

AQRP Monthly Technical Report

PROJECT TITLE	Identifying and Apportioning Ozone Producing Volatile Organic Compounds in Central Texas	PROJECT #	17-053
PROJECT PARTICIPANTS	Aerodyne Research, Inc.	DATE SUBMITTED	8/14/2017
REPORTING PERIOD	From: July 1, 2017 To: July 31, 2017	REPORT #	7

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

The project had a presentation and review in person at the AQRP meeting in Texas. Many of the suggestions have been collected and will be implemented in the future. The Draft Final Report was submitted.

Preliminary Analysis (This is the Draft Report Executive Summary copied here)

A field measurement campaign was undertaken to collect data needed to identify and apportion the volatile organic compounds (VOCs) that contribute to ozone production in Central Texas. Measurement data was collected at three primary sites from May 10th to May 31st, 2017. The sites were selected to emphasize sampling air in the San Antonio urban area, the Eagle Ford oil and gas producing shale and a gulf air site in Corpus Christi State Park. The composition measurements include research and commercial grade instrumentation to quantify the following classes of compounds:

1. ozone and the oxides of nitrogen
2. light hydrocarbon photoproducts such as formaldehyde, acetone and hydrogen peroxide
3. air mass tracer species such as carbon monoxide (CO), hydrogen cyanide (HCN, from biomass burning) and sulfur dioxide (SO₂, anthropogenic tracer)
4. oil and gas light alkanes such as propane, ethane and methane
5. biogenic emissions such as isoprene, terpenes and methanol
6. anthropogenic emissions such as benzene and toluene
7. particulate matter size and composition for both primary (e.g. black carbon, hydrocarbon like organic aerosol) and secondary (e.g. oxidized organic aerosol, sulfate) particulate matter

8. minor secondary photoproducts produced with ozone from a complex mixture of VOC species.

The complete composition dataset has been quality assured and is poised to identify VOC emission categories (e.g. oil & gas; biogenic; anthropogenic) and attribute the quantified production of ozone in central Texas. The continuing analysis will identify the chemical regime (e.g. “NO_x limited vs VOC limited”) and inform mitigation strategies. The goals of the State of Texas Air Quality Research Program (AQRP) are:

1. to support scientific research related to Texas air quality, in the areas of emissions inventory development, atmospheric chemistry, meteorology and air quality modeling,
2. to integrate AQRP research with the work of other organizations, and
3. to communicate the results of AQRP research to air quality decision-makers and stakeholders.

This research project directly addressed to two of the ten research priorities identified in the AQRP Strategic Research Plan FY 16-17: 1. Improving the understanding of ozone and particulate matter formation (in central Texas), and 2. Quantifying the local ozone production that impacts the design value (DV) monitors that exceed the national ambient air quality standards (NAAQS) in central Texas. These research priorities will be conclusively addressed by the continued analysis of dataset.

Preliminary Findings

This project focused on collecting the measurement dataset and performing the in-depth quality assurance. The analysis using the resulting dataset is just beginning at the time of this writing. Some preliminary findings are warranted from the in-field analysis.

- The quantification of low-yield nitrogen containing species involved in isoprene oxidation suggests that **biogenic VOCs play a significant role in net ozone production in San Antonio.**
- The mixing ratio enhancements of oil and gas VOCs (e.g. ethane, propane) suggest local impact in Floresville, however it is unclear that these VOCs fuel local ozone production.
- **A credible fractional attribution of the production rate of ozone ($p(\text{O}_3)$) to oil and gas VOC emissions will require additional analysis** because the nitrogen-containing oxidation products are not yet well characterized.
- When $p(\text{O}_3)$ was between 5 – 15 ppb hr⁻¹, the chemical regime was NO_x-limited.
- When $p(\text{O}_3)$, was less than 5 ppb hr⁻¹ and the radical pool (e.g. HO_x) was lower, either chemical regime was possible (NO_x-limited or NO_x-saturated).

Data Collected

The campaign data is backed up fully in multiple locations.

Identify Problems or Issues Encountered and Proposed Solutions or Adjustments

Brian Lerner reports on the comparison of the GC-EI-FID with TCEQ operated sites. We will ask him to get in touch with the Floresville quality assurance officer.

Goals and Anticipated Issues for the Succeeding Reporting Period

We await comments on the draft final report and have several items to follow up on from the meeting.

Detailed Analysis of the Progress of the Task Order to Date

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 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, all presentations are internal or amongst performers

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

Submitted to AQRP by Scott Herndon and Tara Yacovitch

Principal Investigators