AQRP Monthly Technical Report

PROJECT TITLE	Texarkana Intensive Campaign	**PROJECT #**	24-007
PROJECT PARTICIPANTS	University of Houston, Baylor University, Aerodyne Research	**DATE SUBMITTED**	04/10/2025
REPORTING PERIOD	**From:** 03/01/2025 **To:** 03/31/2025	**REPORT #**	8

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

- Completed field measurements on March 2, 2025, and departed Texarkana.
- The Mobile Air Quality Lab (MAQL3) went to Waco to unload Baylor University's (BU) equipment and returned to the University of Houston (UH) on 3/3.
- Began data processing and finalization.
- Aerodyne generated a time series of the gas phase which is currently under QA in concert with analyzing truck notes to better determine appropriate points of emphasis during analysis.

Preliminary Analysis

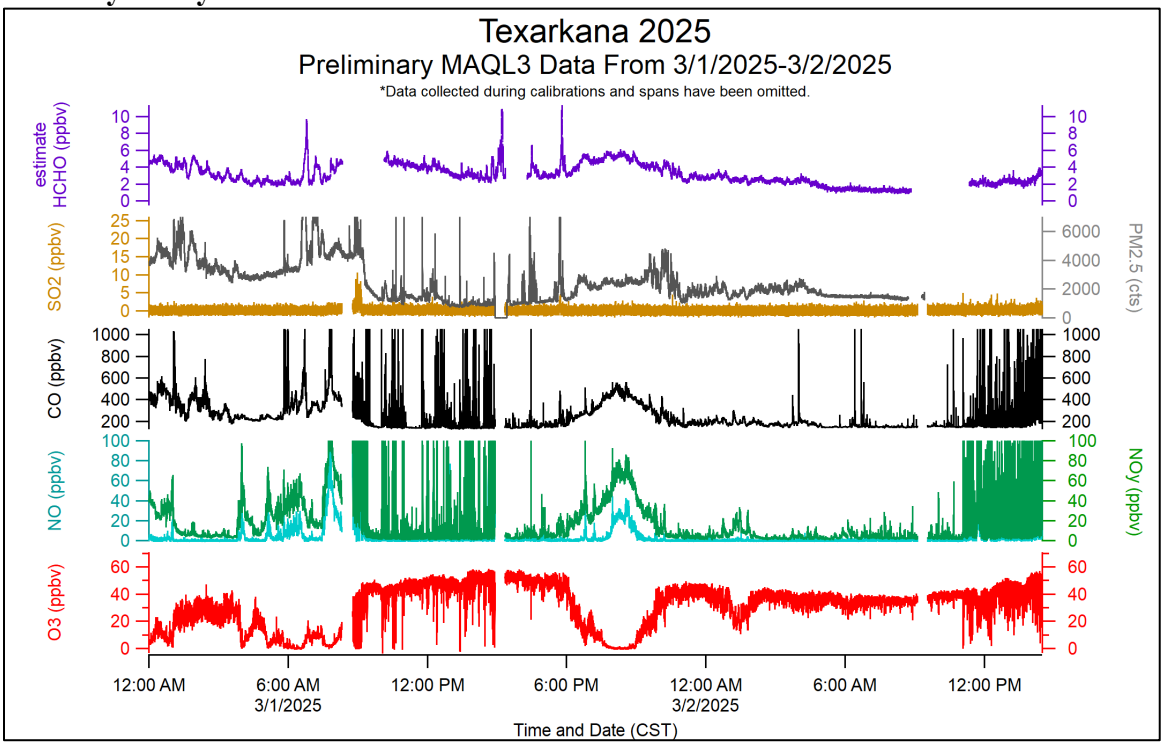

Figure 1. Preliminary gas and aerosol data collected on 3/1/2025 by MAQL3.

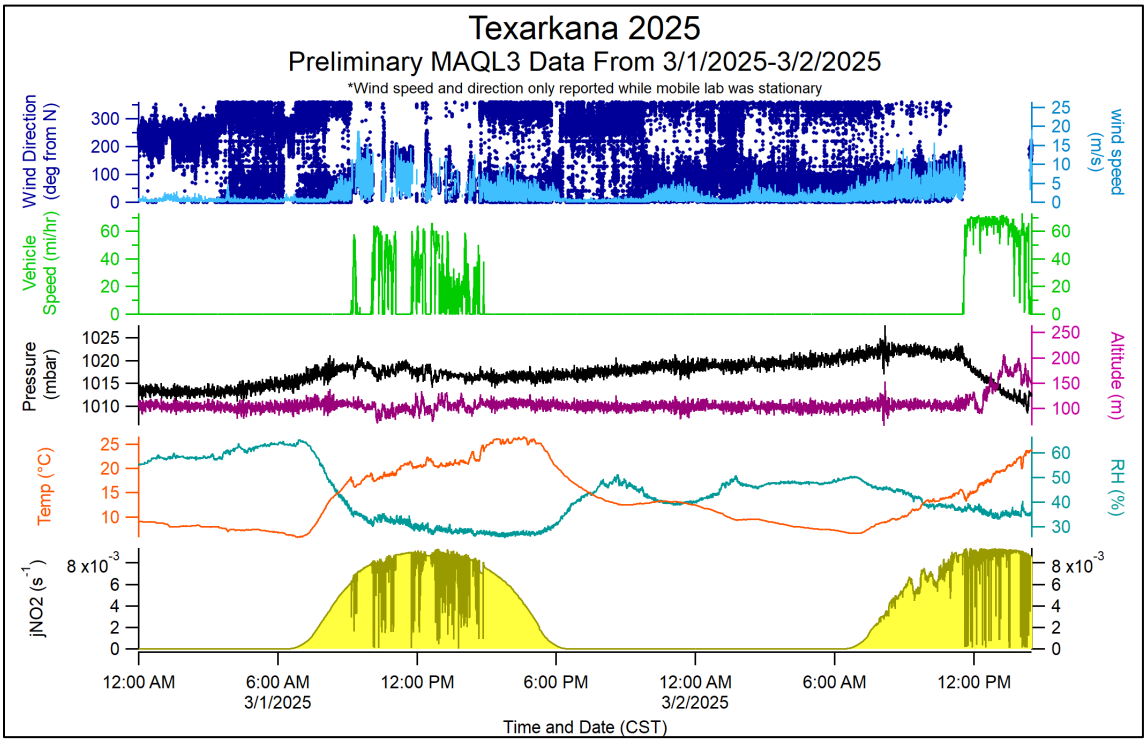

Figure 2. Preliminary meteorological data collected on 3/1/2025 by MAQL3

Below are exemplary data from mobile and stationary, overnight measurements made on February 12 and 13 by the Aerodyne minivan atmospheric mobile laboratory (minAML) that was outfitted with a Vocus proton transfer reaction time of flight mass spectrometer (PTR-TOFMS) with thermal desorption pre concentration gas chromatography (TDPC-GC) instrument package for evaluating VOC species from emission sources and in ambient air.

On February 12, the minAML made several passes of the Graphics Packaging International (GPI) facility located near Domino, TX, south-southwest of Texarkana, TX. The Vocus PTR-TOFMS operated in direct mode, with atmospheric sample sent directly to the Vocus inlet, bypassing the GC preconcentration and separation. Spectra of ambient air upwind and downwind of the GPI facility was collected, shown in Figure 3. Note that the spectra shown are scaled with some ion signals off-scale (e.g. m/z = 59, typically acetone) to allow for visualization of significant differences in signal across the mass spectra. Four unit-masses (63, 81, 93, 137) with large enhancement relative to background air are highlighted. Using the high mass-resolving power of the Vocus instrument, the protonated ions associated with each of these unit mass peaks, shown in Figure 4, can be identified.

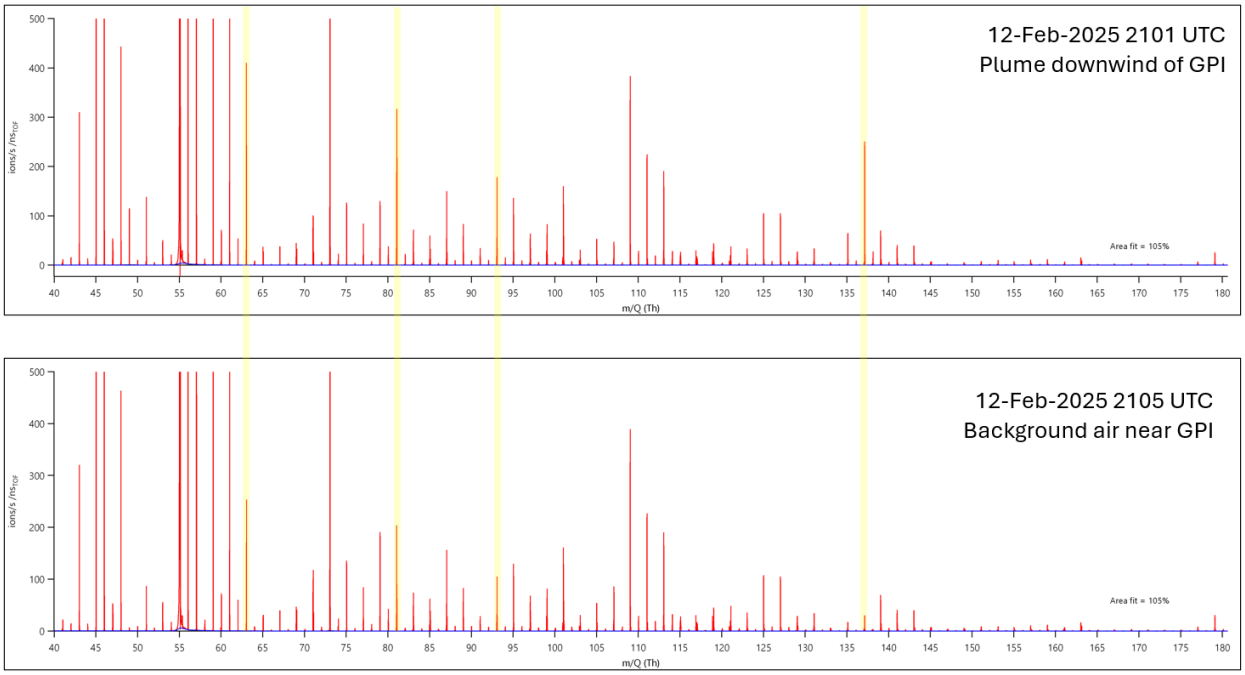

Figure 3. Vocus measurements are depicted upwind and downwind of the GPI facility

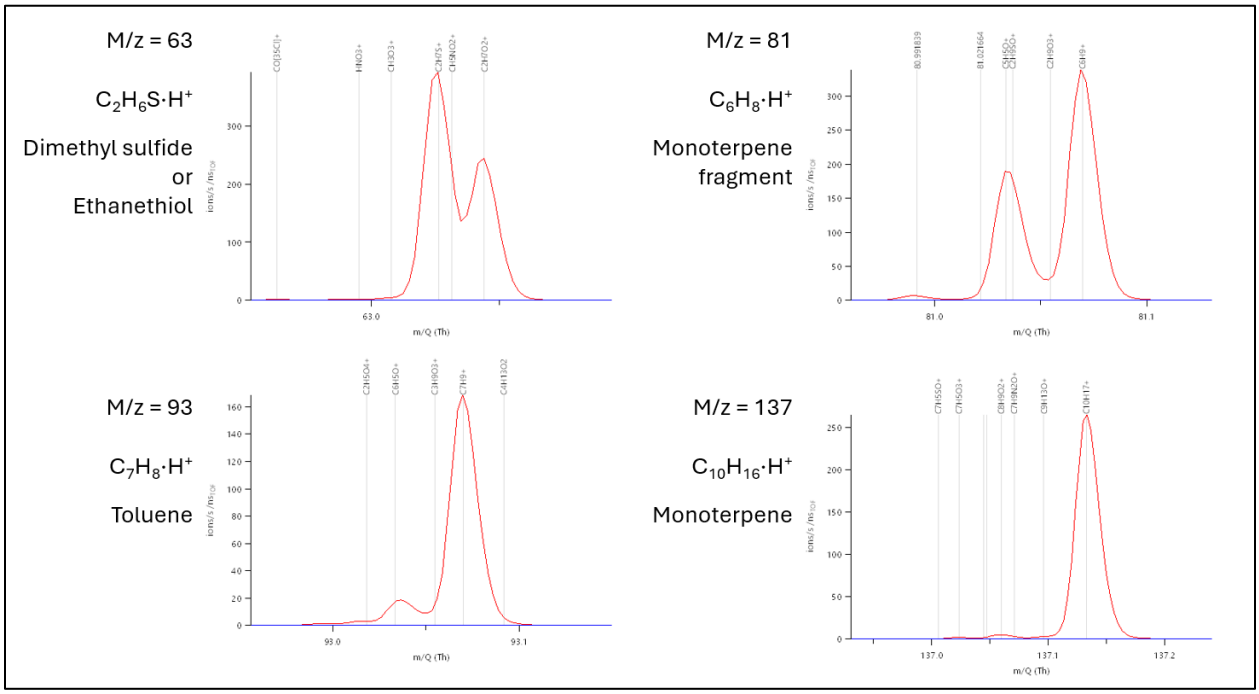

Figure 4. High resolution peak fitting of the masses of focus

Table 1. The primary ion formulas and likely source molecules are depicted for the masses of focus

Unit Mass	Ion formula plus proton)	Likely source molecule
63	$C_2H_6S \cdot H^+$	Dimethyl sulfide/ethanethiol
81	$C_6H_8 \cdot H^+$	Monoterpene fragment
93	$C_7H_8 \cdot H^+$	Toluene
137	$C_{10}H_{16} \cdot H^+$	Monoterpene

On February 13, the minAML made several passes of the Domtar Ashdown (Domtar) paper mill near Ashdown, AR, north-northwest of Texarkana. Included in this drive, the minAML parked downwind of Domtar and collected a GC sample while the Vocus indicated an elevated monoterpene signal (m/z = 137 & 81), associated with paper mill emissions [Strömvall and Petersson, 1991]. Using the GC for pre-separation, we can speciate the monoterpenes in this sample, indicating a mixture of at least 6 different isomers (Figure 5). After completing the measurement drive for the day, the minAML was parked at the Texarkana RV Resort park, southwest of Texarkana, with instruments operating overnight. That evening, the site experienced wind from the north and monoterpene signals elevated above the background. A GC sample collected overnight shows that the enhanced monoterpene signal has a strikingly similar mixture of monoterpene species to Domtar, while roughly 50x lower is signal strength. This could indicate that VOC emissions from Domtar were transported to the RV park roughly 15 miles downwind.

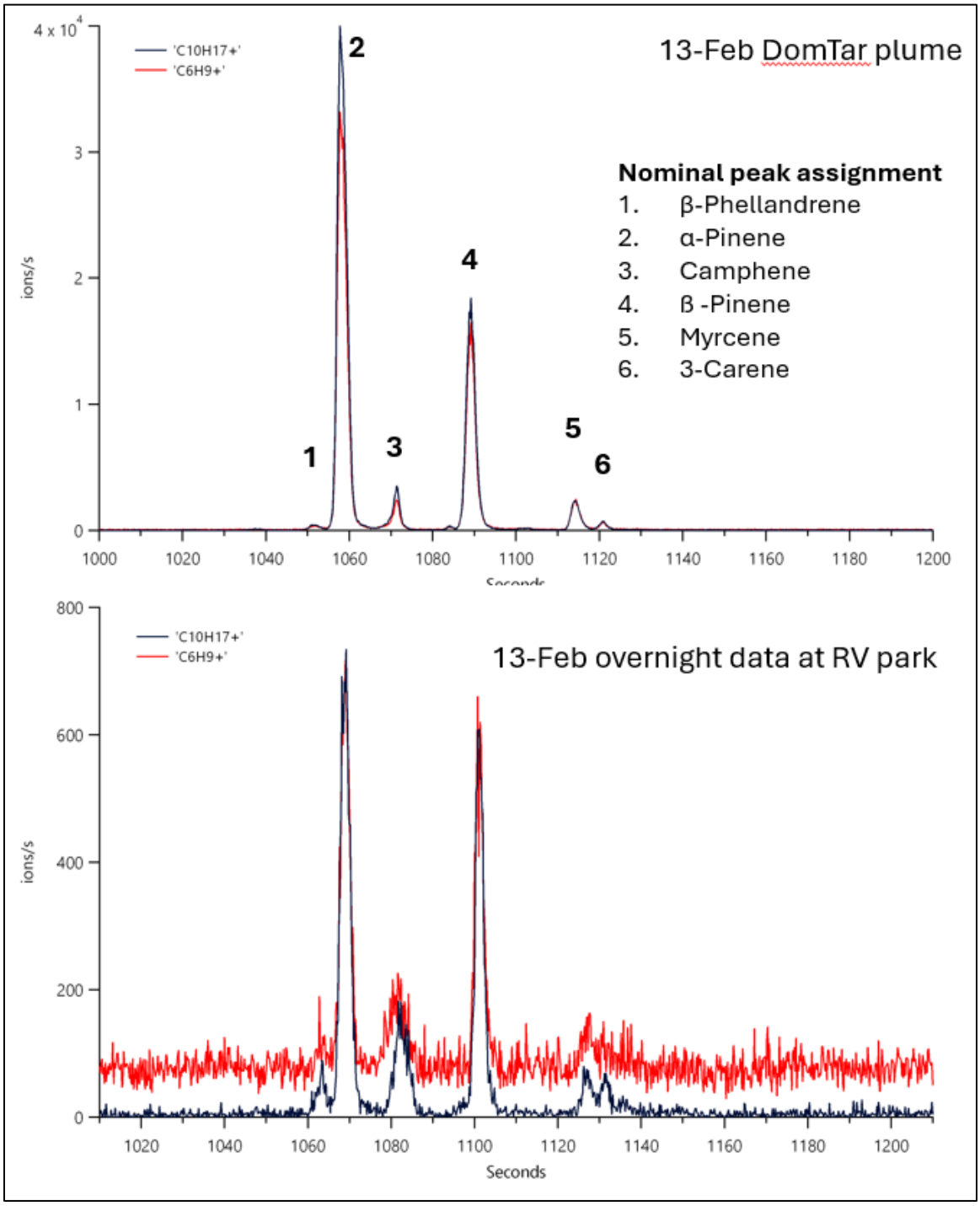

Figure 5 Monoterpene speciation is depicted both immediately downwind of Domtar and at the RV park base site.

*Strömvall and Petersson, 1991, https://doi.org/10.1016/0269-7491(93)90092-3

Data Collected

Raw data was collected during the intensive campaign and will be processed into final data.

Identify Any Problems or Issues Encountered and Proposed Solutions or Adjustments

No major problems

Goals and Anticipated Issues for the Succeeding Reporting Period

- Complete data finalization and share with team members to plan analysis steps
- Receive full funding from the UH Division of Research

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.

N/A

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
James Flynn