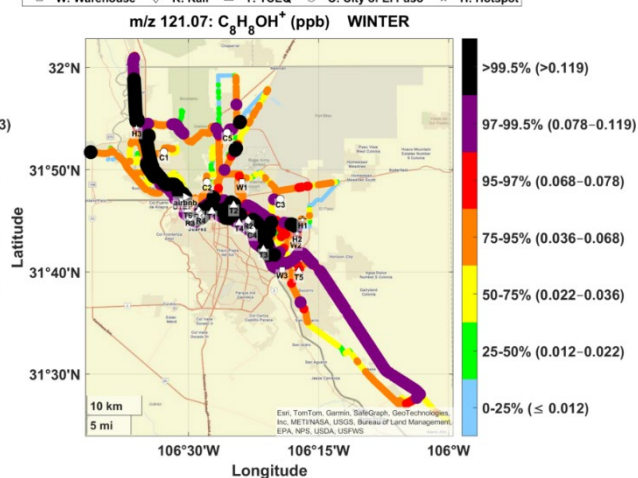
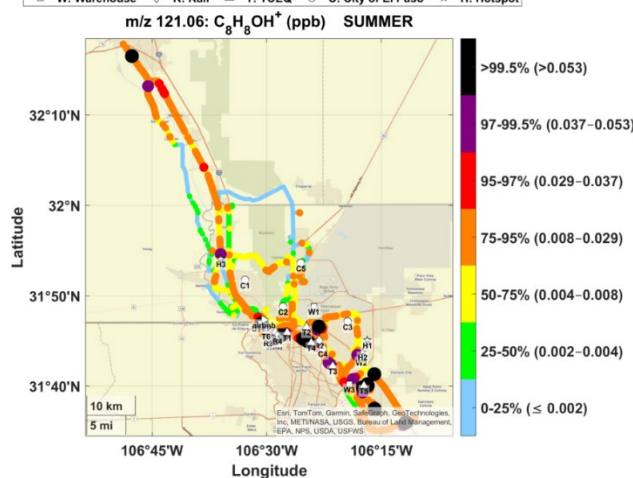
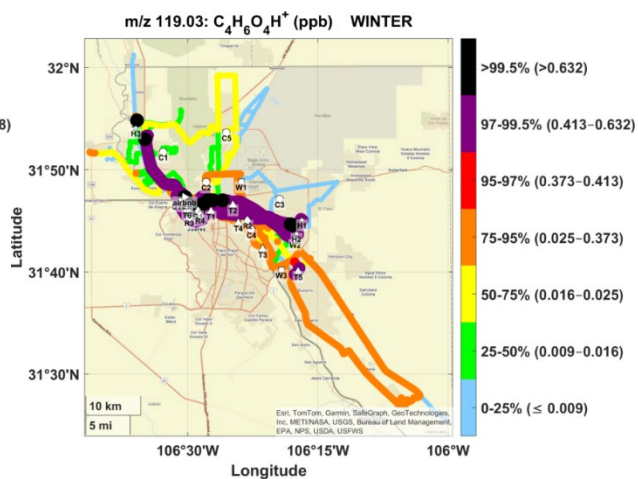
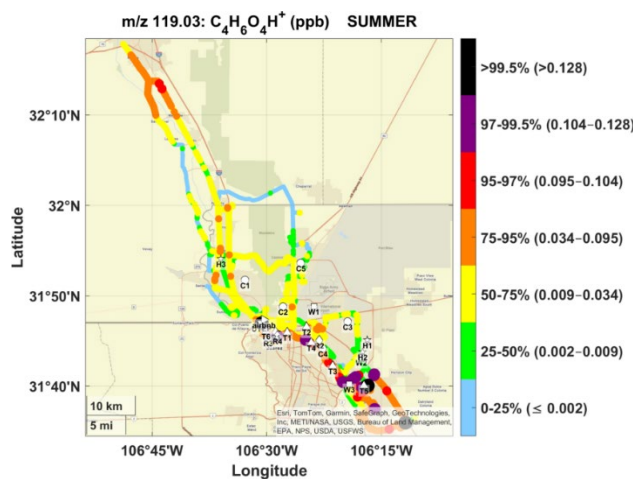


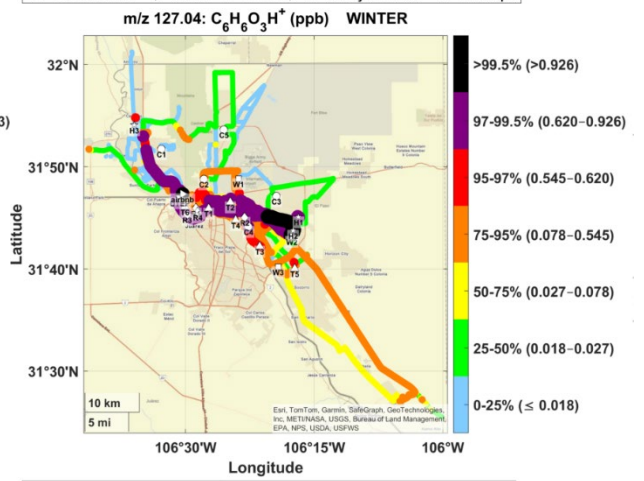
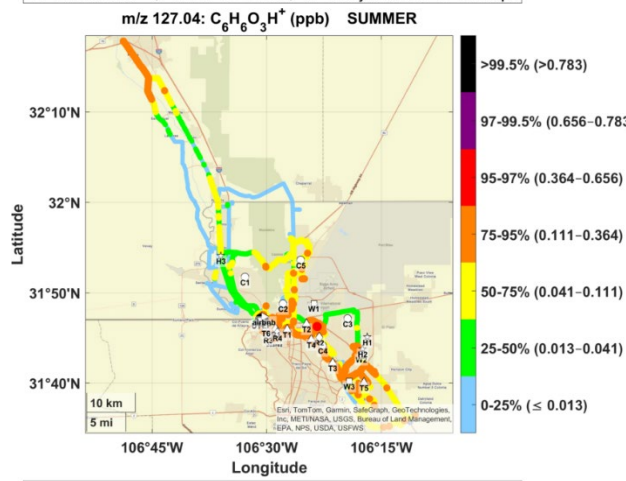
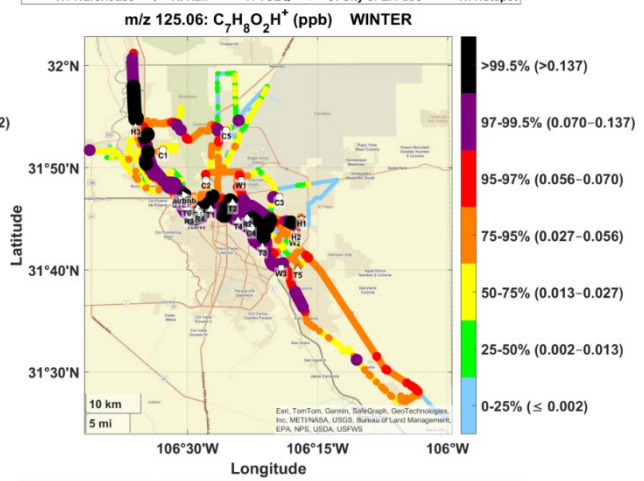
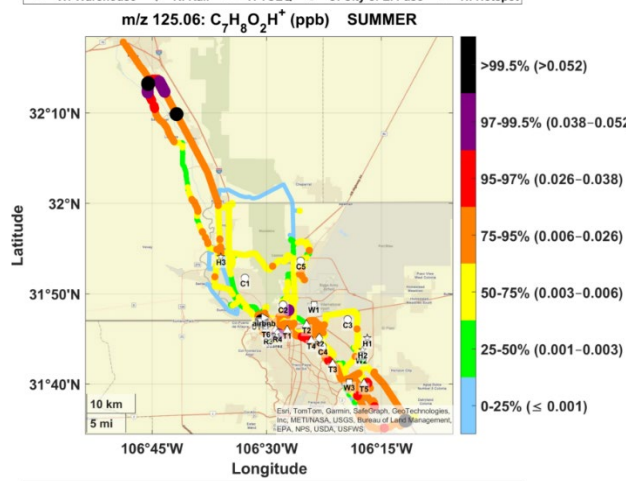
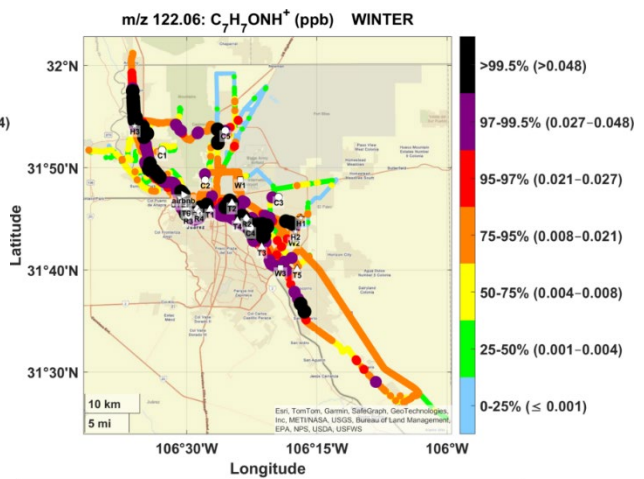
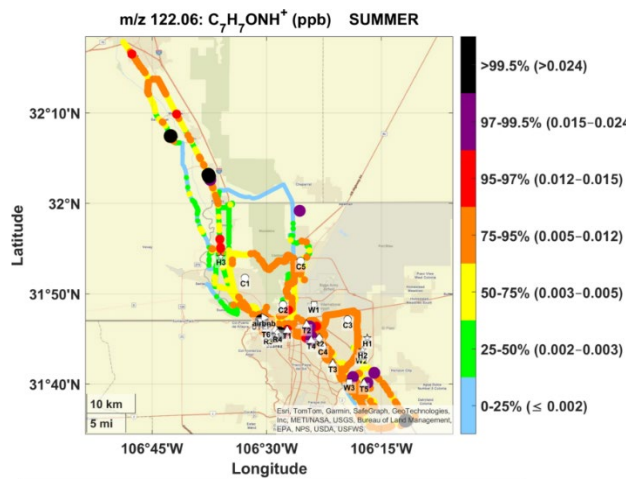


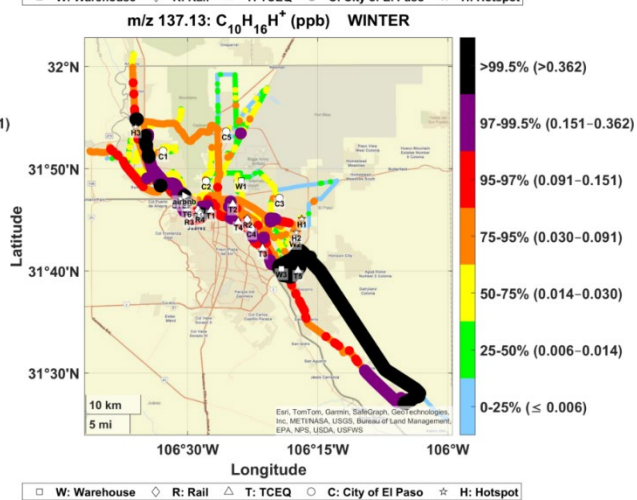
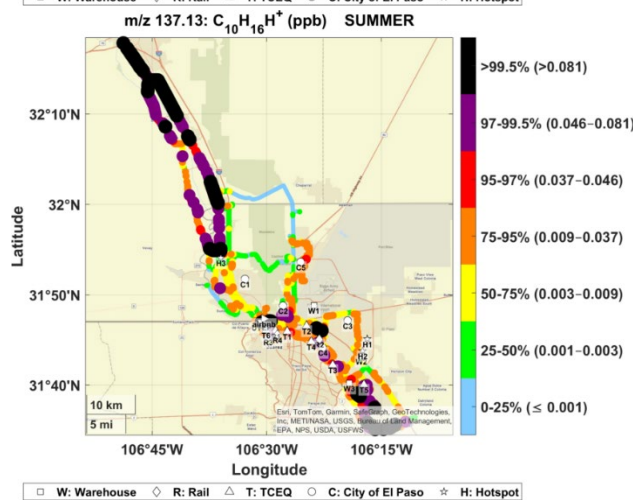
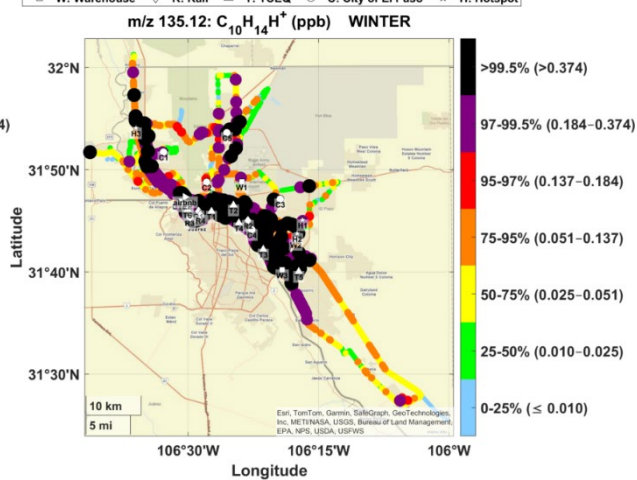
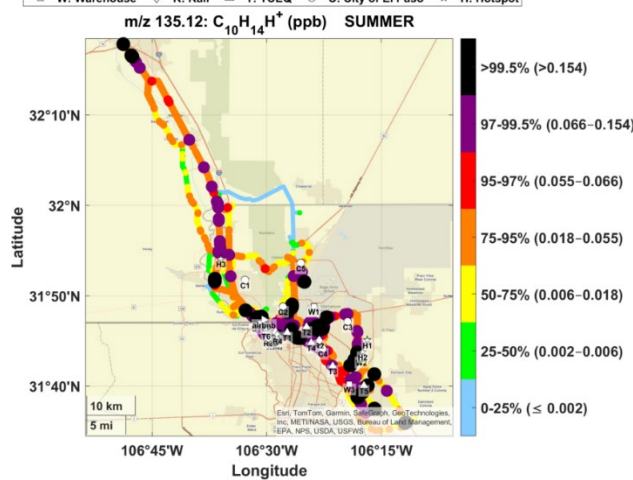
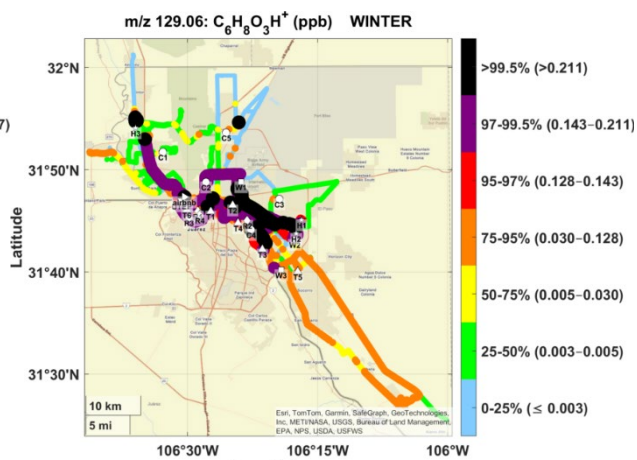
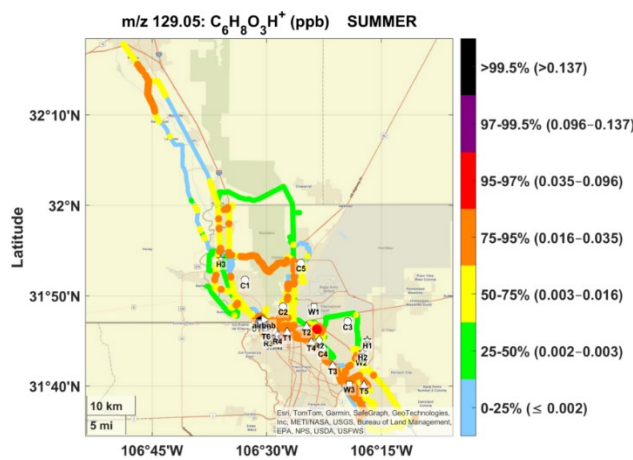


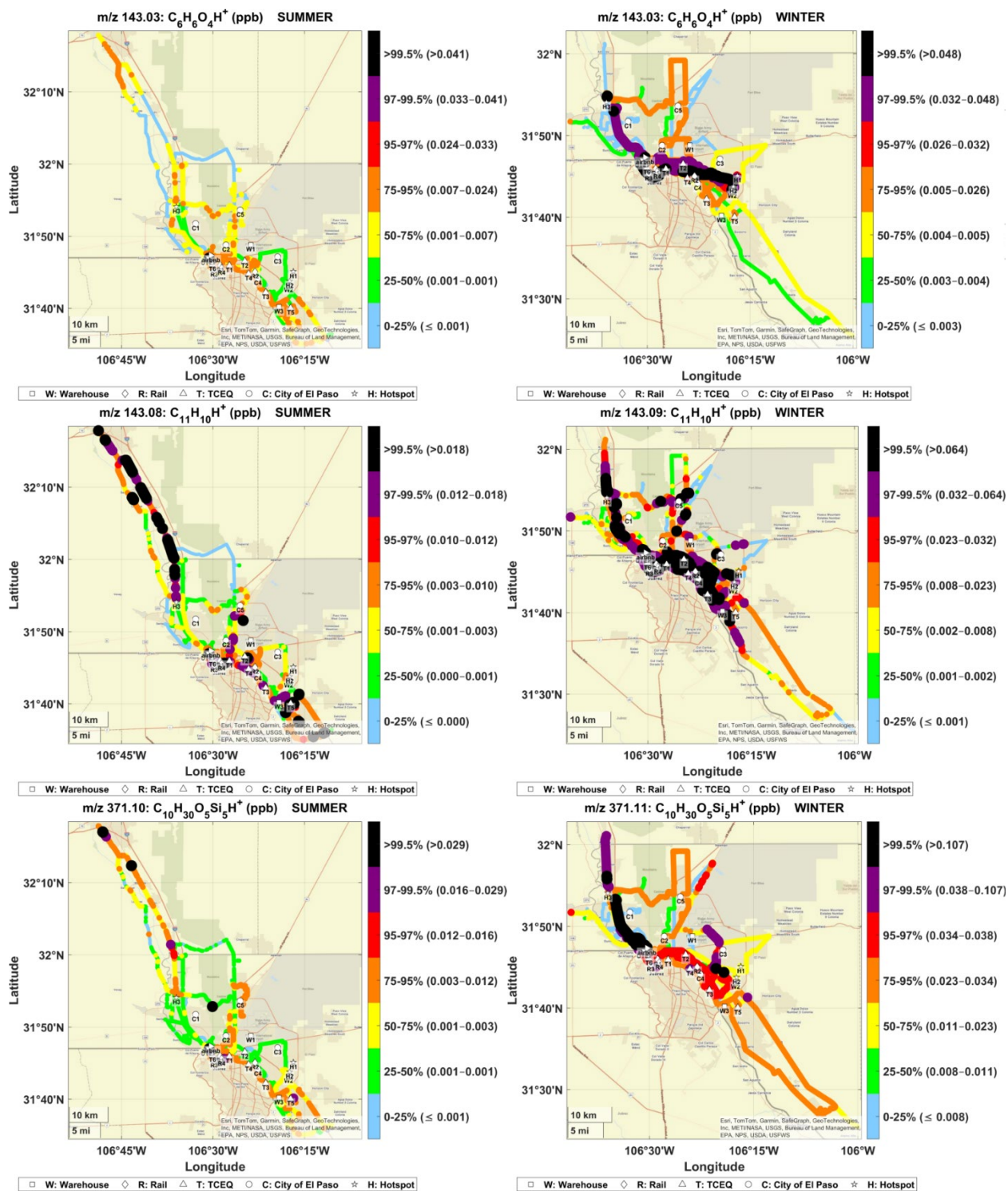












**Appendix Figure A1.** Maps for 42 prominent VOC ions observed using mobile measurements in the summer and winter campaigns. TCEQ and City of El Paso monitoring stations, as well as hotspots are depicted on the maps for the spatial reference.

**Appendix Table A2.** Look-up table with formula assignment and possible compounds.

<b>Detected <i>m/z</i></b>	<b>Chemical Formula</b>	<b>Consistent compounds</b>
33.033	CH <sub>4</sub> OH <sup>+</sup>	Methanol
42.033	C <sub>2</sub> H <sub>3</sub> NH <sup>+</sup>	Acetonitrile
44.013	CHONH <sup>+</sup>	Isocyanic acid
45.033	C <sub>2</sub> H <sub>4</sub> OH <sup>+</sup>	Acetaldehyde+Ethylene Oxide+Ethylene glycol frag.
47.050	C <sub>2</sub> H <sub>6</sub> OH <sup>+</sup>	Ethanol
57.033	C <sub>3</sub> H <sub>4</sub> OH <sup>+</sup>	Acrolein + Propionic Acid frag.
57.070	C <sub>4</sub> H <sub>8</sub> H <sup>+</sup>	Butene + Cyclobutane+**
59.049	C <sub>3</sub> H <sub>6</sub> OH <sup>+</sup>	Acetone + Propanal
61.028	C <sub>2</sub> H <sub>4</sub> O <sub>2</sub> H <sup>+</sup>	Acetic Acid
63.026	C <sub>2</sub> H <sub>6</sub> SH <sup>+</sup>	Dimethyl sulfide + Ethanethiol
63.044	C <sub>2</sub> H <sub>6</sub> O <sub>2</sub> H <sup>+</sup>	Ethylene glycol
69.034	C <sub>4</sub> H <sub>4</sub> OH <sup>+</sup>	Furan
69.070	C <sub>5</sub> H <sub>8</sub> H <sup>+</sup>	Isoprene + Cyclopentene (+ C5 alcohol and aldehyde frag.)
71.086	C <sub>5</sub> H <sub>10</sub> H <sup>+</sup>	Pentene + cyclopentane +**
73.029	C <sub>3</sub> H <sub>4</sub> O <sub>2</sub> H <sup>+</sup>	Acrylic acid
73.065	C <sub>4</sub> H <sub>8</sub> OH <sup>+</sup>	Methyl ethyl ketone + Butanal
75.044	C <sub>3</sub> H <sub>6</sub> O <sub>2</sub> H <sup>+</sup>	Propionic acid + Methyl acetate
78.047	C <sub>6</sub> H <sub>6</sub> <sup>+</sup>	Benzene <sup>1</sup>
83.049	C <sub>5</sub> H <sub>6</sub> OH <sup>+</sup>	Methyl furan
89.024	C <sub>3</sub> H <sub>4</sub> O <sub>3</sub> H <sup>+</sup>	Ethylene carbonate
89.060	C <sub>4</sub> H <sub>8</sub> O <sub>2</sub> H <sup>+</sup>	Butyric acid + Ethyl acetate
91.039	C <sub>3</sub> H <sub>6</sub> O <sub>3</sub> H <sup>+</sup>	Dimethyl carbonate + Lactic acid

93.070	$C_7H_8H^+$	Toluene
95.049	$C_6H_6OH^+$	Phenol
97.029	$C_5H_4O_2H^+$	Furfural
105.069	$C_8H_8H^+$	Styrene
107.086	$C_8H_{10}H^+$	C8-aromatics (Xylenes and Ethylbenzene)
109.028	$C_6H_4O_2H^+$	Benzoquinone
115.039	$C_5H_6O_3H^+$	Glutamic anhydrite
119.034	$C_4H_6O_4H^+$	Succinic aldehyde
119.070	$C_5H_{10}O_3H^+$	Diethyl carbonate + Ethyl lactate
121.064	$C_8H_8OH^+$	Acetophenone
121.101	$C_9H_{12}H^+$	C9-Aromatics (Trimethylbenzene, Methylethylbenzene, Propylbenzene)
122.061	$C_7H_7NOH^+$	Acetylpyridine
125.059	$C_7H_8O_2H^+$	Guaiacol
127.039	$C_6H_6O_3H^+$	Hydroxymethylfurfural + Benzenetriols
129.055	$C_6H_8O_3H^+$	Bis(hydroxymethyl)furan
135.116	$C_{10}H_{14}H^+$	C10-Aromatics
137.132	$C_{10}H_{16}H^+$	Monoterpenes
143.033	$C_6H_6O_4H^+$	Benzenetetrols + other isomers
143.085	$C_{11}H_{10}H^+$	Methylnaphthalene
371.104	$C_{10}H_{30}O_5Si_5H^+$	D5-siloxane (decamethylcyclopentasiloxane)