

AQRP Monthly Technical Report

PROJECT TITLE	Integrated Airborne-Mobile Ground Observations and Inventory for Enhanced VOC Source Attribution and Ozone Precursor Mapping in Texas	PROJECT #	26-029
PROJECT PARTICIPANTS	PIs: Pawel Misztal, Lea Hildebrandt Ruiz, Yue Zhang, Nathan Malarich, Munkhbayar Baasandorj Students and Postdocs: <i>TAMU:</i> Alana Doderio, Jiayun Zhao, Alexander Treadway, John Gonzales, Rajab Mammadov <i>UT Austin:</i> Keuntaek Kim, Hyeonjun Lee, Chun-Ying Chao, Shihao Zhai, Daniel Sung, Sam Lin, Kat Konon <i>CU Boulder/NOAA:</i> Nathan Malarich	DATE SUBMITTED	09/10/2026
REPORTING PERIOD	From: 8/01/2026 To: 8/31/2026	REPORT #	5

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

Preliminary Analysis

Mobile Measurements

Mobile Measurements (UT Austin)

During this reporting period the team began a closer examination of hotspots visited multiple times, including an asphalt plant and a data center in DFW as shown in preliminary Figures 1 and 2. Plumes downwind of each source were identified and compared with background air.

The asphalt plant plume was characterized by oxygenated aromatics (phenol and cresols), alkylbenzenes, and furan, with the largest enhancement for phenol.

The data center plume contained glycols (propylene and hexylene glycol) together with enhanced acrolein and acetic acid, while benzene was only slightly enhanced.

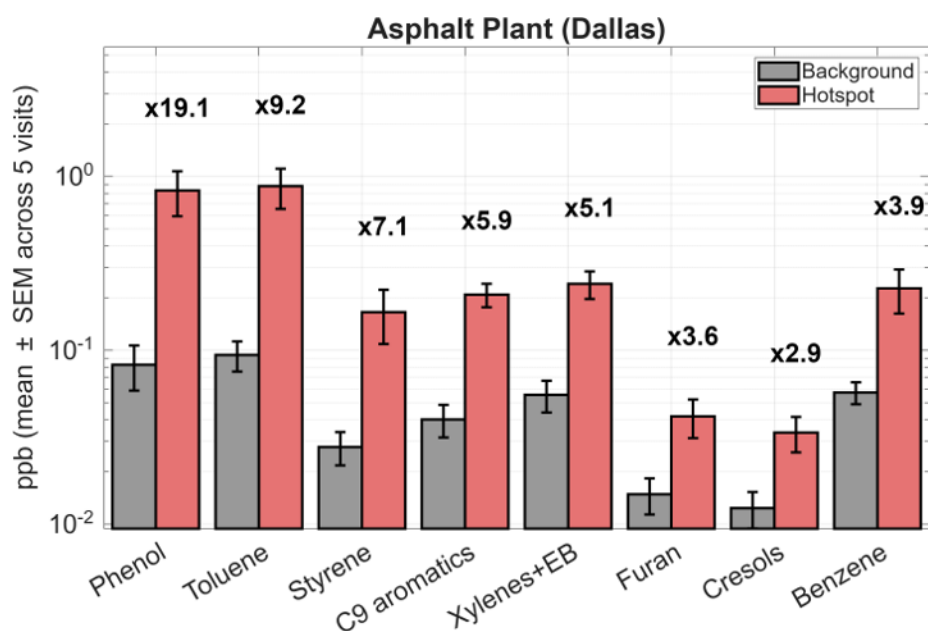


Figure 1. Mobile Vocus PTR-ToF-MS fingerprint of the asphalt plant: mean VOC mixing ratios in background vs. plume windows, averaged over 5 drive-by visits (error bars = SEM). Labels show the mean per-visit plume/background enhancement factor. (Fig. By Keuntaek Kim, Misztal Group)

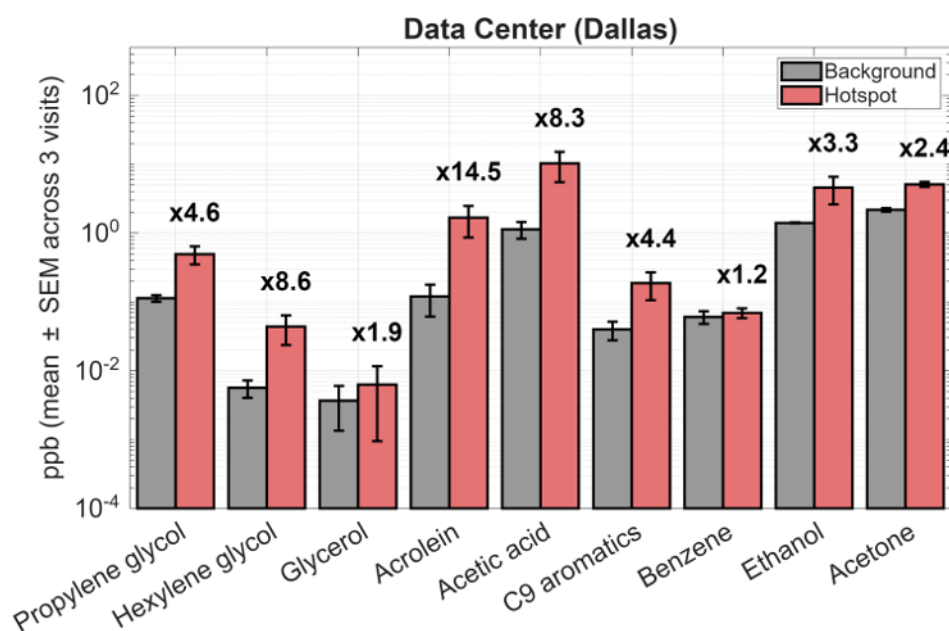
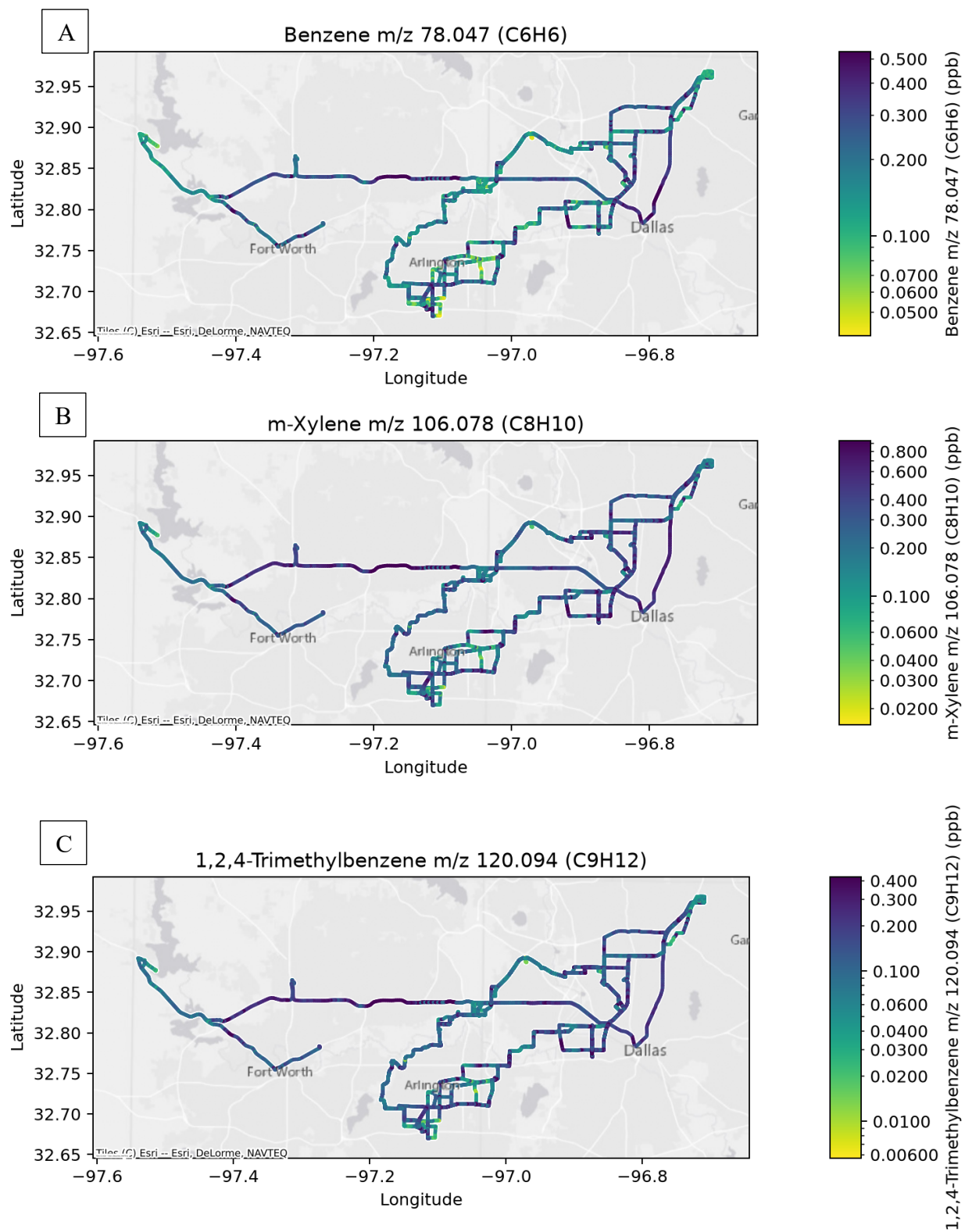


Figure 2. Mobile Vocus PTR-ToF-MS fingerprint of the data center: mean VOC mixing ratios in background vs. plume windows, averaged over 3 drive-by visits (error bars = SEM). Labels show the mean per-visit plume/background enhancement factor. (Fig. by Keuntaek Kim, Misztal Group)

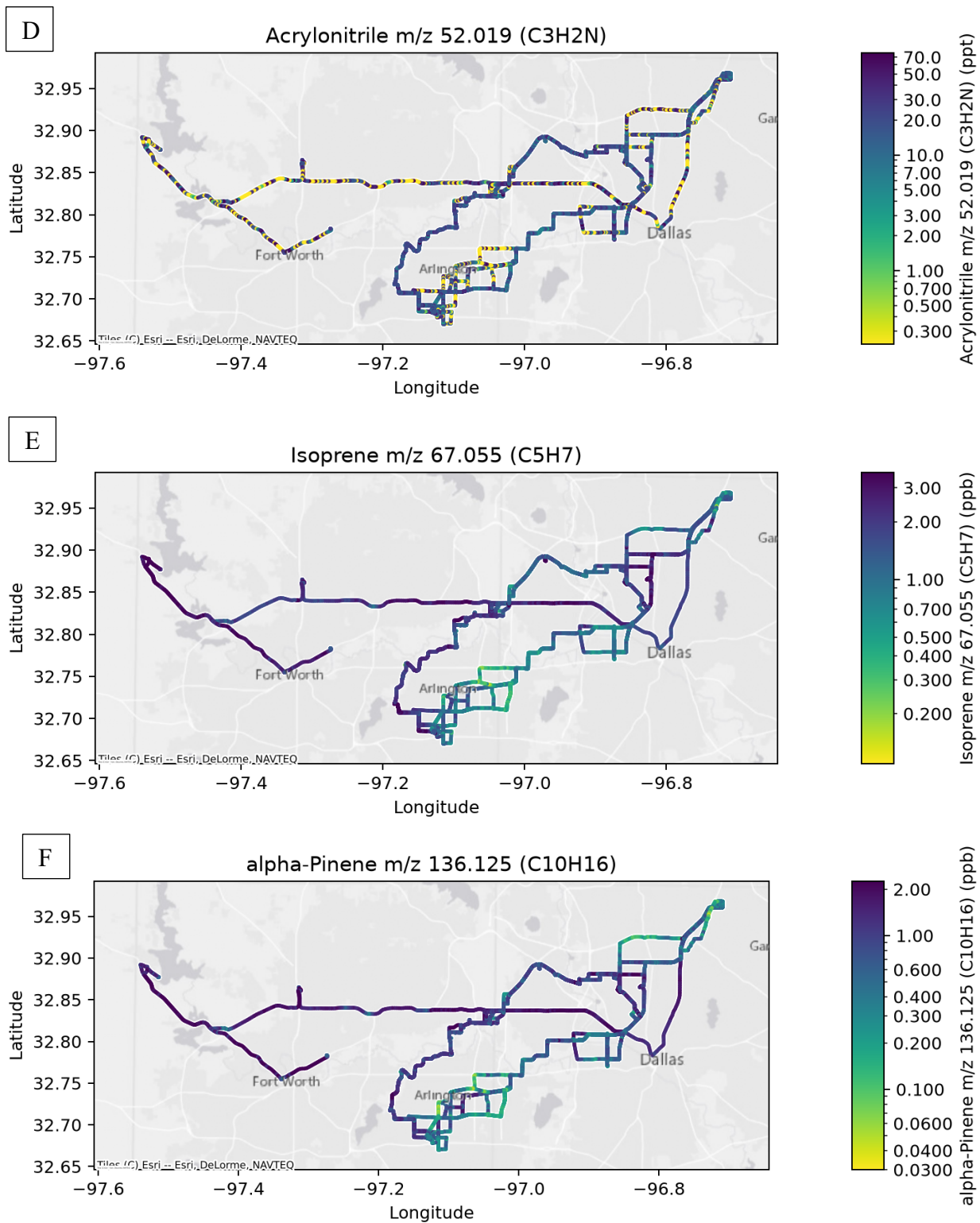
Mobile Measurements (TAMU)

Calibration factors were applied to the Dallas dataset, measured with NO⁺ reagent ion chemistry, to convert background-corrected ion signals to mixing ratios. The preliminary maps (Figure 3) combine 12 routes. One route showed concentrations orders of magnitude higher than the others, so each route will be analyzed individually to determine its relative contribution.

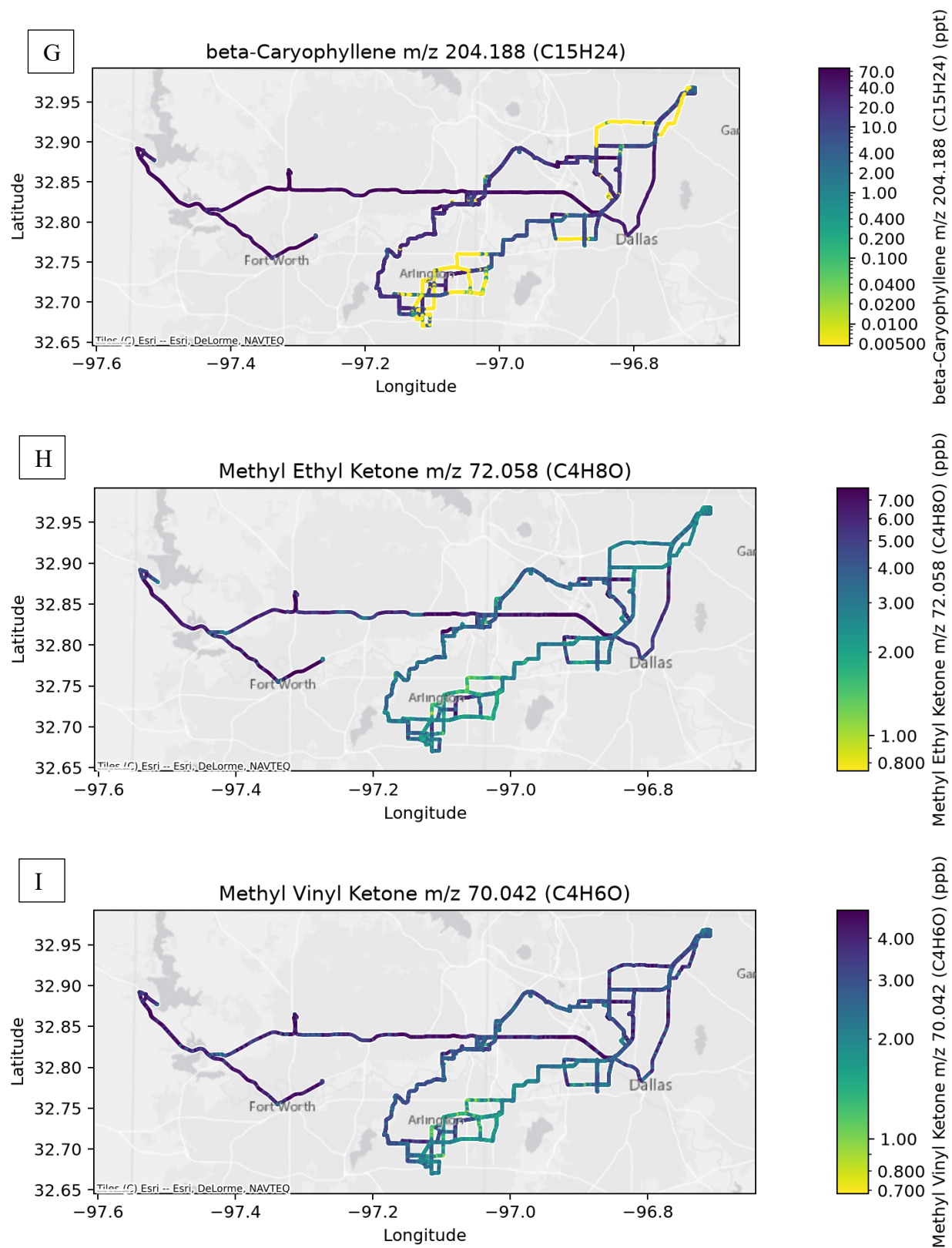
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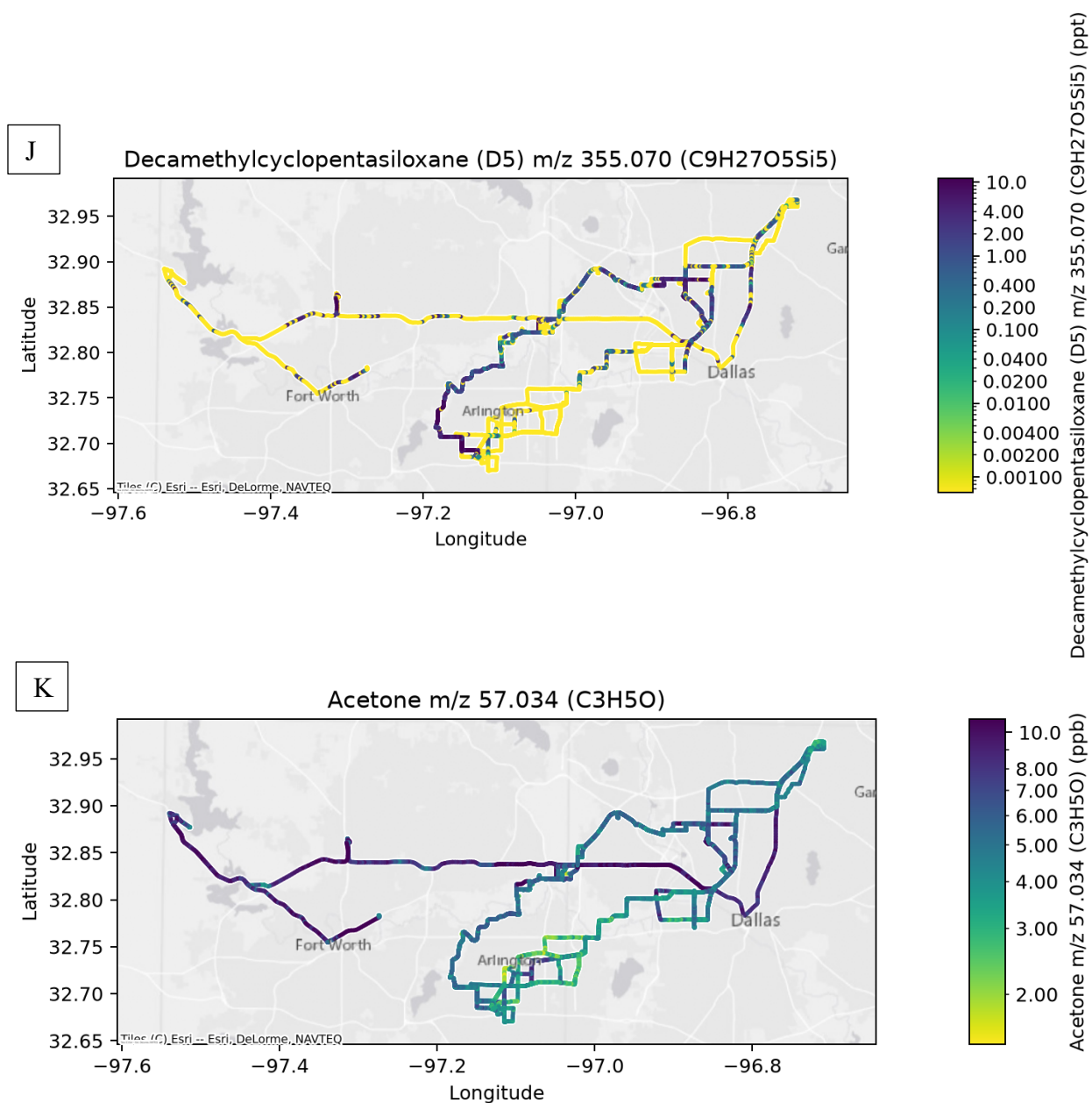


Figure 3. Calibrated, background-corrected mixing ratios along 12 Dallas routes for (A–C) aromatics, (D) acrylonitrile, (E–I) biogenic compounds and oxidation products, and (J–K) other anthropogenic species. (Figure credit: Alexander Treadway, TAMU)

Airborne Measurements

Calibration gases have returned to Boulder, and we are continuing the processing of final data, which we anticipate posting by the end of the calendar year.

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One of the goals of the urban flights was to follow the same air parcel as it propagated downwind of the city, rather than flying too far ahead of the plume. This Lagrangian sampling will allow us to perform mass balance and box modelling analysis of a particular time of emissions, without having to disentangle any transients. To accomplish this Lagrangian sampling, we adjusted the distance between the downwind flight transects. The three Houston flight days were all moderately successful at this Lagrangian sampling goal, with the 6/13 flight (Figure 4) the closest. The right plot shows the flight track with the color accentuating the air parcel that passes through the Houston Ship Channel (HSC), and the left plot shows the progression of both the air parcel and airplane both upwind and downwind from the HSC. We sampled in a Lagrangian manner a plume that originated downtown and at the HSC at 1 PM local time, following it 90 km downwind over 3 hours of chemistry.

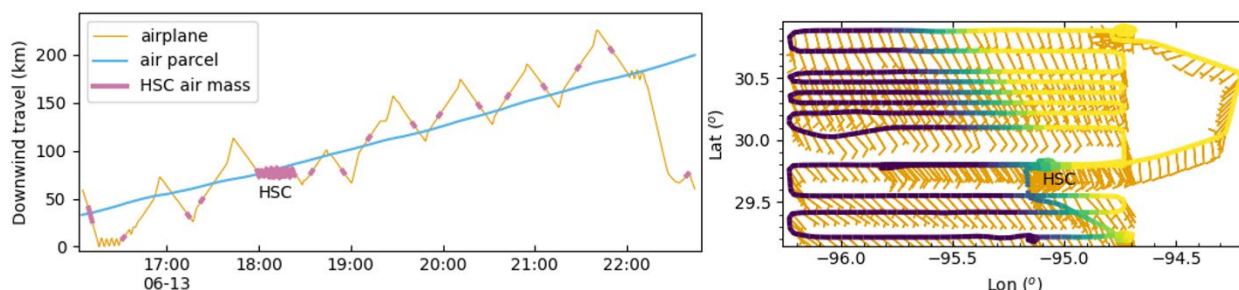


Figure 4. Lagrangian sampling of the Houston plume on June 13, 2026. Left: downwind distance of the aircraft and of the air parcel passing the Houston Ship Channel (HSC) versus time (UTC). Right: flight track with wind barbs. (Courtesy of Nathan Malarich and Munkhbayar Baasandorj)

Stationary Measurements

Houston Supersite – Formaldehyde and TOF-AMS (UT Austin and TAMU)

UT Austin AMS analysis

The UT Austin and TAMU groups met to discuss progress on coordinated comparisons of PM₁ and PM_{2.5} composition and on positive matrix factorization.

Identify Any Problems or Issues Encountered and Proposed Solutions or Adjustments

None.

Goals and Anticipated Issues for the Succeeding Reporting Period

During the next reporting period the UT Austin group will extend the hotspot fingerprinting shown in Figures 1 and 2 to other repeatedly visited sources in all four metropolitan areas and will compare the plume signatures with the trace gas and VOC data from TCEQ monitoring stations provided by Doug Boyer (TCEQ). The TAMU group will complete the route-by-route analysis of the Dallas dataset to quantify the relative contribution of individual routes, including the route with

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markedly higher concentrations, and will apply calibrations to the Houston and San Antonio datasets. The two mobile groups will intercompare species measured by both platforms using consistent ion assignments and compound nomenclature. The NOAA team will continue processing the final airborne data and will begin mass balance and box model analysis of the Lagrangian Houston flights, starting with June 13. UT Austin HR-ToF-AMS analysis will focus on positive matrix factorization of the organic aerosol, including the high sulfate period of June 18 and 19, to constrain its age and sources. Route-density products and collocation logs for all four metropolitan areas will be consolidated for data delivery to TCEQ. Final airborne data are not expected before the end of the calendar year, so the comparison of ground-based and airborne BTEX during the Dallas and Houston aircraft spirals will rely on preliminary airborne data until the final data are posted.

Publications and Presentations

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

Abstract has been submitted:

Keuntaek Kim, Hyeonjun Lee, Daniel H Sung, Chou-Hsien Lin, Shihao Zhai, Chun-Ying Chao, Alana Dodero, Jiayun Zhao, Alexander Treadway, John Gonzales, Yue Zhang, Lea Hildebrandt Ruiz, and Pawel K Misztal: Spatiotemporal Characterization of Urban VOCs in Dallas, Houston, and San Antonio using Mobile and Stationary PTR-ToF-MS Measurements from the AQRP-TexAQs Campaign. Submitted for presentation at AGU 2026 Annual Meeting, San Francisco, December 7-11, 2026.

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

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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.

None

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