

AQRP Monthly Technical Report

PROJECT TITLE	Hydrogen Cyanide for Improved Identification of Fire Plumes in the (BC)² Network	PROJECT #	22-006
PROJECT PARTICIPANTS	Dr. Tara I. Yacovitch, PI Dr. Rebecca Sheesley and Dr. Sascha Usenko, Co-PIs	DATE SUBMITTED	6/12/2023
REPORTING PERIOD	From: 5/1/2023 To: 5/31/2023	REPORT #	10

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

The project team continues to hold update meetings via telecon, but will reduce the frequency of these meetings in June and for the remainder of the project.

The instrument continues to run at Meacham International Airport, collecting HCN data collocated with the BB2 trailer. Instrument zeroes stopped near the end of the month and needed to be restarted.

Stationary sampling will continue until at least mid-June to fulfill the 66-day measurement period. We will determine the exact measurement de-integration date based on whether active wildfire smoke is present at the time.

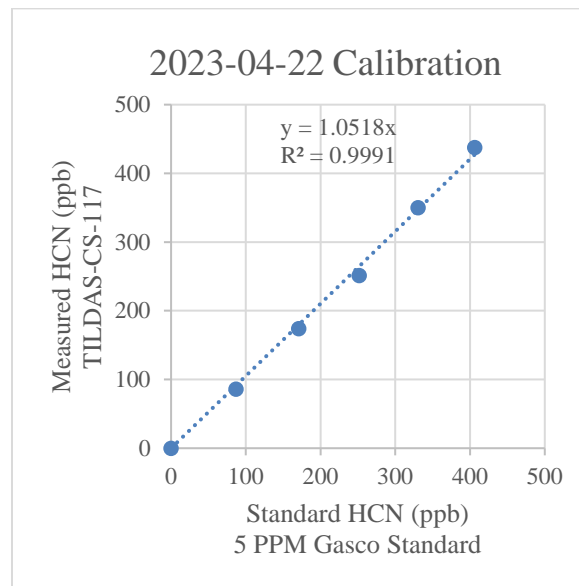
Preliminary Analysis

The in-field calibration performed in April has been worked up:

Aerodyne scientists, as part of the Aerodyne Mobile Laboratory deployment in Dallas/Fort-Worth were able to conduct an HCN instrument calibration for this project on 4/22/2023. Results of HCN calibration are shown below:

4/22/23 14 UTC 5 ppm HCN in N₂ balance
HCN Calibration (Field Site)

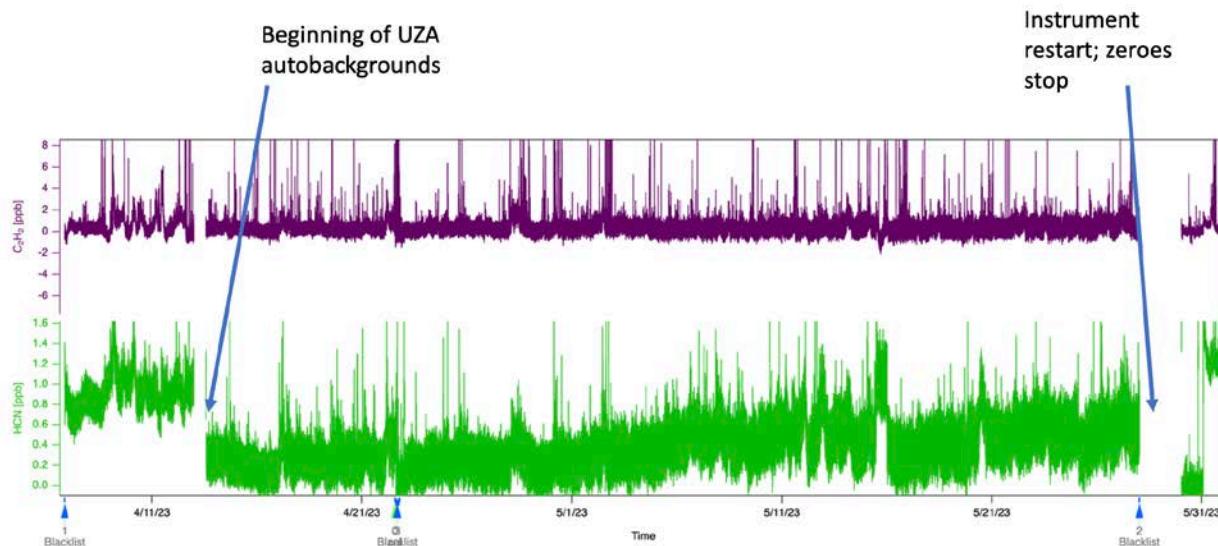
<i>Small HCN flow (sccm)</i>	<i>Big UZA flow (SLPM)</i>	<i>HCN Standard Conc (ppb)</i>	<i>HCN Measured Conc (ppb)</i>
500	5.65	406.504	437.615
400	5.65	330.579	350.197
200	5.65	170.940	174.056
100	5.65	86.957	86.36
0	5.65	0	0.0327
300	5.65	252.101	251.356



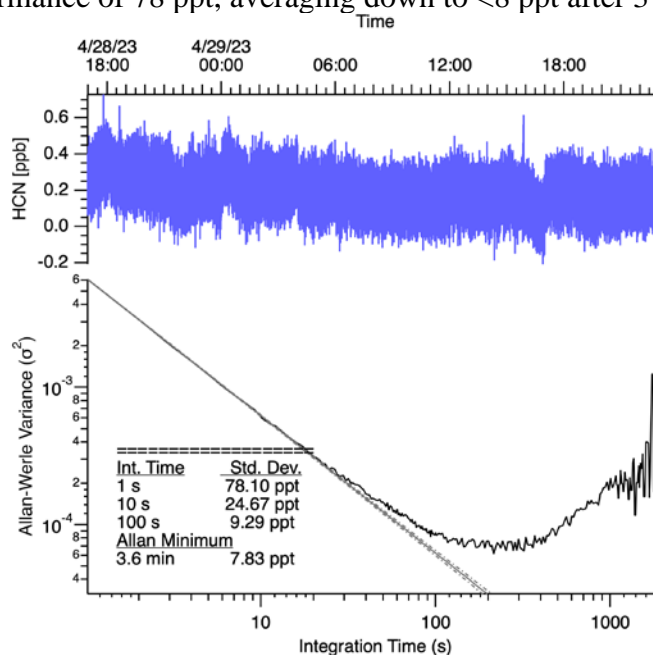
A calibration factor $m = 1.05$ was determined on 4/22/2023, where $HCN_{meas} = m * HCN_{true}$. This means that raw HCN values will be divided by 1.05 in the final QA'ed dataset. The instrument was undergoing autobackgrounds, and had a cell pressure of 40 Torr during this measurement. This calibration uses a 5 ppm HCN GasCo standard purchased from Concept Controls (Quotation 11002165) in a balance of zero air.

This calibration result is more in line with expected instrument performance than a previous calibration done on 10/26/2022 at Baylor campus, which showed a calibration factor $m=1.26$. We will discard the first calibration factor since the instrument was sent back to Aerodyne for repair and assessment prior to the above campaign calibration.

A first-pass data QA has been conducted on the HCN trace to remove calibration periods, zero periods, and select glitches. We have identified periods requiring offsets to be applied due to the absence of UZA zeroes, but have not yet applied these offsets. In the graph below, we observe about a 0.8 ppb positive offset in HCN mixing ratios when the instrument is operating without UZA autobackgrounds, as it was prior to the 04/16 delivery of UZA. A similar offset is observed after 5/31 when there was an unexpected instrument restart, and zeroes stopped. Troubleshooting of these zeroes and if necessary, replacement of this tank will be done as soon as possible in the next reporting period.



In-field instrument performance has been assessed. We choose a period of quiet data in April, during the co-deployment of the AML, and do an Allan-Werle variance plot. This shows a 1-second 1-sigma performance of 78 ppt, averaging down to <8 ppt after 3 minutes.



Data Collected

Ambient data is currently being collected at Meacham International Airport from the sample inlet at the (BC)² network trailer. Auxiliary data collected by the AML in this area as part of a separate project (AQRP 22-010) could aid in interpretation of this dataset.

Identify Any Problems or Issues Encountered and Proposed Solutions or Adjustments

Previous delays with site electrical upgrades, combined with the instrument issues identified in November have caused the measurement days from the anticipated fall campaign to be moved to the spring campaign (currently underway).

The original project design included a 45-day deployment in the fall, (Sept – Oct); and a 21-day deployment in the spring (to coincide with Aerodyne mobile lab project AQRP 22-010). The full 66 HCN measurement days have now been allocated to this spring measurement period.

Accomplishing the science goals of this project depends on measuring biomass burning emissions in the DFW area. We still believe an extended spring campaign gives us the greatest likelihood of capturing such emissions from a variety of sources. The current Canadian forest fires present such an opportunity.

Goals and Anticipated Issues for the Succeeding Reporting Period

Coordination of consumables at the site (ultra zero air) may prove challenging with the departure of Aerodyne scientists working on the mobile lab project. We are in the process of coordinating a UZA tank replacement with support from Baylor University co-PIs (and associated colleagues). Given the slow consumption of zero air gas by the HCN instrument, this should be the last required tank change before the end of the project. Additional support with respect to data transfer and backup will be required.

We continue to monitor the instrument via daily remote log-ins.

Detailed Analysis of the Progress of the Task Order to Date

Measurement days originally assigned to the fall campaign have been added to the spring campaign. Measurements are in progress and analysis had begun.

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 (i.e.: 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

Dr. Yacovitch returned from family leave last month. She is resuming project management and reporting duties as of this reporting cycle.

Are any delays expected in the progress of the research? If so, please include a detailed description of the potential delay below.

Yes No

Given the previous delays with the electrical work at the sampling sites in the DFW, measurement days were added to the spring campaign from the fall campaign.

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

See above sections describing the ongoing issues and project changes.

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,

Dr. Tara Yacovitch