BISHOP PAIUTE TRIBE
ENVIRONMENTAL MANAGEMENT OFFICE
AIR QUALITY PROGRAM

TO: Bishop Paiute TEPA Board
FROM: Emma Ruppell, Air Quality and Meteorology Specialist
DATE: December 8, 2022

SUBJECT: RESULTS FOR BLACK CARBON/LIGHT ABSORBING PARTICLES SAMPLING USING AN MA200 AETHALOMETER, NOVEMBER 2022

This project has been funded wholly or in part by the United States Environmental Protection Agency under assistance agreement (number) to (recipient). The contents of this document do not necessarily reflect the views and policies of the Environmental Protection Agency, nor does the EPA endorse trade names or recommend the use of commercial products mentioned in this document.

BACKGROUND. This report describes the results of light absorbing particles/black carbon (and proxy for elemental carbon) sampling at the Bishop Tribe's air quality monitoring station during November 2022. Background on the purpose, equipment selection, and details of the methodology, can be found in the Quality Assurance Project Plan (QAPP) for the sampling (**Appendix A**). Site and location details are also described in the QAPP. Included in the project objectives are the following:

- Determine a quantification of light-absorbing particles/black carbon concentrations occurring in the area covered by the Tribe's sampling network (the Bishop Paiute Reservation)
- Determine a qualification of potential sources of any measured carbon based on speciation; i.e., determine, by comparison, the significance in ambient air pollution (measured in PM2.5) of wood and biomass burning and diesel vehicle exhaust and any other determined combustion sources, measured (or reported) in black carbon

EPA's definition of black carbon aerosols is as follows: *"Black carbon (BC) is the most strongly light-absorbing component of particulate matter (PM), and is formed by the incomplete combustion of fossil fuels, biofuels, and biomass. It is emitted directly into the atmosphere in the form of fine particles (PM2.5)." (Office of Air and Radiation/Office of Atmospheric Programs/Climate Change Division, 2013).*

This is more commonly observed as soot, though the particle size denomination is not usually implied then. Soot may contain the chemicals and compounds that PM2.5 and PM10 contain, including hydrocarbons, carcinogens, and minerals. Observations at the Tribe's air monitoring station continue to show that soot is present in the air at the station, as in cold months, it loads onto the PM10 continuous monitor internal filters (see photos). Direct localized effects of the monitoring station itself were ruled out because this only occurs in winter and the TEOM runs all year. Sampling runs of 3 separate overnight periods were completed in March 2021 and March 2022. The results are described in detail in the reports for those rounds of sampling.

Dec 2019 (Using fingers for scale)

Nov 2020

The DOE Aethalometer Instrument Handbook (AJ Sedlacek, 2016), and the MA Series Operator Manual by Aeth Labs were referenced extensively in preparing the QAPP, and though not included as attachments with this report, are available upon request. The Handbook states: "The Aethalometer measures optical attenuation to determine BC aerosol concentrations expressed in terms of grams per cubic meter." Many technical studies since the 1960's (mostly since 2000) detailed how different classes of particles are estimated based on absorption across the light spectrum (using the Angstrom principal). (A partial list of studies which contributed to the science of aethalometers are available upon request. The MA200 model measures in up to 5 user-selected channels in the visible light spectrum: Ultraviolet, Blue, Green, Red, Infrared. Increasing attenuation towards the smaller end of the spectrum has been interpreted to indicate the presence of biomass burning of some kind, though with considerable variability. Measurements consistent with the larger wavelengths are interpreted (based on speciation studies) as fossil fuel or vehicle-based combustion.

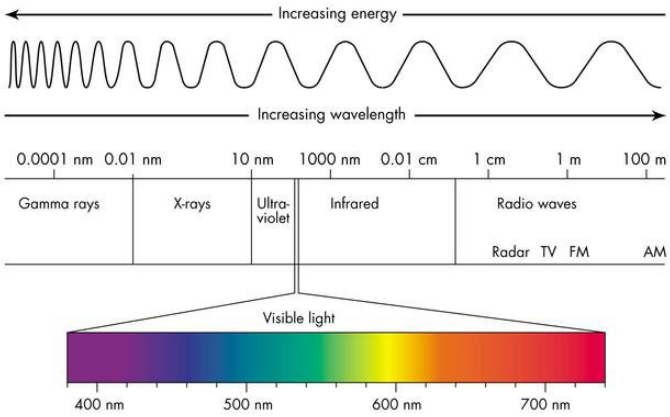

Photo: www.mira.org

SAMPLING METHOD. The 2022 sampling captured data for the period Friday Nov 18th - Sat Nov 26th

The sampling was performed with the Aeth Labs MA200, programmed as per the variables in the table below, following the MA200 operating manual and the project QAPP. The sampling timing and variables (test conditions) were chosen for the likelihood of seasonal wood burning occurring, backyard burning, as well as warming up vehicles in the morning and regular day time traffic. (See **Appendix B**, **Weather Forecasts, and Appendix C, Ambient Conditions During Sampling**).

All data generated by the sampling runs were reviewed for appropriate values, and screened for status codes. Flow calibrations were completed on 11/18/22 prior to the sampling run. Pre-Sampling calibration results and sampler settings were performed and recorded/saved according to the Project QAPP.

The sampler was placed in the PM2.5 enclosure (a temperature-controlled Ekto TEOM shelter converted to house the Tribe's TAPI T640 monitor, with empty pump chamber- see photos below). The sample inlet was run through the bulkhead with other cabling to ambient air outside, roughly 16" above the platform, and was protected at the end with a wire mesh cap and weather protectant cup. The sampler was placed on the least vibrating surface in the shelter, with a layer of neoprene rubber and a layer of rubber foam as additional vibration dampers. It was plugged into the Clary UPS inside the shelter to protect from power surges or outages. Beginning and ending ambient conditions were recorded in the instrument logbook and on the field data sheet.

The results of the sampling runs are summarized in the tables below, and are also summarized in reports generated by the AethLabs software (**Appendix D).**

The following reports were generated in Aeth software:

- Raw data
- Split session (daily) Data with 7-point center moving average
- All days' data with 15 and 25- point center moving average

The All days' dataset is used for the purposes of sample run summary and statistics below. The CMA7 split sessions datasets were used for the purposes of charting, and analyses based on the charts. All ambient air quality measurements are recorded/timestamped in PST (or UTC – 8:00).

SAMPLE RUN SUMMARY

TEST CONDITIONS	VALUE BEFORE RUN	FINAL VALUE
Timestamp - sampler	2022-11-18T16:00:00	2022-11-26T07:00:00
Day of week	Friday	Saturday
Ambient temp	49d F	38d F
Dewpoint temp	7 F	18d F
Wind speed	6 mph	2 mph
RH	18%	44%
Baro pressure	877 millibars	880 millibars
PM10 (1 hour)	12 ug/m3	5 ug/m3
PM2.5 (1 hour)	31 ug/m3	31 ug/m3
SAMPLER SETTINGS	**VALUE BEFORE RUN**	**FINAL VALUE**
Wavelengths	All (IR, R, G, B, UV)	DOES NOT CHANGE
Sample mode	Dual	DOES NOT CHANGE
ATN*	75	DOES NOT CHANGE
Timebase	300 seconds	DOES NOT CHANGE
Flow rate	150 ml/min	Av flow 150ml/m
Flow levels calibrated (last cal)	50 ml/min – 194 ml/min (dual)	Flow dev 2.5 ml/m
Tape position	10	17
Sampling Results – UV		
Mean	3776 ng/m3	
Point-to-Point Variability	1974 ng/m3	
Maximum (Raw)	43,460 ng/m3	
Minimum (Raw)	-1,055 ng/m3	
Sampling Results – Blue		
Mean	3506 ng/m3	
Point-to-Point Variability	1903 ng/m3	
Maximum (Raw)	50,522 ng/m3	
Minimum (Raw)	-1,955 ng/m3	
Sampling Results – Green		
Mean	3252 ng/m3	
Point-to-Point Variability	1858 ng/m3	
Maximum (Raw)	48,465 ng/m3	
Minimum (Raw)	-2,248 ng/m3	
Sampling Results – Red		
Mean	3071 ng/m3	
Point-to-Point Variability	1878 ng/m3	
Maximum (Raw)	46,131 ng/m3	
Minimum (Raw)	-1,991 ng/m3	

Sampling Results – IR	
Mean	2726 ng/m3
Point-to-Point Variability	1832 ng/m3
Maximum (Raw)	40,047 ng/m3
Minimum (exclude stabilization)	-3,579 ng/m3

The March 2022 sampling report discussion covers the scope of observations made on the data in comparison to sampling completed in March 2021. The analysis covered several comparisons:

- Establishing the presence of a diurnal pattern of scale of black carbon concentration (highest magnitudes pos and neg in nighttime or early morning hours)
- Establishing the presence of "breakouts"- short periods of IR channel "dominance" between longer periods of UV channel "dominance" in the charts, with majority occurring in late afternoon/evening, with exceptions possibly related to steady SE wind
- Establishing the presence of negative dips in the mid am hours in the IR channel, usually at a point or reduction in noise in the data
- Comparison to continuous FEM PM2.5 measurements, with similar maxima
- Comparison to some temperature measurements
- Comparison to wind speed (resultant) and wind direction measurements, with highest black carbon concentrations during low nighttime wind speeds, often with variability (standard deviation) in wind direction
- Wind roses (in EPA RETIGO tool), with modest evidence of some influence of a different pollutant source (indicated by IR channel rather than UV) when the wind is blowing at higher speeds from the West

Based on what was observed in March 2022, analyses of the 2022 sampling data omit comparison with PM10, examination of windy periods, or of negative black carbon concentrations ("drops"), or comparison with temperature. Analyses of the duration is omitted; instead, selected runs in the split session data (midnight-to-midnight days) are examined. Overall, the focus is on examining the following possible relationships:

- Comparison of black carbon concentrations with continuous FEM (T640) concentrations
- Confirmation of presence of IR channel breakout periods. These are concluded to indicate vehicle traffic, as explained in the March 2022 report.
- Detection of different pollution profiles (i.e., UV v. IR channel absorption levels) in different wind direction quadrants
- Account for any influences of winter inversion layer formation

OBSERVATIONS AND DISCUSSION. The 9 days of data were screened for quality and examined for patterns. The sampler was set to flag records with status error- no codes besides "startup" and "tape advance" were recorded.

First, it was concluded (using the daily attenuation and flow rate charts in Aeth Labs) that there were no major anomalies in flow rates during the sampling. Periodic physical inspections of the equipment ensured that there were no obstructions to flow or problems with the device in the shelter.

The following table summarizes observational criteria of black carbon (BC) concentrations for each full day (midnight-to-midnight) sampled, based on the charts in AethLabs as described above.

DAY	IR DROP/NEGATIVE (HRS)	IR BREAKOUT (HRS)	BC CONC SCALE (ng/m3)	HIGHEST CHANNEL/S NIGHTTIME HRS
SAT 11/19/22	Yes, ~07:30 – 09:30	No	12.5k	UV, BLUE
SUN 11/20/22	Yes but not negative, ~08:00 – 09:30	Minimal, ~15:30 – 16:00	25k	UV, BLUE
MON 11/21/22	Yes, ~08:00 – 09:30	Yes, ~15:00 - 16:30	15k	UV
TUE 11/22/22	Yes, ~08:30 – 09:30	Yes, ~15:00 – 17:00	17.5k	UV
WED 11/23/22	Yes, ~08:00 – 09:30	Yes, ~15: - 18:00	15k	UV, BLUE
THU 11/24/22	Yes, ~08:00 – 09:30	Yes, ~15:00 – 18:30	20k	UV, BLUE
FRI 11/25/22	Yes, ~07:30 – 09:30	Yes, ~15:00 – 18:00	20k	UV, BLUE

Comparison of the BC concentrations with PM2.5 (T640 5-minute data recorded by QREST) was done in RETIGO- see below for detailed discussion of comparison with wind data. Data was entered for 11/23/22, which was the day with the highest PM2.5 concentration, and also a day with an obvious IR breakout period (discussed more below). This day's data visualizations indicate a similar consistency of overall pattern as the various visualizations of March 2022 data showed. On this day, the night-time data indicates either the microaeth was recording soot concentrations over the 2.5 micron cutoff, or was much noisier than the T640 data. It is observed though that from midnight until about 05:00, the T640 PM2.5 concentrations are in the same range as the black carbon concentrations. Those observations are appliable for both IR and UV values. The "breakout period", discussed below, is visible in the time-series RETIGO chart for IR BC concentrations, and may indicate particles not captured by the T640 (>2.5 micron).

To best compare the UV and IR channels of black carbon with wind direction quadrants, sampling data was entered into the US EPA tool RETIGO (Real Time Geospatial Data Viewer) for the creation of time-series plots and wind roses of the sampling run, and of selected time periods. The steps for this process are described below in **Appendix E**. Additionally, tutorials and instructions for using RETIGO are documented in detail at https://www.epa.gov/hesc/real-time-geospatial-data-viewer-retigo

Graphs and wind roses were generated using RETIGO and are included in **Appendix E**. All visualizations with wind direction on the compass rose made in RETIGO display the values of the selected variable in each quadrant in position based on wind vector magnitude. There appears to be a discrepancy in the software between the scale of m/s in the rose and in the data range legend, but each circle from the center (i.e., 1, 2) represents 1 bin in terms of wind speed.

The observed drops in IR in the table above refers to a very noticeable dip (usually negative) at those times; however, the IR channel is typically the lowest channel in the charts for all hours other than the breakout periods. During those hours, especially overnight time hours, UV is typically the highest. We do

not know why this drop (of already low IR levels) occurs and whether it reflects influence of mixing and inversion, calculations within the sensor between different channels, or inadequate amount of a certain type of pollution relative to the known/common presence of woodsmoke in most cold early mornings. If there is a short-lived passage of the inversion layer though the monitoring location on a given morning in winter, it may render any evidence of the source of pollution captured in the IR channel at that time unreadable or at least uncapturable.

A small count of the March 2022 sampling morning profiles of IR in relation to other channels were in contrast to this. A shift from UV to IR channel dominance after the inversion lifts and mixes was expected, unless vehicle pollution was present in the morning before then. But exact timing and elevation of the inversion (generally eastward) was not known. Vehicle activity, inferred and observed, happens in close proximity to the sampling location, so it should be assumed that at least some of the IR dominance observed in morning hours during that sample run was from vehicle sources. The difference in time of year (or possibly just different activity locally on the sample run days) may explain why the negative dip of IR in the early mornings is so much more consistent in the November sampling than in the March sampling.

The breakout periods observed are generally also the periods of the lowest overall pollution concentrations recorded, so there was the caveat that with very low concentrations, and possibly wind, there may be a greater likelihood that the heavier particles are more easily captured, even if pollution by the sources has not changed. Smoke from wood burning tends to most strongly coincide with the evening and nighttime hours in the Valley partly due to the Valley inversion formation, so we are always working with this condition.

The RETIGO time-series chart for wind speed on 11/23/22 does show that the IR breakout period does not correspond with the highest wind speeds. Unlike the noisy nighttime swings in magnitude and the early morning negative dip of IR values, the mid/late afternoon breakout period concentrations (in all channels) build steadily- in every day examined from each sample run, and do not illustrate noise or a chance occurrence that IR is highest. On 11/23, zooming in on the 12:00 – midnight hours in the chart shows that the IR BC values increasing after 15:00 was not affected by a dip in wind speeds from >8 mph to ~2 mph, or again at ~17:00, from ~6 mph to <2 mph.

Wind speeds were low to moderate on 11/22- the max speed was 10.1 mph. The majority of the distribution is in the NW quadrant, followed by SW and NE. The highest windspeeds were from Northerly directions.

There does not appear to be a significant pattern in BC concentrations by wind direction or wind speed, other than that for concentrations in the top quartile (i.e., 15.75 ug/m3 for UV and 12.75 for IR) to appear, wind speed had to be in at least the 3rd block or bin from 0 for UV, and 2nd for IR. The highest concentrations in both channels are observed to align with the N or W wind directions, in the middle range of wind speeds.

On 11/23/22, there is also some evidence from which it could be inferred that it took higher (but still mild-moderate) wind speeds to increase concentrations in BC than it did for the PM2.5 (T640) concentrations, possibly indicating a different pollution source. When winds were coming from the SW, there were some elevated BC concentrations which the T640 did not record as elevated relative to its daily highest concentrations, which may have been outside the size range of the T640. The highest daily wind speeds correspond with low values for all 3 pollution variables, which is to be expected, as the

particles disperse with wind. But the differences in the 3 variables' concentrations over varying wind speeds and directions at the same point in time may indicate they are from different pollution sources. A summary of the March 2022 sampling noted that there was modest evidence in the wind roses of those sample runs that when the wind was blowing at higher speeds from the West, IR BC values being to appear, whereas they did not for UV, and may have indicated a different pollution source

A pollution rose was also created for the 11/23/22 T640 PM2.5 data, which showed that all values >100 ug/m3 occurred in the NW or NE quadrants. This is not consistent with some of the BC higher concentrations being clustered around the W axis line in the SW quadrant. Additionally, all of the higher PM2.5 concentrations are within the first 3 wind speed bins.

CONCLUSIONS.

One of the major goals of the sampling project is to reasonably determine if vehicle pollution is of enough significance on and the Reservation to revise the narrative of woodsmoke and wood burning outreach materials, or to use a new calculation of vehicle emissions in the Emissions Inventory (2009, 2012, and 2019 versions). Wood and vegetation burning are known, and the largest, sources of PM2.5 on the Reservation, according to the EI. Vehicle traffic is not expected to be anywhere near equal to this source, but is one subject of this investigation. It is to be expected that BC/soot pollution from vehicles is most likely to be recorded in the IR channel.

The clearest evidence for a potential change in pollution source continues, since the March 2021 and March 2022 sampling also at the BPT air monitoring station, to be the breakout in the afternoon to elevated values in the IR channel, relative to all other microaeth channels. The breakouts are the only consistent occurrences of IR being the highest recorded BC channel, and the timing is very consistent among days, especially on weekdays (in the Nov 2022 sampling). With weekend days being the exception, and with the particular hours of the day, it can be inferred that this is vehicle activity and not wood burning; however, sampling over additional weekends would be needed to confirm this.

The absence of IR channel dominance during weekday morning hours (which would be expected if IR is reflecting vehicle traffic) in the November 2022 sampling data may be a seasonal difference to the occurrence of some observed in March 2022, accounting for the inversion layers' impact on the monitoring location. Sampling outside of any time periods with seasonal inversions and wood burning would be needed to confirm this.

At this time, there is no revision to the method used to determine vehicle emissions in the EI. However, some of these concentrations may be used in the future as a check on the method, or contribute to a new estimate. Another short-term goal of this sensor/aethalometer study is to capture mobile data or data at different locations. In the meantime, a fairly predictable, if not uniform profile of daily wintertime data levels, overall noise, and relativity of channels has been established for the BPT air monitoring station.

APPENDIX A – QUALITY ASSURANCE PROJECT PLAN

BISHOP PAIUTE TRIBE
ENVIRONMENTAL MANAGEMENT OFFICE
AIR QUALITY PROGRAM

QUALITY ASSURANCE PROJECT PLAN

Ambient Air Monitoring Project for Measuring Speciated Carbon

Using an Aeth Labs MA200 Aethalometer

March 2021

APPROVALS:
Environmental Management Office

Authorized by: _____ Date: 4/5/21
Brian Adkins, Environmental Manager

Prepared by: _____ Date: 3/19/21
Emma Ruppell, Air Quality & Meteorology Specialist

EPA Region 9

Authorized by: _____ Date: _____

Citizen Science QAPP Requirement Summary		
Section 1	Title and Approval Page	Template #1
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Section 3	Project/Task Organization	Template #3
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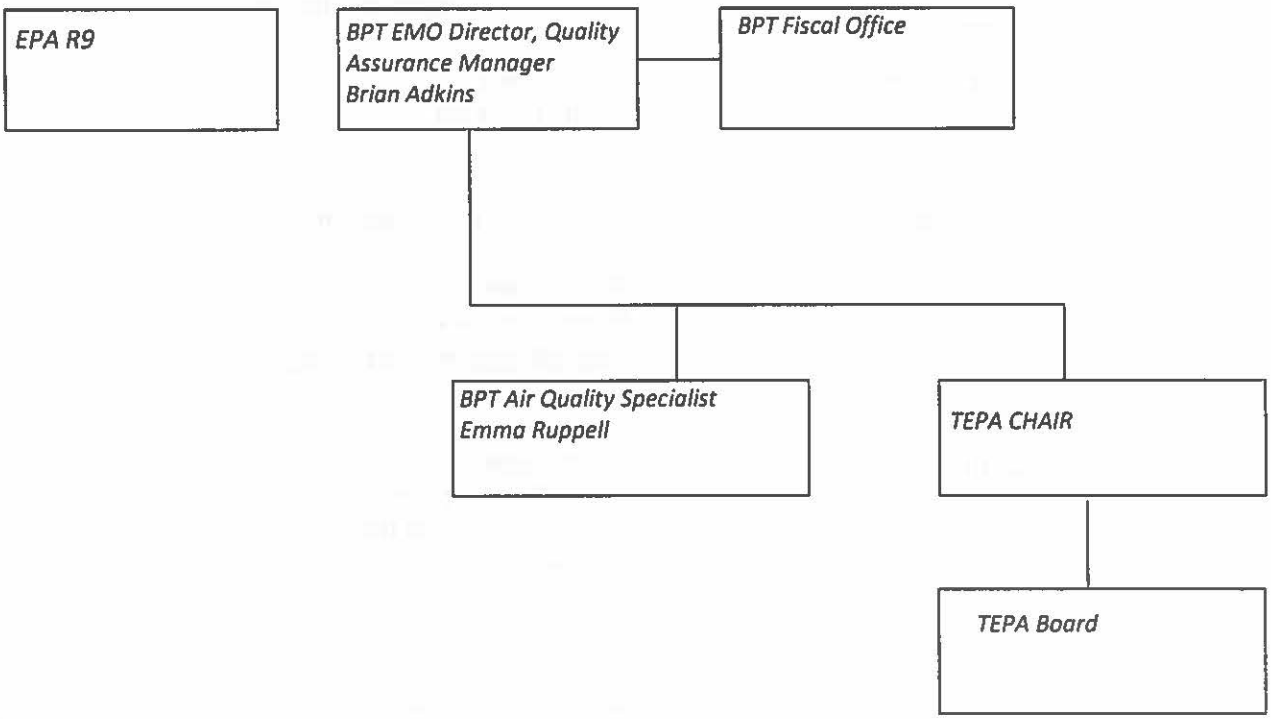
Appendix	Operating SOP	Appendix

Citizen Science QAPP Template #2A Project Organization Chart



Citizen Science QAPP Template #2B Project Distribution List

Name/Title	Contact Information
Harry Williams	50 Tu Su Lane Bishop, CA 93514
Brian Adkins	Environmental Management Office Bishop Paiute Tribe 50 Tu Su Lane Bishop, CA 93514 brian.adkins@bishoppaiute.org
Roberto Gutierrez	US EPA Region 9 – Air 8 75 Hawthorne St San Francisco, CA 94105 gutierrez.roberto@epa.gov
Audrey L. Johnson	75 Hawthorne St LSS San Francisco, CA 94105

Citizen Science QAPP Template #3 Project/Task Organization

Name	Title	Organizational Affiliation	Responsibilities (specific to this project)
Emma Ruppell	*Air Quality and Meteorology Specialist*	*Bishop Paiute Tribe Environmental Management Office*	*Designs and executes the research; reports to Director, TEPA Board, and EPA R9*
Brian Adkins	*Director*	*Bishop Paiute Tribe Environmental Management Office*	*QA Manager for BPT Air Program and authorization on purchasing, and ensuring corrective actions are completed, if needed*
Roberto Gutierrez	*Project Officer*	*EPA R9*	*Reviews and approves project documents including quality assurance project plan (QAPP) and associated standard operating procedures (SOPs), budgets, and reports.*
Audrey Johnson	*Region 9 QA Officer*	*EPA R9*	*Reviews and approves quality assurance project plan (QAPP).*
Harry Williams	*Chairman*	*BPT TEPA Board*	*Reviews project report*

Citizen Science QAPP Template #4 Problem Definition and Project Objectives

Problem Definition

As outlined in the FY21 CAA grant workplan, the Tribe will be conducting a sensor-based data collection study. The purpose of the study is to examine and quantify the potential presence of pollutants from vehicle or other combustion-related sources, to direct reduction strategies and outreach efforts in the best way, and to further characterize pollution on the Reservation.

Project Objectives (linking data results with possible actions)

The objectives of the project include:

- Determine a quantification of light-absorbing particles/black carbon concentrations occurring in the area covered by the Tribe's sampling network (the Bishop Paiute Reservation)
- Determine an estimate of concentrations proportional or otherwise comparable to particulate matter measured on the Reservation
- Determine a qualification of potential sources of any measured carbon based on speciation; i.e. determine, by comparison, the significance in ambient air pollution (measured in PM10 and PM2.5) of wood and biomass burning and diesel vehicle exhaust and any other determined combustion sources, measured in black carbon
- Determine the likeliest health effects, and likeliest prevention strategies

Data Uses

The data collected from this project will be used by the BPT Air Program to inform the TEPA on any potential health hazards related to pollution not specifically characterized by the Tribe's continuous PM monitors. It may also be used to inform the community on the Reservation for awareness of the pollutants of concern and any steps they may take to play an acting role of improving their air quality or protect their own health.

NOTE: This document is required by EPA, and by necessity of purpose, describes elements of the sampler system which are or may be protected intellectual property: "DualSpot" and "SpotSense" as they appear throughout this document refer to protected elements.

Citizen Science QAPP Template #5 Background and History

Background

This framework provides for the sampling of speciated/qualified light absorbing particles (black carbon) in ambient air by the Bishop Paiute Tribe's Environmental Management Office (EMO), using an Aeth Labs MA 200 aethalometer. The EMO's sampling network functions for informational purposes, based on the Tribal air quality standards (adopted in April 2006), and to meet the objectives described above.

EPA's definition of black carbon aerosols is as follows: *"Black carbon (BC) is the most strongly light-absorbing component of particulate matter (PM), and is formed by the incomplete combustion of fossil fuels, biofuels, and biomass. It is emitted directly into the atmosphere in the form of fine particles (PM2.5)." (Office of Air and Radiation/Office of Atmospheric Programs/Climate Change Division, 2013).*

Sources which may be impacting the air quality on the Reservation have been documented in Tribal Air Program documents including: 3 Emissions Inventory (EI) revisions (latest 2019); 2 Air Pollution Prevention Plan revisions (latest 2020); The Project QAPPs for PM2.5, PM10, and Ozone continuous monitoring; a Health Study based on clinical visits, and a long-term particulate matter trends analysis. More recently, projects such as Diesel Vehicle replacement and Tribal Greenhouse Gas Inventory further assessed potential emissions from vehicles, also included in the EIs. Investigative and supplemental assessments of air quality include portable PM measurements (i.e. indoors), visible emissions, indoor carbon monoxide, and indoor formaldehyde. This project is the first attempt in the Air Program's history to characterize PM pollution beyond size-denominated concentrations, in terms of content or speciation.

Originally, carbon monoxide (CO), nitrogen dioxide (NO2), and possibly volatile organic compounds (VOCs) were suggested. Thus far, the Tribe's Air Program operates continuous monitoring for particulate matter by size, and ozone. Ultimately, CO and VOCs were ruled out. Reasons primarily had to do with lack of availability of sensors of sufficient quality, or lack of applicability for an outdoor study. Gaseous sensors are known to vary in quality and performance. Some models were rejected due to insufficient performance specifications for a winter study on the Reservation.

Aethalometers were identified as sensors which may address pollutants directly observed as black build-up on the TEOM (PM10 monitor) filters. As there is no way to directly observe NO2, data from a NO2 sensor would provide indirect measurements. The aethalometer was chosen to provide information on the significance of pollutant sources of concern, notably wood burning for home heating, which was the second largest finding of the EI at 13.61 TPY estimate, narrowly behind dust from dirt roads at 13.81 TPY estimate. The EIs and related studies are available at http://www.bishoptribeemo.com/library.htm.

Field test reports by other Air agencies are available for some such models, with Aeth Labs sensors being the vendor of the aethalometers field tested (in multiple studies). A model was identified (the MA200), the lowest-cost model which has multiple channels, designed to distinguish between biomass (wood etc) smoke and diesel exhaust soot.

This QAPP describes how this program controls and evaluates data quality so that the objectives listed

above are met. Currently, the primary objective is informational. Therefore, the data quality objectives necessary for that determination are the most important. The objective for overall accuracy, which includes both bias and precision, is 30%, according to the EPA tiering system for characterization studies, though the requirement for informational studies allows 50%.

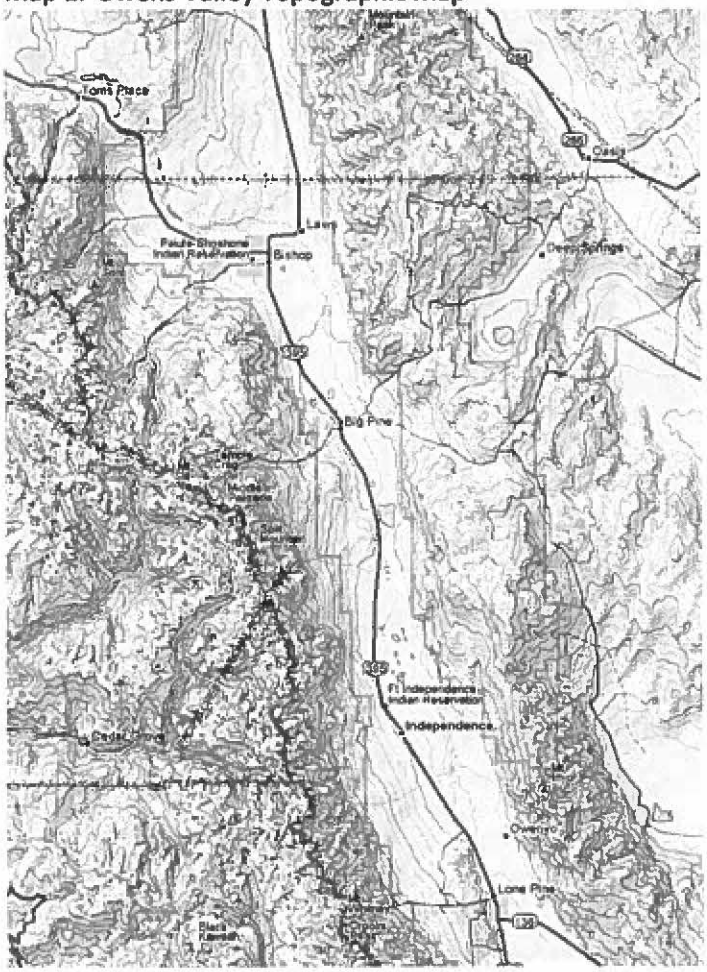
History

The Bishop Tribe initiated PM10 monitoring in April 2003 and PM2.5 monitoring in June 2004, and at the time there was no air quality monitoring in the Bishop area. The Tribe operates a continuous FEM PM10 monitor- a 1405 Tapered Element Oscillating Microbalance (TEOM), and FEM 2.5 monitor- a TAPI T640 (replacing a 1400/8500 TEOM FDMS monitor in 2020). Data have been collected according to EPA guidelines (as detailed in the project QAPPs) for over 15 years, and are submitted to AQS. At present GBUAPCD operates a large portable monitoring station at the White Mountain Research Station, to the East of Bishop. Other PM10 monitors in the area are operated by the Lone Pine Paiute Shoshone Reservation, located 60 miles to the south, and the Ft. Independence Reservation, located 45 miles to the south. This project is the first attempt in the Air Program's history to characterize PM pollution beyond size-denominated concentrations, in terms of content or speciation.

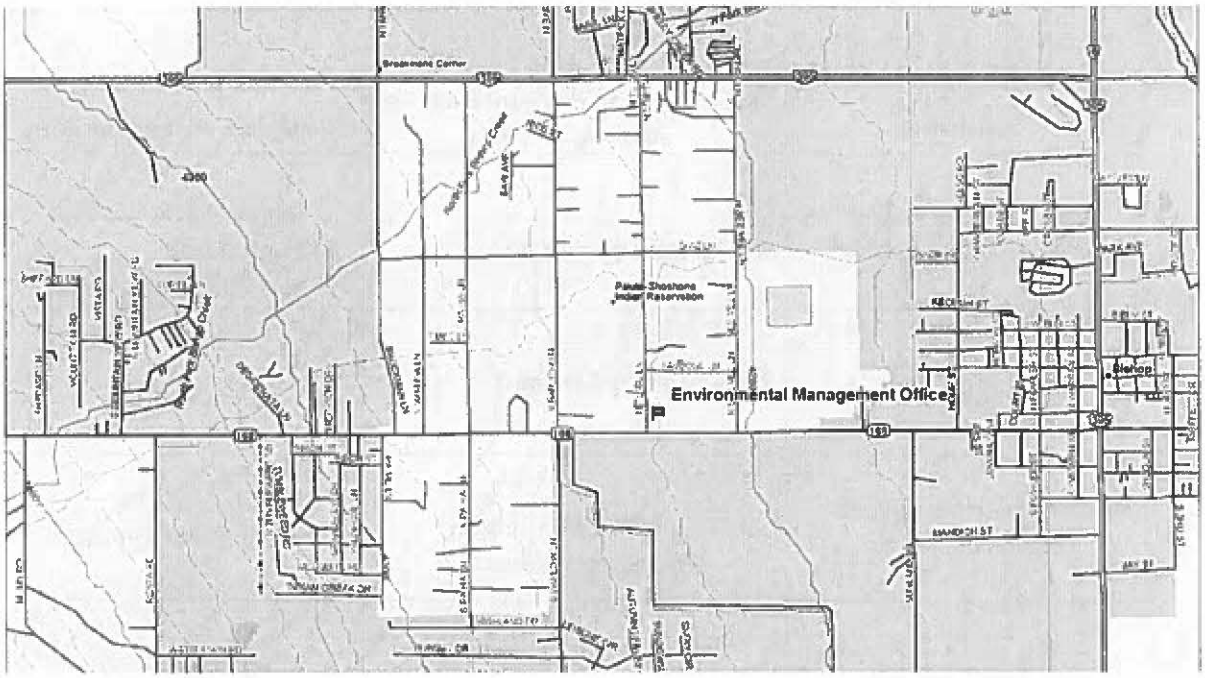
Citizen Science QAPP Template #6 Project Location

The air monitoring equipment is located on the roof of the Environmental Management Office at 50 Tu Su Lane, on the Bishop Paiute Reservation (N37°22', W118°25' at an elevation of 4,226 ft.), shown in Maps 1 and 2 and in the photographs below. As shown in Map 1, the Bishop Paiute Reservation is located in the Owens Valley in eastern California, near the Nevada border. The reservation itself comprises 879 contiguous acres and is flanked by the City of Bishop to the East. It is surrounded by private lands and by lands owned by the Los Angeles Department of Water and Power. Approximately 1,796 people live on the Reservation. Map 2 shows the location of the Environmental Management Office on the Bishop Paiute Reservation. Photographs 1 and 2 show the Air Monitoring Station platform, and the enclosure the instrument will be housed in. Access to both are secured, and is via external stairs to the roof.

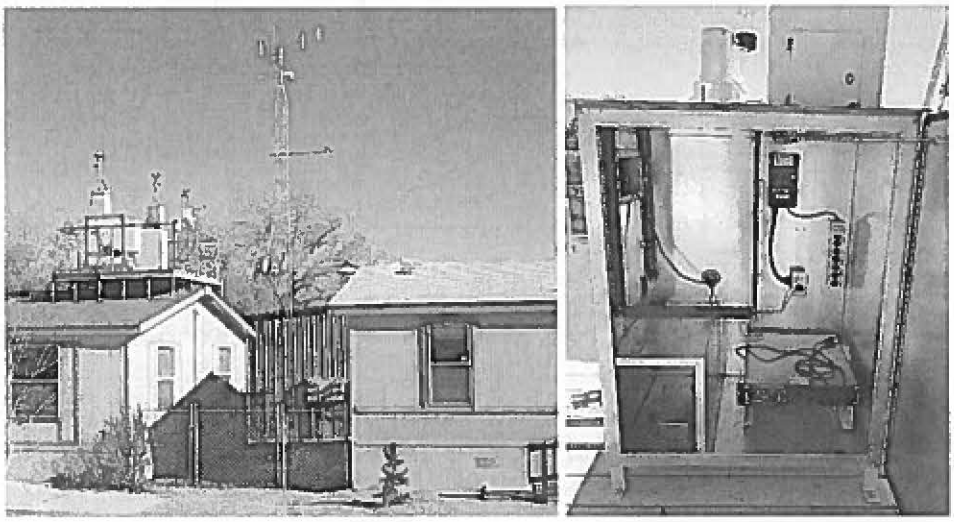
Map 1. Owens Valley Topographic Map



Map 2. Environmental Management Office and the Bishop Paiute Reservation.



Photographs 1 and 2. PM10 Air Monitoring Equipment Platform and Shelter



Citizen Science QAPP Template #7 Project Schedule

Activities	Organization/Group responsible for activity completion	Timeframe work will be done
Preparation of Project Description for approval	*BPT Air Quality Specialist*	*February 2020- Submit FY21 proposal June 2020- Apply FY21*
Research, Lit. review, correspondences	*BPT Air Quality Specialist*	*January 2021*
Funding Oversite; budget revision approvals	*BPT EMO Director, EPA Project Officer*	*January/February 2021*
Instrument purchase	*BPT staff (EMO, Fiscal)*	*February 2021*
Region 9 QAPP Review and Approval	*EPA R9*	*March 2021*
Instrument testing, calibration, data collection	*BPT Air Quality Specialist (and Aeth Labs)*	*March 2021*
Data Recovery, Evaluation	*BPT Air Quality Specialist*	*April 2021*
Data Secondary Evaluation	*ITEP, EMO or other tribal staff (Aeth Labs)*	*April – May 2021*
Preparation of Final Report	*BPT Air Quality Specialist*	*May 2021*

Citizen Science QAPP Template #8 Existing Data

Existing Data	Data Source	How Data Will Be Used	Acceptance Criteria
Existing and Historical PM10, PM2.5, and meteorological data from the Tribal continuous FEM air monitors (available also via EPA Air Data Mart and QREST or Vista Data Vision)	*1405 TEOM, TAPI T640 continuous 1-hour average data via Sutron XLite logger compiled to QREST, validated and saved for AQS submittal as per the PM10 and PM2.5 Project QAPPs; raw instrument internal storage data from the monitors.*	*Data will be used to compare the PM concentrations in ug/m3 measured by the monitors with the MA200 data, to better understand the scale of the MA200 data and volumetric flow concentrations.*	*See Project QAPPs for PM10, PM2.5*

Citizen Science QAPP Template #9 Quality Objectives

Precision:

Field – Our goal for this project is to educate, inform and organize the community and make them aware of the pollutants that exist in a wide range of concentrations. Precision Error, as defined for criteria pollutant sensor projects by EPA using collocation with a regulatory monitor, is required to be <50% for a level 1 or informational study, but the goal is <30%. Until a collocation opportunity with another equivalent or greater model aethalometer is identified, instrument calibrations will be relied upon for determining precision.

Existing data – Checked as per QAPPs or continuous FEM PM monitoring and corresponding EPA validation templates.

Bias:

Field –The MA200 will be located in an outdoor enclosure at the Air Station on the Reservation. This is at a close proximity to a 2-lane highway, vehicle and equipment storage area, paved or treated parking lots, office buildings, residences, an organic garden, Dialysis Center, and Cultural Center. The location was selected for comparability to TEOM data, and access to electrical power and security. Any collocation which occurs with mobile units is planned to occur at the monitoring station, as well as flow rate calibrations, including any third party audits and calibrations.

Bias Error objective is <30% however goal for informational study is <50%.

Representativeness:

Field- The location is subject to elevated exposure of a mix of combustion compounds generated by residential wood burning, and to an unknown extent- cold start diesel. The result will be representative of the compounds the community is exposed to during the project timing of March 2021.

Comparability:

Field- Comparability will be between runs of the aethalometer, based on the calibration status and any available QA metrics output for the calibrations for each run.

Completeness:

Field- The goal is to collect 100% of the sensor data; however >75% would be acceptable for the purposes of the project. If weather or other issues impede a sampling event, the event will be rescheduled or eliminated.

Resolution:

Field- See table below, using values as per the MA200 MA300 MA350 Operating Manual, 2018. (referenced further as the MA200 Manual).

Channel/ parameter	Detect Limit	Range	Resolution	Flow Rate/Sample Settings	Accuracy
All	30 ng/m3 BC (150ml/ min)	0-1 mg/m3 BC	.001 ug/m3 BC	50, 75, 125, 100, or 150 ml/m	+/-5% FS 0-1 L/min at 25d C; repeatability +/- 0.4% FS 0-1 L/min
880 nm (IR)				50, 75, 125, 100, or 150 ml/m (lower flow rates recommended if BC levels are high)	
375 nm (UV)				>100 ml/m	
Temperature		-40 to 85dC		Enter local conditions or use STP	+/- 0.2dC sample, +/- 1dC @STP, +/- 3dC avg -40 to 85dC
Pressure		50 – 110kPa		Enter local conditions or use STP	+/- 0.4 kPa @ 50 – 110kPa, -10dC – 70dC
Humidity		0 – 100%			+/- 1.8% 10 – 90% @25dC

Citizen Science QAPP Template #10A Data Collection Methods

Sampling Design

According to the Department of Energy, Office of Science, the Aethalometer method is described as such: *"The Aethalometer is an instrument that provides a real-time readout of the concentration of "Black" or "Elemental" carbon aerosol particles (BC or E) in an air stream... It is a self-contained instrument that measures the rate of change of optical transmission through a spot on a filter where aerosol is being continuously collected and uses the information to calculate the concentration of optically absorbing material in the sampled air stream. The instrument measures the transmitted light intensities through the "sensing" portion of the filter, on which the aerosol spot is being collected, and a "reference" portion of the filter as a check on the stability of the optical source. A mass flowmeter monitors the sample air flow rate. The data from these three measurements is used to determine the mean BC content of the air stream. ... The aethalometer measures optical attenuation to determine BC aerosol concentrations expressed in g/m3. ...etc."* (AJ Sedlacek, DOE/SC-ARM-TR-156, p. 1)

The Jan 2021 Specifications Sheet for the MA200 (page 2) describes the method further as: *"Real-time Aethalometer® method, 5 wavelength absorption analysis... Measurement at 880 nm interpreted as concentration of Black Carbon ('BC'). Measurement at 375 nm interpreted as Ultraviolet Particulate Matter ('UVPM') indicative of woodsmoke, tobacco, and biomass burning."* The MA200 can be used in single or dual spot sampling mode.

The Tribal Air Program plans on sampling the Reservation at 1 location, initially, which is the Air Monitoring Station (described above). This location meets the EPA siting criteria for ambient monitoring. The instrument will be placed inside of one of the temperature-controlled outdoor shelters, with a weatherproofed sample line at a height of roughly 1.5 meters above the rooftop platform.

The sampling will take place in March and April 2021, in multiple runs covering early morning hours. Selection of the specific dates and hours will be determined by temperature forecasts, review of TEOM data, observation of the winter inversion layer (which often can be directly observed from the platform), and observations of equipment starts and warm-ups.

The study sample runs will collect multi-wavelength 5-min data, for analysis in time-series plots, allowing comparison between the spectrum channel quantities at different times during the run, and between different times of the run for specific channels. (Example data for the MA200 is available at https://aethlabs.com/microaeth/ma200/data-examples)

The following excerpt summarizes the selection of flow rates for use with an aethalometer, as described by AJ Sedlacek in DOE/SC-ARM-TR-156, p. 12, Data Tradeoffs:

"Higher flow rate will provide less noise, but shorter lifetime of the tape spot. When the spot saturates, the tape automatically advances... Increase flowrate to reduce noise on data if tape advance intervals are acceptable."

Matrix	# of Sampling Locations	Parameter/ Channel	QC Measures	Total Number of Samples/ Measurements	Project Objective for Sampling and Analysis or Monitoring
Ambient Air	*1*	*880nm BC (IR)*	*Flow calibrations*	*10-12 tape locations/sampling sessions; varies with flow rate; 5 minute data*	*Determine quantity of soot BC*
Ambient Air	*1*	*375 nm BC (UV)*		*~ half of 880nm channel samples available*	*Determine quantity of biomass burning BC*
Ambient Air	*1*	*Additional channels (red through blue)*		*NA*	*Determine absorption at other wavelengths*
Ambient Air	*1*	*Ambient conditions (temperature, pressure, RH)*	*Flow calibration*	*NA*	*Determine correct volumetric concentration of BC*

Citizen Science QAPP Template #10B Equipment List and Instrument Calibration

Equipment/Parts List

MA200 Aethalometer
Qty 2 filter tape cartridges
MA series Flow Calibration kit (and accessories)
AC adapter & power plug
USB/serial cables
(VSCC – optional for future study)
Batteries (1 3.6 V rechargeable)
Desiccant (optional)
Sampling hose & connector
Outdoor enclosure (existing)

Instrument Calibration and Maintenance

Calibration type	Calibration Frequency	Maintenance Requirements
Flow calibration	*Once at start, 1 year (DOE/SC-ARM-TR-156 p.5)* *As instructed by manufacturer (Aeth correspondence, March 2021)*	*Recommended annual service/bench cleaning at manufacturer with heavy use*
Optical calibration	*As instructed by manufacturer*	*Recalibration of calibration kit*

Calibration trials will be run prior to any ambient sampling. Results of these initial trials will be reviewed by Aeth Labs personnel to determine the flow rate options for the monitoring site under ambient conditions. For sampling (data collection) sessions, all calibration results will be reviewed by the Air Quality Specialist.

All calibrations for this project will be documented. Calibration records are imported directly from the sampler for saving (see SOP), and will also be recorded as logbook entries. Calibration records will include date, time, operator name/initials if other than the Air Quality Specialist who keeps the logbook, and the calibration results themselves. Calibrations for sampling (not testing) will be recorded on the Field Data Sheet for the sampling run. Acceptance criteria for calibration checks are calculated by the instrument programming. See MA200 Manual Section 7 for calibration details, Section 3 for parts and supplies.

Citizen Science QAPP Template #11 Analytical Methods*

***This table only needs to be completed when sample analysis by a laboratory is applicable to the project.**

Matrix	Analytical Group/Parameter	Reporting Limit	Detection Limit	Analytical & Preparation Method/ SOP Reference	Sample Volume	Containers (*number, size, type*)	Preservation Requirements (*chemical, temperature, light protected*)	Maximum Holding Time (*preparation/ analysis*)	Laboratory used for Analysis
NA	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*

No field samples requiring laboratory analyses shall be collected during this project.

Citizen Science QAPP Template #12
Field Data Sheet
BPT MA200-0301 Sampling Log

Date_____ Operator:_____

Sample Run (description):
_____
_____

Battery charged?
Yes ☐ No ☐
If yes, date: _____

Flow setpoint, ml/min: 50 ☐ 75☐ 100☐ 125☐ 150☐
Channels selected, nm: IR (880)☐ IR/UV (880, 375)☐ All (IR, Red, Green, Blue, UV)☐
Sampling mode: DualSpot☐ SingleSpot☐ Tape advance: Auto☐ Set____☐
Timebase interval:_____min (sec) Operation mode: AC power ☐ Battery

Start date_____
Start time_____
Start temp: _____
Start RH: _____

End date_____
End time_____
End temp: _____
End RH: _____

PM2.5, PM10 averages
(from monitors)
_____
_____
1 hr☐ 8 hr☐ 12 hr☐ 24 hr☐

Total run time: _____
hours/min

Pre-test Instrument Setup

Settings viewed/saved ☐ Flow Levels calibrated: _____

Performed by: Date/Time: Cal Table Saved ☐
_____ _____

Post-test Instrument Operations

Data downloaded Yes ☐ No ☐ File directory: _____

Performed by:_____Date: _____

Comments

Citizen Science QAPP Template #13 Training and Specialized Experience

Training

Personnel/Group to be Trained	Description of Training	Frequency of Training
Emma Ruppell, Air Quality Specialist	*Proper use of the MA200 sampling equipment (by vendor and agency colleagues)*	*Winter/spring 2021; as needed for additional sampling*
Emma Ruppell	*Fundamentals of Air Monitoring, Air monitoring with sensors, IAQ diagnostics at TAMS Center*	*2016-2019*

Specialized Experience

Person	Specialized Experience	Years of Experience
Emma Ruppell	*Proficient operation of:* *-Bacharach gas analyzer* *-opacity meter for on-road diesel* *-TAPI T640 FEM PM2.5 monitor* *-Thermo 1405 TEOM for FEM PM10* *-Thermo 1400/8500 FDMS TEOM for FEM PM2.5* *-Rad 7 continuous radon detector* *-Graywolf DirectSense IAQ probe* *-Thermo 49i ozone analyzer* *-TAPI 703E photometric ozone calibrator* *Thermo 42i NOx analyzer with CEMS* *-R&P DustScan Scout PM sensor* *-gravimetric cyclonic PM10 sampler* *Flowmeters: SL Pro, Delta Cal, Bios*	*2006 - 2021*

Citizen Science QAPP Template #14 Assessments and Oversight

The table below indicates tasks to be performed at the Monitoring site.

Field Activity to Check	Field Activity Tasks
Monitoring of site activities	Daily visits to site when sampling – Air Quality Specialist • Check operational status of sampler • Check site or sampler integrity not compromised • Visual/audible inspection of sampler Calibration/audit of sampler- Air Quality Specialist • Save automated results and record in logbook • Note any special considerations or issues
Sampling performed correctly	Step by step following of SOP procedures – Air Quality Specialist • Downloading of data • review any potential issues or discrepancies from the collected data from the sensors. • Follow up by Air Quality Specialist if needed with EPA
Documentation of Calibrations	Verify calibration information is documented on the Field Data Sheet
Evaluate any deviations from QAPP or SOPs to determine the impact to the data and project objectives	Air Quality Specialist • Confirm operations are proceeding as planned • Note any issues regarding installation or operation of sampler • compile any relevant details or notes regarding CSAM operation as reported by volunteers • On a periodic basis (at least quarterly), check in with EPA regarding sampler operations and progress of the project

Citizen Science QAPP Template #15 Data Management

Data Management

Field Datasheets and Field Data: The Air Quality Specialist enables the routine operation of the sampler, recovers data from said operation, validates recovered data, and establishes a working data base (e.g., Excel spreadsheet or R file) through the end of the project period (September 30, 2021). The SOP (appendix) reports file storage procedures being used in the recovery of the data; data maintenance procedures; data sharing; and data file naming conventions prior to initiation of any data collections.

A detailed description of the data file and structure from the sampler is given in the Appendix – SOP, as per Section 6 of the MA200 Manual.

Laboratory Analytical Results: NA

Citizen Science QAPP Template #16 Data Review and Usability Determination

Data Checks

Field/Lab	Data Management
Data Completeness	*Data Transcription (Movement of raw data from instrument to central computer)*
Verification of sampler data file	*SOP followed; QA measures met.*
Exclusion of data due to instrument testing/errors, operator errors, or other causes (with documentation)	*Time stamp verification, filter tape advancement records*
Reasonableness of range of response	*Data records retained as "final" following verification*

All data issues identified during the project will be reported and discussed with EMO and TEPA (and EPA R9 where needed) to determine data usability on a case by case basis. All decisions to allow data that did not fully comply with QC criteria or QAPP requirements will be explained, and any resultant limitations on data use will be fully discussed in the final project report.

Citizen Science QAPP Template #17 Reporting

Reports

Project Coordinator, Emma Ruppell, is responsible for submitting quarterly project reports to the EPA Project Officers (Roberto Gutierrez). The quarterly reports will provide a status update for the project and will include a summary of the quality assurance activities, data, and results. The final project report will summarize the entire project along with the data usability determinations made.

The rationale for the use of any data that does not fully comply with the quality criteria requirements of the approved QAPP will be fully explained in the final report.

APPENDIX A
STANDARD OPERATING PROCEDURES

SOP 1. DATA VERIFICATIONS AND MANAGEMENT – MA200 MANUAL SECTION 6

Response to flagged data/automatic alarms in daily data checks. If the data download reveals coded, lost or missing data or evidence that the monitor is operating out of specification, use Aeth Manager to connect to the sampler and to check current operating parameters (using the instrument OB interface as needed). In addition, follow the instructions below to download data from the last point and import into the specified Excel spreadsheet to try to identify the source of the problem and determine necessary actions. MA200 Manual Table 6.3 contains the 11 possible status codes. The operator notes unusual data or occurrences in the field logbook.

Downloads. Data exports/downloads take place after each sampling run using Aeth Manager or Tera Term software. MA200 Manual Section 5.7 describes the download process (as part of operations via the softwares). The instrument data storage series will contain sequentially numbered files named with the sampler serial number and session number. The downloaded .csv files are stored in the file Aeth Data year, located on a dedicated machine. Each row of the file represents one hour's worth of data.

The exported/downloaded data files contain up to roughly 80 columns/headers, including measurements of up to 5 channels, flows, and settings, listed in MA200 Manual 6.1. The calculated mass concentrations are the headers listed for the channels in the format:

Color_BC_x

where x is the SpotSense number 1 or 2 or "c" for compensated value resultant of concentration 1 or 2, if the sampler was operated in DualSpot.

Data Back-Up. The Air Quality Specialist performs periodic back-ups of the files on the dedicated computer to a networked computer drive which is backed up nightly. The data remains backed up in the sampler until manually deleted in Aeth Manager. The internal storage of the sampler can contain 31,250,000 data rows.

Analysis. Uploading data into the Aeth Manager software enables graphing, comparison, and analytical viewing. Data can be flagged or noise reduction applied.

Downloaded files are copied to a second machine for extra analysis, with no editing or changes in file names, which include the date. They are stored in a directory "Aeth raw data". Next the files are imported into an annual Excel spreadsheet with a separate tab for each month, called "Aeth year." This file is used for troubleshooting and comparison. All notes are transferred with the data and invalid values may be coded, moved, or deleted.

Additional fields may be added containing internal consistency calculations, such as verifying that flows and temperature are within standards. Status codes or drift in parameters may lead to identifying the source of the problem.

Validation. This is completed for the reportable datasets in Aeth Manager or in Excel or in R. Status codes are appended to selected records in batch or single records. Though the codes may be used to

convert data to AQS coded records in the future, for the intended purpose of the study, it is to determine which records represent real, calibrated sampling. Flow calibrations are performed prior to each sample run as per the following part of the SOP.

Data Reporting. Data is reported in the final project report, which is submitted to TEPA, and EPA R9.

SOP 2. INSTRUMENT MAINTENANCE AND CALIBRATION

Pre-sampling checks involve a check of internal values reported on the sampler OB interface. Selected values are recorded directly on the form labeled "Field Data Sheet," attached; and in the sampler logbook. A new form and logbook entry is completed for every sample run. Operating parameters reported on the OB interface are listed in MA Manual Section 5.6, and include:

- Date/time/zone
- GPS
- Flow setpoint
- Tape advance setting
- Timebase (averaging period)
- Wavelengths
- Sampling mode

Sampling Precision Checks involve:

- Direct measurement of 16 flow setpoints, in DualSpot and SingleSpot, using an external transfer. standard (MA200 Manual, Section 7.3). **Flow calibrations are performed prior to each sampling run.**
- Temperature and pressure verification using the external standard.

The flow calibration is an automated process in which the external flow standard supplies values to be compared against the calibration table values stored in the sampler. An overall result displays on the sampler OB interface. Detailed results, i.e. the full calibration result table (FlowCal table) is exported into Tera Term software for viewing and saving. Template #9 lists the options for flow rates available; the calibration tables produced in initial testing will determine the operational modes including flow rates conforming to QA design which will work for the ambient conditions at the monitoring site. Calibrated flow rate levels for pre-sampling calibrations are recorded on the field data sheet for the sample run.

Every Year the following additional procedures are also undertaken, and entries recorded for each or any in the sampler logbook.

- Direct measurement of the total flow using the external transfer standard
- Optional – optical calibration
- Optional – optical chamber cleaning
- Filter cartridge resupply as needed
- Battery life check

APPENDIX B – WEATHER FORECASTS

1. 7-Day NWS Forecast Fri 11.18.22
2. Hourly NWS Forecast Fri 11.18.22
3. 7-Day NWS Forecast Tues 11.22.22
4. Hourly NWS Forecast Tues 11.22.22

Intense Lake Effect Snow Bands Downwind of the Great Lakes; Santa Ana Winds in Southern California

Heavy lake effect snow bands are expected to continue difficult to impossible travel, especially, downwind of Lakes Erie and Ontario through this weekend. Some locations may be paralyzed by several feet of snow. A wintry mix is possible in west Texas while below normal temperatures will remain across much of the U.S. High winds will bring critical fire weather threats to southern California. Read More >

En Español Share |

Current conditions at
Bishop, Bishop Airport (KBIH)
Lat: 37.37111°N **Lon:** 118.35806°W **Elev:** 4121ft.

Clear
55°F
13°C

Humidity	22%
Wind Speed	N 17 MPH
Barometer	30.11 in (1019.64 mb)
Dewpoint	17°F (-8°C)
Visibility	10.00 mi
Last update	18 Nov 10:50 AM PST

Extended Forecast for
2 Miles W Bishop CA

Today	Tonight	Saturday	Saturday Night	Sunday	Sunday Night	Monday	Monday Night	Tuesday
								
Sunny	Mostly Clear	Sunny	Mostly Clear	Sunny	Mostly Clear	Mostly Sunny	Partly Cloudy	Sunny
High: 51 °F	**Low: 20 °F**	**High: 51 °F**	**Low: 26 °F**	**High: 57 °F**	**Low: 27 °F**	**High: 57 °F**	**Low: 29 °F**	**High: 59 °F**

Detailed Forecast

Today
Sunny, with a high near 51. North wind 13 to 15 mph, with gusts as high as 21 mph.

Tonight
Mostly clear, with a low around 20. North northwest wind 6 to 8 mph.

Saturday
Sunny, with a high near 51. Northwest wind 3 to 5 mph.

Saturday Night
Mostly clear, with a low around 26. West wind around 6 mph.

Sunday
Sunny, with a high near 57. Calm wind becoming south southeast around 5 mph in the afternoon.

Sunday Night
Mostly clear, with a low around 27.

Monday
Mostly sunny, with a high near 57.

Monday Night
Partly cloudy, with a low around 29.

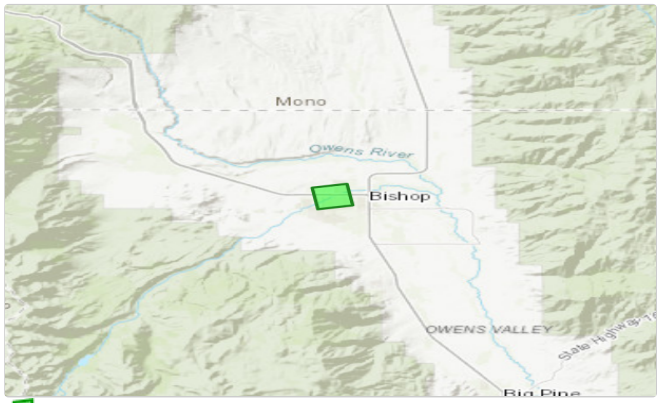
Tuesday
Sunny, with a high near 59.

Tuesday Night
Mostly clear, with a low around 31.

Wednesday
Sunny, with a high near 61.

Wednesday Night
Mostly clear, with a low around 32.

Thanksgiving Day
Sunny, with a high near 63.



Forecast Area

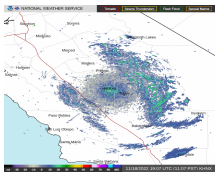
Point Forecast:
2 Miles W Bishop CA
37.37°N 118.42°W (Elev. 4213 ft)

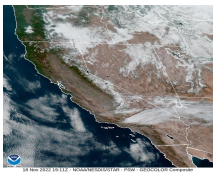
Last Update:
12:06 am PST Nov 18, 2022

Forecast Valid:
11am PST Nov 18, 2022-6pm PST Nov 24, 2022

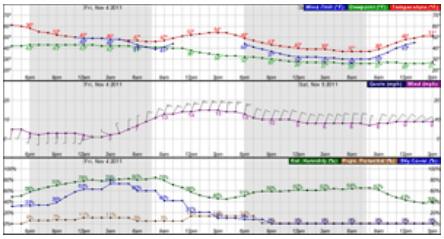
Additional Resources

Radar & Satellite Image





Hourly Weather Forecast



Point Forecast: 2 Miles W Bishop CA
37.37N 118.42W (Elev. 4213 ft)

Last Update: 12:06 am PST Nov 18, 2022

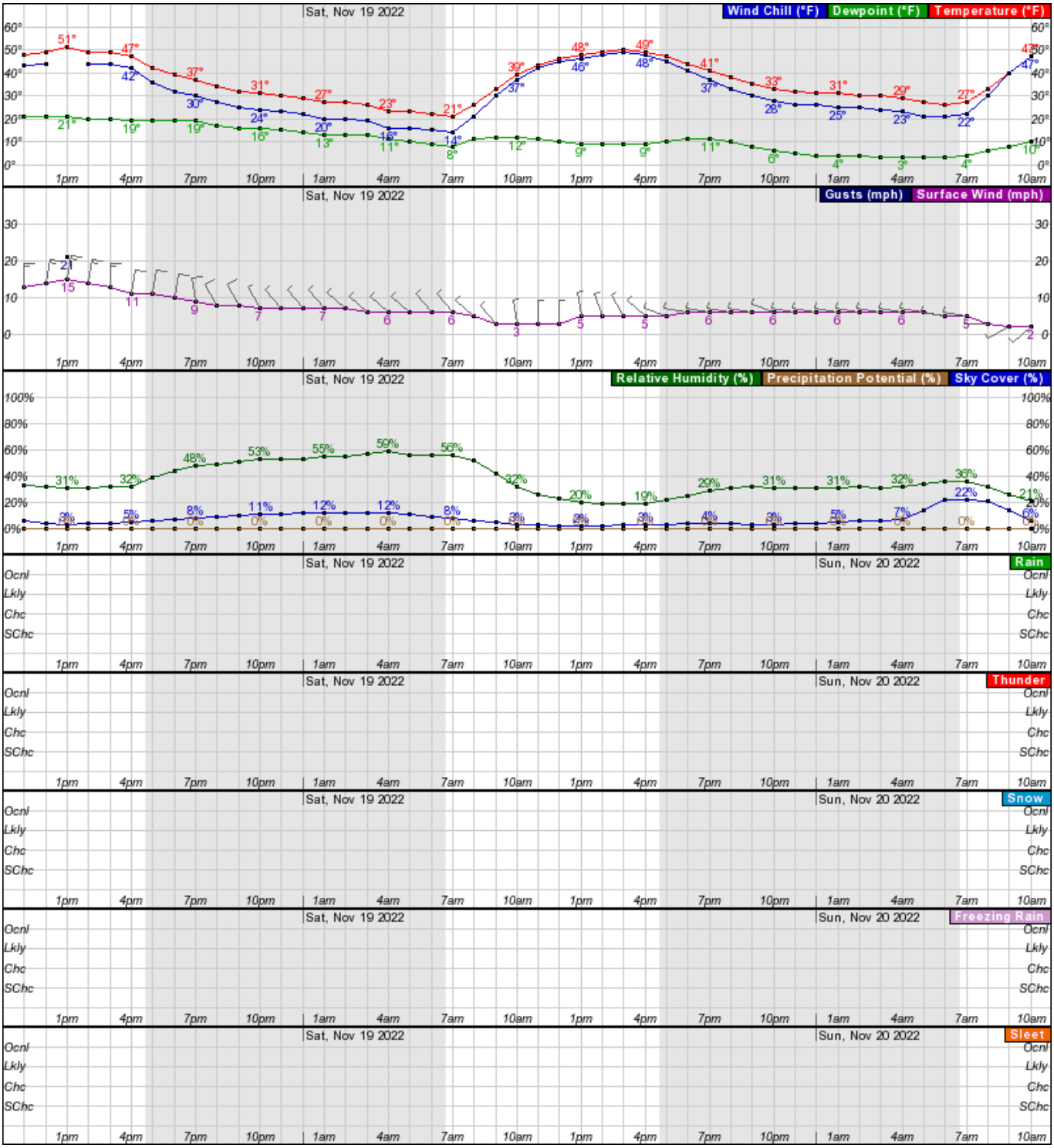
Hourly Weather Forecast Graph

[dashes/dots] | [b/w] | [hide menu] XML

Weather Elements	Weather/Precipitation	Fire Weather
☑ Temperature (°F) ☑ Dewpoint (°F) ☑ Wind Chill (°F) ☑ Surface Wind mph ☑ Sky Cover (%) ☑ Precipitation Potential (%) ☑ Relative Humidity (%)	☑ Rain ☑ Thunder ☑ Snow ☑ Freezing Rain ☑ Sleet ☐ Fog	☐ Mixing Height x100ft ☐ Haines Index ☐ Lightning Activity Level ☐ Trans. Wind mph ☐ 20ft Wind mph ☐ Vent Rate (x1000 mph-ft)

48-Hour Period Starting: 11am Fri, Nov 18 2022 Submit

Back 2 Days Forward 2 Days



Sunday, November 20 at 9am
Temperature: 40 °F Dewpoint: 8 °F Wind Chill: 40 °F Surface Wind: WSW 2mph
Sky Cover (%): 14% Precipitation Potential (%): 0% Relative Humidity (%): 26%
Rain: <10% Thunder: <10% Snow: <10% Freezing Rain: <10% Sleet: <10%

Additional Forecasts & Information

International System of Units
Forecast Discussion
7-Day Forecast
Tabular Forecast
Road Conditions
Fire Weather
User Defined Area
Recreation Forecasts

Webmaster
NOAA's National Weather Service
Las Vegas, NV

Active Pattern for Portions of Alaska and the Northwest; System Developing for the South

A strong storm system will approach southern Alaska and its associated moisture will track into the Northwest through Wednesday. Rain, wintry mix, higher terrain snow and gusty winds are all expected with these systems. Meanwhile, we continue to monitor the development of a storm system across the Southern Plains on the Thanksgiving Holiday where heavy rainfall and severe weather are possible. Read More >

Current conditions at
Bishop, Bishop Airport (KBIH)
Lat: 37.37111°N **Lon:** 118.35806°W **Elev:** 4121ft.

Clear
34°F
1°C

Humidity	37%
Wind Speed	NW 6 MPH
Barometer	30.23 in (1023.71 mb)
Dewpoint	10°F (-12°C)
Visibility	10.00 mi
Wind Chill	29°F (-2°C)
Last update	22 Nov 08:05 AM PST

Extended Forecast for
2 Miles W Bishop CA

Today	Tonight	Wednesday	Wednesday Night	Thanksgiving Day	Thursday Night	Friday	Friday Night	Saturday
								
Sunny	Mostly Clear	Sunny	Mostly Clear	Sunny	Clear	Sunny	Mostly Clear	Mostly Sunny
High: 58 °F	**Low: 32 °F**	**High: 61 °F**	**Low: 30 °F**	**High: 60 °F**	**Low: 32 °F**	**High: 64 °F**	**Low: 33 °F**	**High: 62 °F**

Detailed Forecast

Today
Sunny, with a high near 58. Light and variable wind becoming north around 6 mph in the afternoon.

Tonight
Mostly clear, with a low around 32. West northwest wind around 8 mph.

Wednesday
Sunny, with a high near 61. North wind 8 to 10 mph.

Wednesday Night
Mostly clear, with a low around 30. Northwest wind 7 to 10 mph.

Thanksgiving Day
Sunny, with a high near 60. North northwest wind around 7 mph.

Thursday Night
Clear, with a low around 32.

Friday
Sunny, with a high near 64.

Friday Night
Mostly clear, with a low around 33.

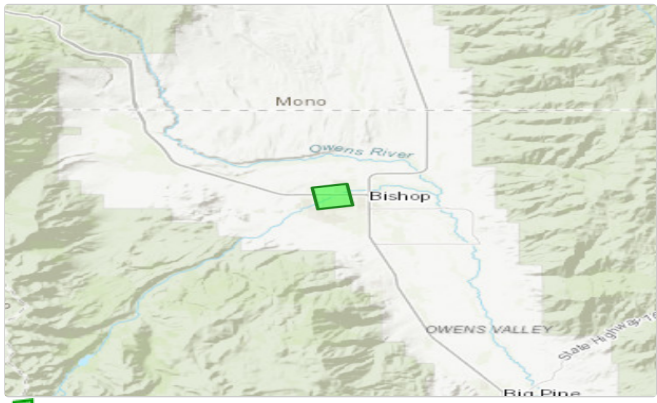
Saturday
Mostly sunny, with a high near 62.

Saturday Night
Mostly clear, with a low around 32.

Sunday
Sunny, with a high near 60.

Sunday Night
Partly cloudy, with a low around 29.

Monday
A chance of rain and snow showers. Partly sunny, with a high near 51.



Forecast Area

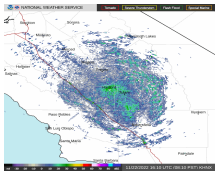
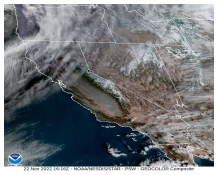
Point Forecast:
2 Miles W Bishop CA
37.37°N 118.42°W (Elev. 4213 ft)

Last Update:
12:26 am PST Nov 22, 2022

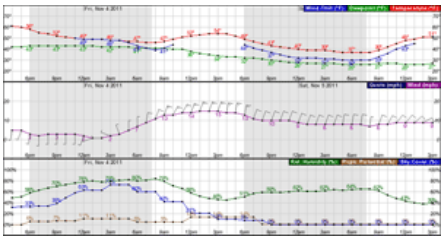
Forecast Valid:
8am PST Nov 22, 2022-6pm PST Nov 28, 2022

Additional Resources

Radar & Satellite Image

Hourly Weather Forecast



Point Forecast: 2 Miles W Bishop CA
37.37N 118.42W (Elev. 4213 ft)

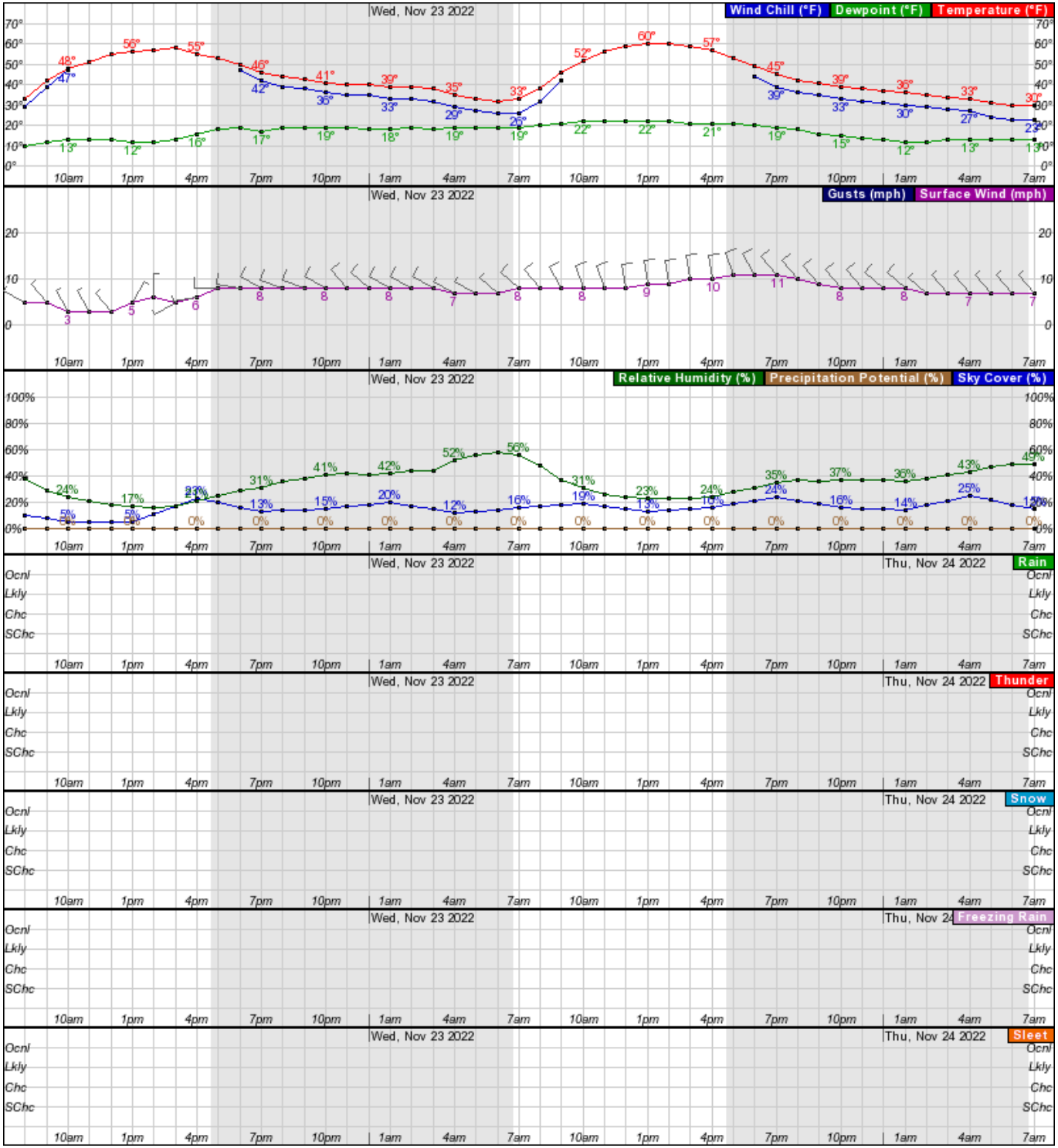
Last Update: 12:26 am PST Nov 22, 2022

Hourly Weather Forecast Graph

[dashes/dots] | [b/w] | [hide menu] XML

Weather Elements	Weather/Precipitation	Fire Weather
☑ Temperature (°F)	☑ Rain	☐ Mixing Height x100ft
☑ Dewpoint (°F)	☑ Thunder	☐ Haines Index
☑ Wind Chill (°F)	☑ Snow	☐ Lightning Activity Level
☑ Surface Wind mph	☑ Freezing Rain	☐ Trans. Wind mph
☑ Sky Cover (%)	☑ Sleet	☐ 20ft Wind mph
☑ Precipitation Potential (%)	☐ Fog	☐ Vent Rate (x1000 mph-ft)
☑ Relative Humidity (%)		

48-Hour Period Starting: 8am Tue, Nov 22 2022 Submit Back 2 Days Forward 2 Days


Wed, Nov 23 2022
Wind Chill (°F)
Dewpoint (°F)
Temperature (°F)
Gusts (mph)
Surface Wind (mph)
Relative Humidity (%)
Precipitation Potential (%)
Sky Cover (%)
Thu, Nov 24 2022
Rain
Thunder
Snow
Freezing Rain
Sleet
Ocnl
Lkly
Chc
SChc
10am
1pm
4pm
7pm
10pm
1am
4am
7am

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7-Day Forecast
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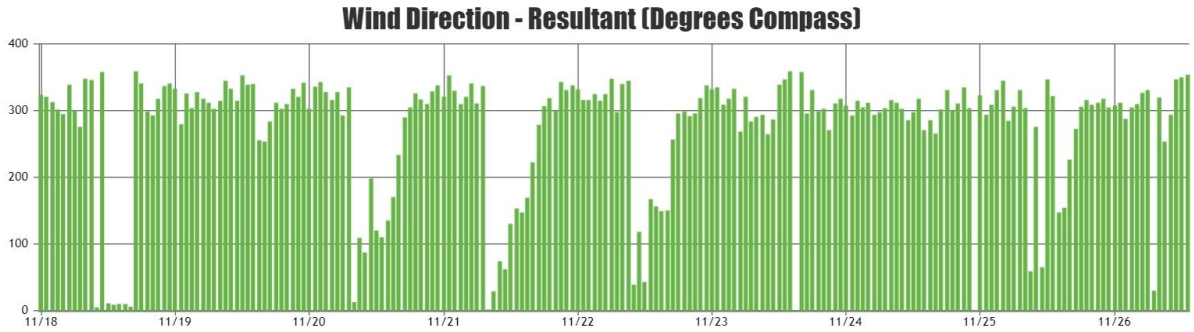
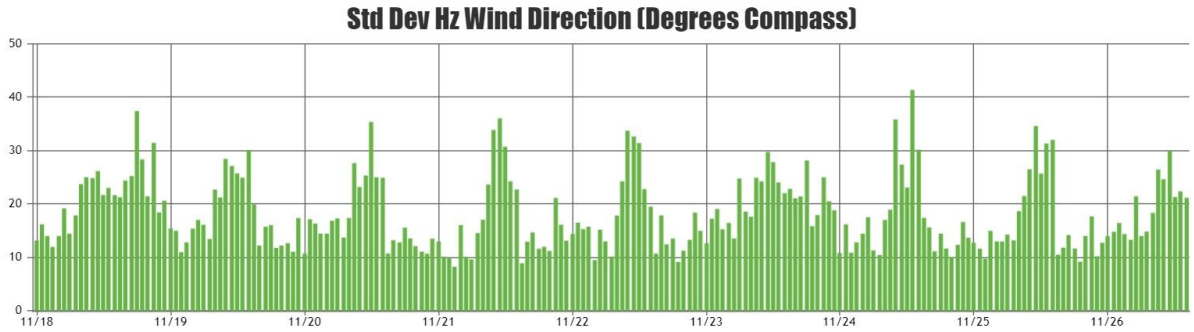
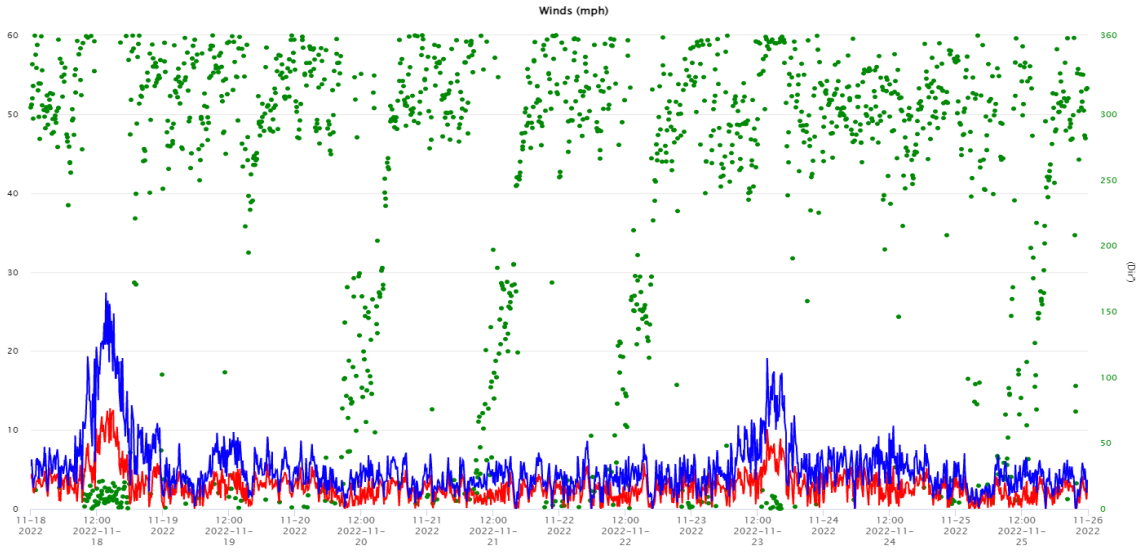
APPENDIX C – Ambient Conditions During Sampling

NOTE: *Charts are made with Vista Data Vision Software from T&B Systems or with QREST.net for additional wind parameters and for PM2.5), and do not overlay the run durations exactly. Pay attention to begin and end-run times when matching charts.*

1. Winds During Sampling Run

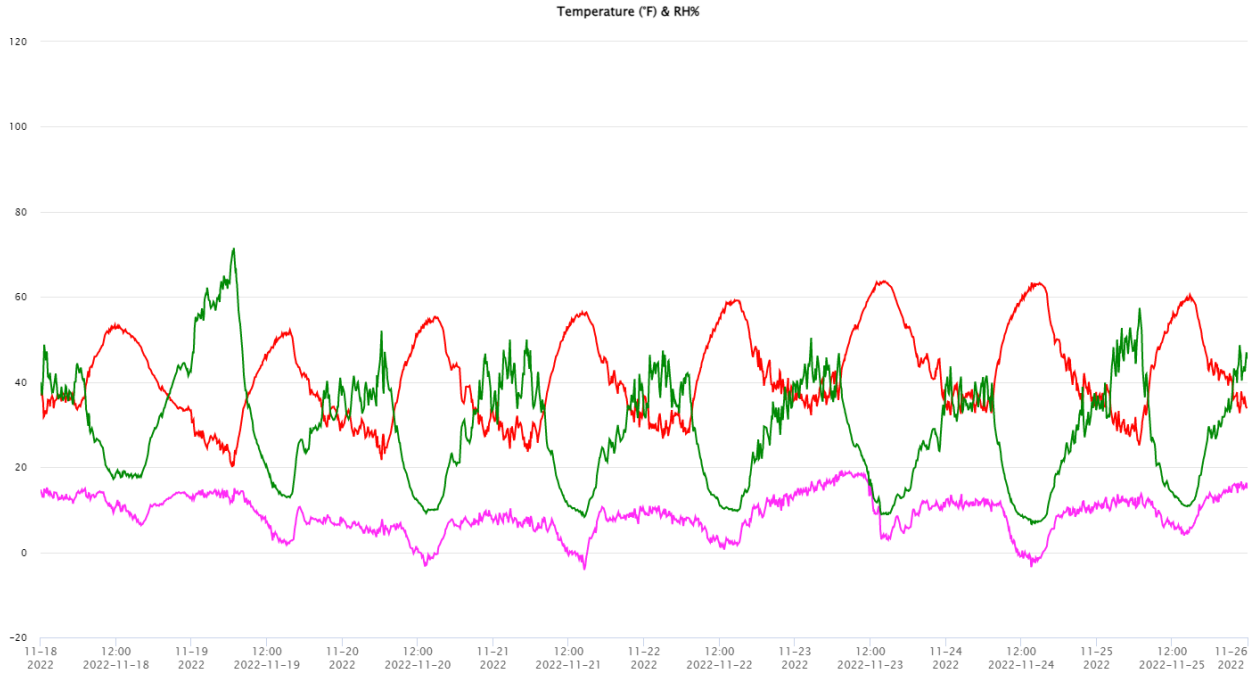






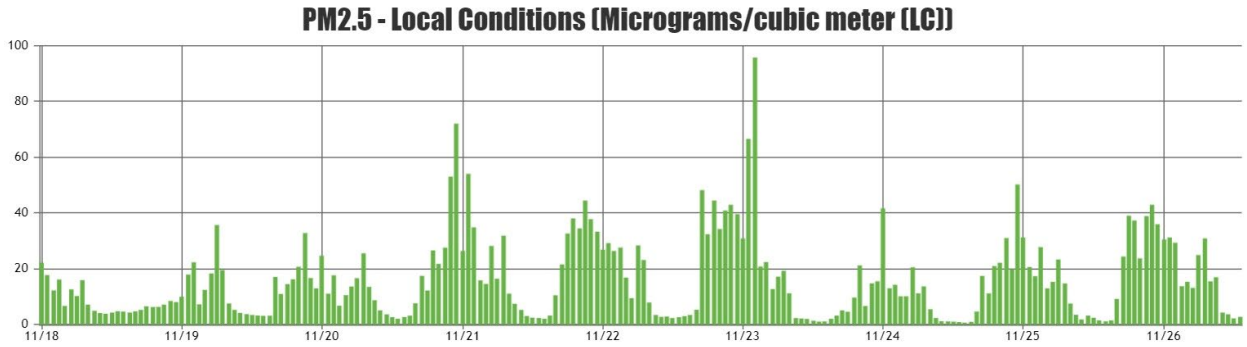
Red: Wind speed / Blue: Wind max gust / Green: Wind direction

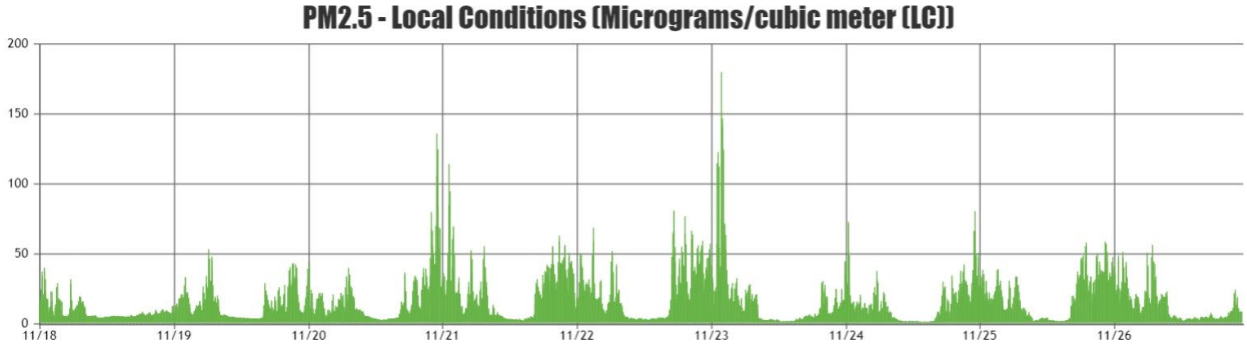
2. Temperatures During Sampling Run



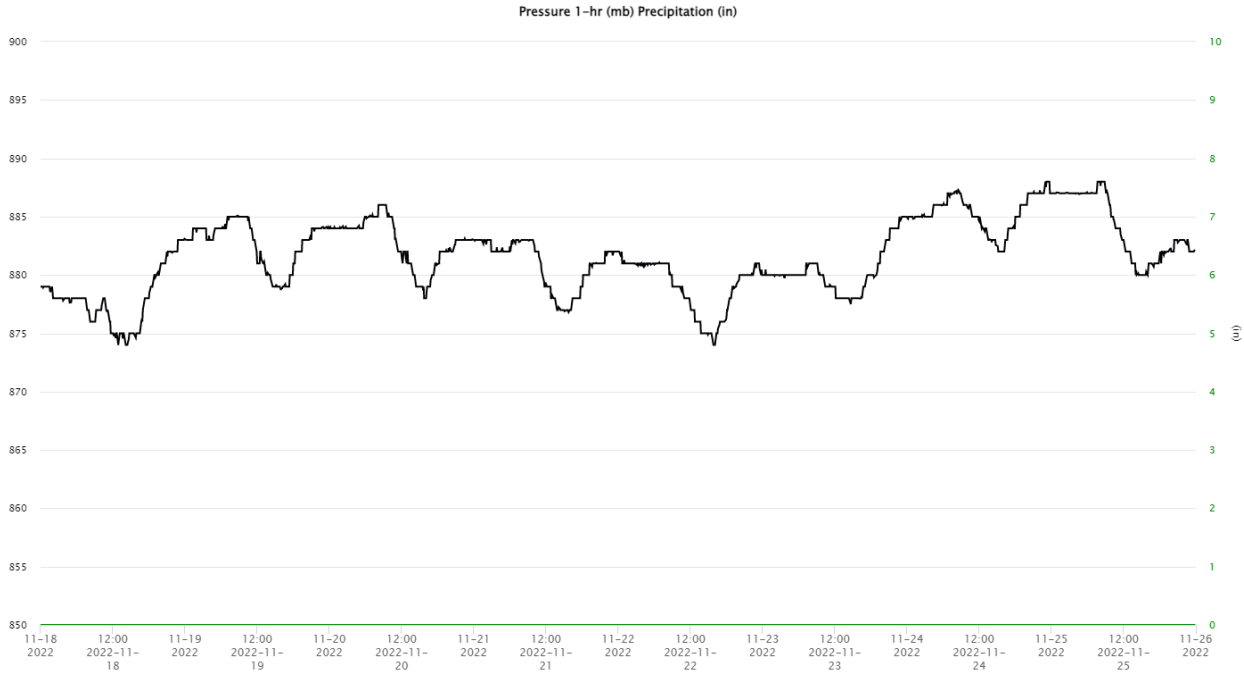
Red: Outdoor Temp / Green: Humidity / Pink: Dewpoint

3. PM2.5 levels During Sampling Run, 1-hr and 5-minute





4. Barometric Pressure & Precipitation During Sampling Run



Black: Barometric pressure / Green: Precipitation

APPENDIX D – AethLabs Software Reports

1. Sample Run, CMA 25 applied
2. Split Sessions, CMA 7 applied

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MA200-0301 data for Nov 18, 2022 at 4:00:00pm

Submitted by Emma Ruppell on December 1, 2022 - 9:40am

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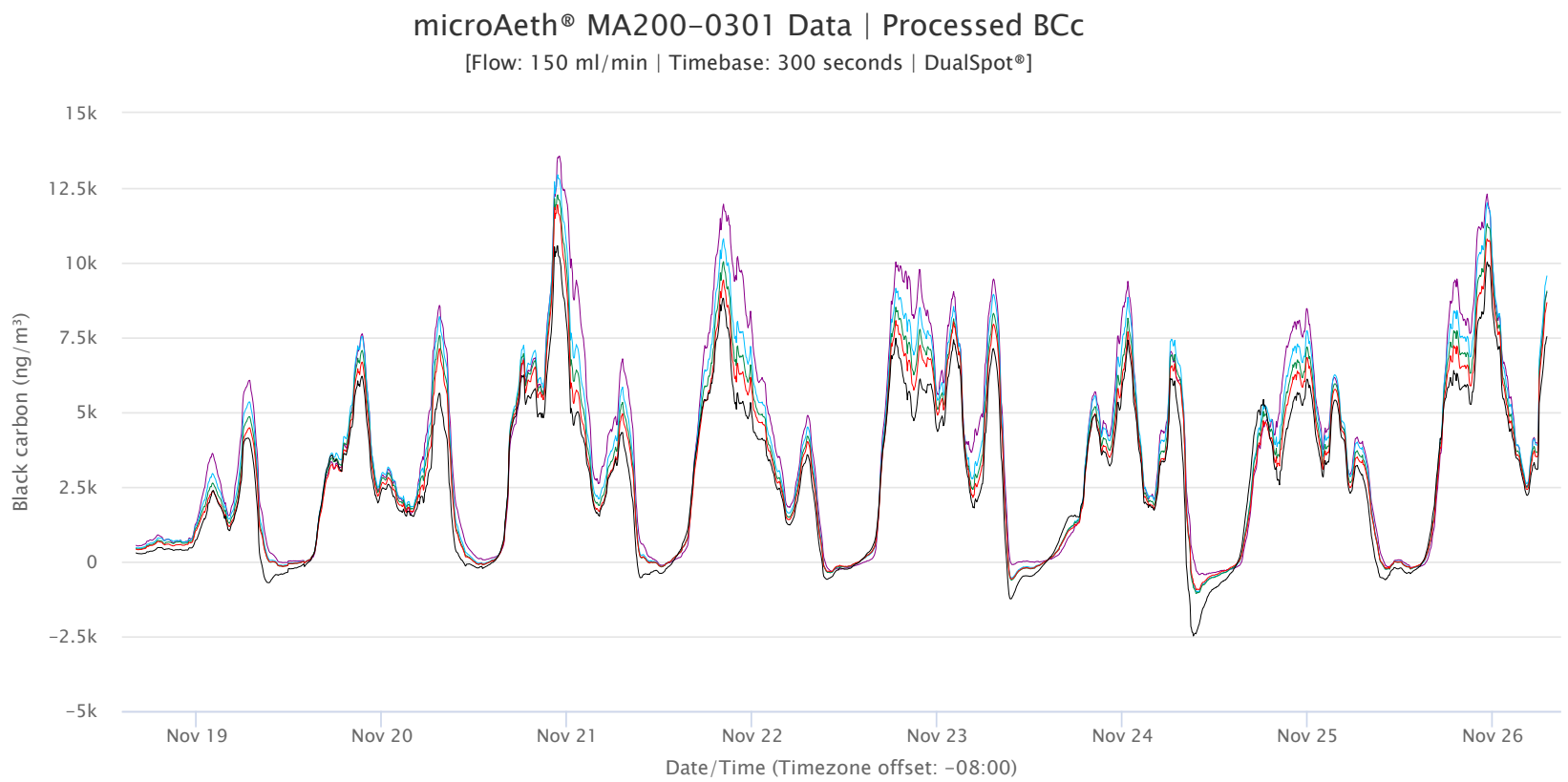
Device record

Smoothing: Centered moving average (25 points) **Flagging**: Status errors (No errors found)

Raw BCc Processed BCc



Legend

-●- UV channel (BCc)
-●- Blue channel (BCc)
-●- Green channel (BCc)
-●- Red channel (BCc)
-●- IR channel (BCc)

Settings

Firmware version:	1.10
Sample air flow rate:	150 ml/min
Sampling timebase:	300 seconds
Sampling mode:	DualSpot®

Flow

	Spot 1	Spot 2	Total
Minimum flow:	78.7	62.7	148.7
Maximum flow:	87.1	71.4	154.1
Average flow:	82.9	67.1	150
Flow standard deviation:	1.761	2.502	2.529
Air flow per sampling period:	0.4145	0.3355	0.75

Timing

Start time:	Nov 18, 2022 4:00:00pm -0800
End time:	Nov 26, 2022 7:00:00am -0800
Total run time:	7 days, 15 hours
Tape advances:	10 → 11 on Nov 20 @ 12:35:00pm 11 → 12 on Nov 21 @ 7:25:00am 12 → 13 on Nov 22 @ 4:55:00am 13 → 14 on Nov 23 @ 3:05:00am 14 → 15 on Nov 23 @ 11:45:00am 15 → 16 on Nov 25 @ 3:20:00am 16 → 17 on Nov 26 @ 2:15:00am

Optics

	UV	Blue	Green	Red	IR
Reference beam stability:	3894	2291	2954	3889	2885
Average reference beam intensity:	829944	871102	817906	919036	943241
Minimum sensing beam 1 intensity:	377309	481306	496365	512566	558611
Minimum sensing beam 2 intensity:	327593	483564	498439	521936	595100
Maximum sensing beam 1 intensity:	854644	901269	924750	989391	862468
Maximum sensing beam 2 intensity:	705877	853983	891468	967437	897207

Attenuation

	UV	Blue	Green	Red	IR
Spot 1 delta attenuation:	76.859	60.07	52.77	44.54	31.496
Spot 2 delta attenuation:	69.839	54.382	47.461	39.675	27.7

Black carbon

	UV	Blue	Green	Red	IR
Average concentration (ng/m^3):	3776	3506	3252	3071	2726
Point-to-Point data variability (ng/m^3):	1974	1903	1858	1878	1832
Deviation as BC Increment (pg/cm^2):	11524.27	11109.77	10847.06	10963.82	10695.27

Map

Show route

Table

Row	Serial Number	Datum...	Sess...	Data F...	Firm...	App V...	Date Time	Timez...	Date L...	Time L...	GPS Lat	GPS Long	GPS Speed	GPS S...	Timebase	Status
1	MA200-0301	99796	17	1	1.10	1.4	2022-11-18T16:00:00	-480	2022/1...	16:00:...	0	0	0.0	3	300	6
2	MA200-0301	99797	17	1	1.10	1.4	2022-11-18T16:05:00	-480	2022/1...	16:05:...	37.3621...	-118.417...	0.3	8	300	6
3	MA200-0301	99798	17	1	1.10	1.4	2022-11-18T16:10:00	-480	2022/1...	16:10:...	37.3621...	-118.417...	0.2	10	300	6
4	MA200-0301	99799	17	1	1.10	1.4	2022-11-18T16:15:00	-480	2022/1...	16:15:...	37.3621...	-118.417...	0.2	11	300	6
5	MA200-0301	99800	17	1	1.10	1.4	2022-11-18T16:20:00	-480	2022/1...	16:20:...	37.3622...	-118.417...	0.2	11	300	6
6	MA200-0301	99801	17	1	1.10	1.4	2022-11-18T16:25:00	-480	2022/1...	16:25:...	37.3621...	-118.417...	0.3	12	300	6
7	MA200-0301	99802	17	1	1.10	1.4	2022-11-18T16:30:00	-480	2022/1...	16:30:...	37.3622...	-118.417...	0.1	12	300	6
8	MA200-0301	99803	17	1	1.10	1.4	2022-11-18T16:35:00	-480	2022/1...	16:35:...	37.3621...	-118.417...	0.2	12	300	6
9	MA200-0301	99804	17	1	1.10	1.4	2022-11-18T16:40:00	-480	2022/1...	16:40:...	37.3622...	-118.417...	0.6	12	300	6
10	MA200-0301	99805	17	1	1.10	1.4	2022-11-18T16:45:00	-480	2022/1...	16:45:...	37.3621...	-118.417...	0.1	12	300	6
11	MA200-0301	99806	17	1	1.10	1.4	2022-11-18T16:50:00	-480	2022/1...	16:50:...	37.3622...	-118.417...	0.1	12	300	6
12	MA200-0301	99807	17	1	1.10	1.4	2022-11-18T16:55:00	-480	2022/1...	16:55:...	37.3621...	-118.417...	0.2	13	300	6
13	MA200-0301	99808	17	1	1.10	1.4	2022-11-18T17:00:00	-480	2022/1...	17:00:...	37.3621...	-118.417...	0.1	12	300	6
14	MA200-0301	99809	17	1	1.10	1.4	2022-11-18T17:05:00	-480	2022/1...	17:05:...	37.3622...	-118.417...	0.0	12	300	6
15	MA200-0301	99810	17	1	1.10	1.4	2022-11-18T17:10:00	-480	2022/1...	17:10:...	37.3622...	-118.417...	0.2	12	300	6
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All Days

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MA200-0301 data for Nov 18, 2022 at 4:00:00pm

Submitted by Emma Ruppell on December 1, 2022 - 9:15am

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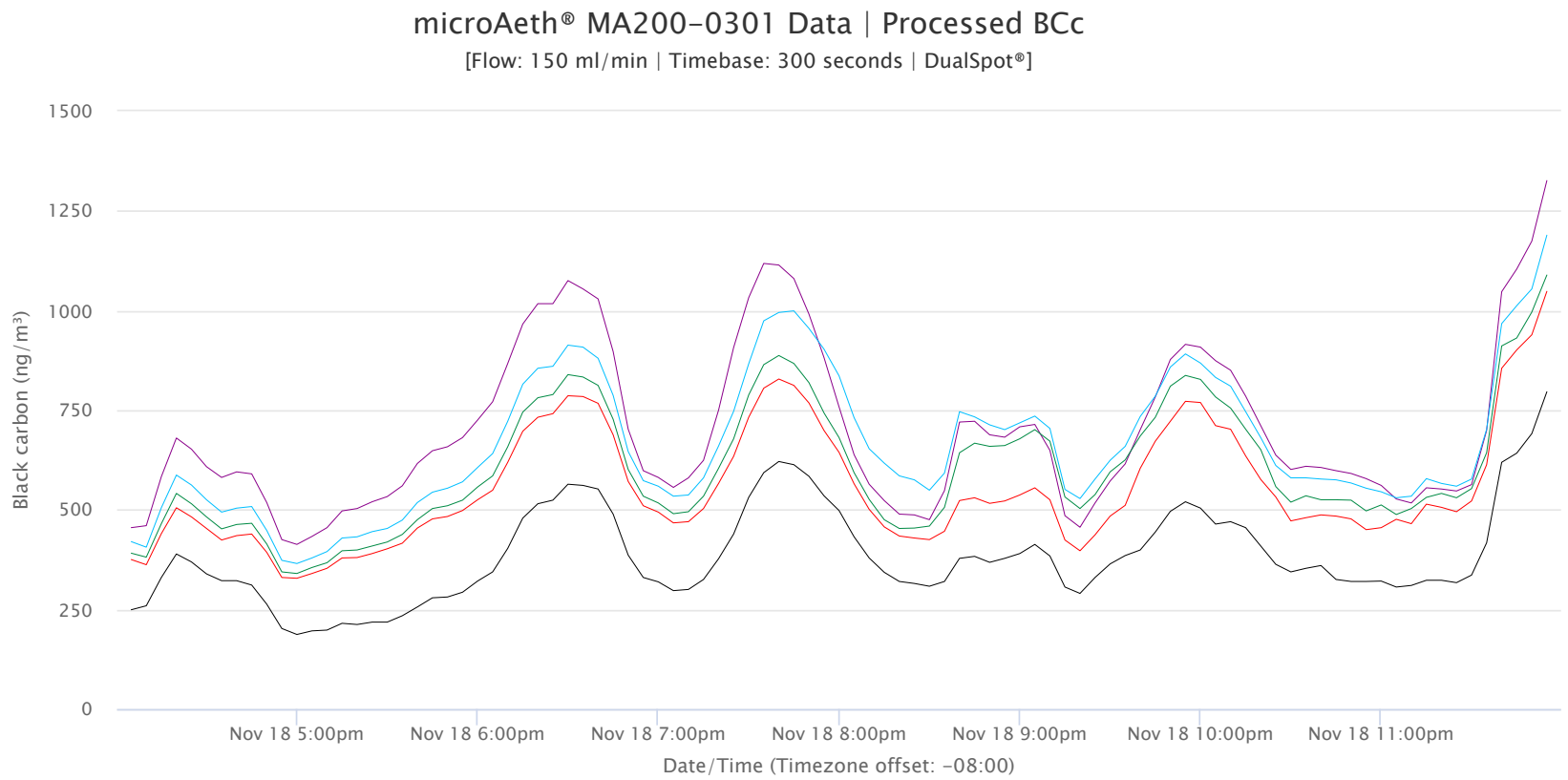
Device record

Smoothing: Centered moving average (7 points)

Flagging: Status errors (No errors found)

Raw BCc Processed BCc



Legend

-●- UV channel (BCc)
-●- Blue channel (BCc)
-●- Green channel (BCc)
-●- Red channel (BCc)
-●- IR channel (BCc)

Settings

Firmware version:	1.10
Sample air flow rate:	150 ml/min
Sampling timebase:	300 seconds
Sampling mode:	DualSpot®

Flow

	Spot 1	Spot 2	Total
Minimum flow:	79.9	66	149.3
Maximum flow:	83.5	69.6	150.9
Average flow:	82.6	67.5	150
Flow standard deviation:	0.571	0.852	0.934
Air flow per sampling period:	0.413	0.3375	0.75

Timing

Start time:	Nov 18, 2022 4:00:00pm -0800
End time:	Nov 18, 2022 11:55:00pm -0800
Total run time:	7 hours, 55 minutes
Tape advances:	None

Optics

	UV	Blue	Green	Red	IR
Reference beam stability:	3036	2362	2368	3199	2135
Average reference beam intensity:	829584	871082	817439	918828	942589
Minimum sensing beam 1 intensity:	767429	843067	810273	867558	747110
Minimum sensing beam 2 intensity:	631765	807702	781071	848330	779558
Maximum sensing beam 1 intensity:	843392	897624	854648	908725	766433
Maximum sensing beam 2 intensity:	681083	850833	816949	882580	798399

Attenuation

	UV	Blue	Green	Red	IR
Spot 1 delta attenuation:	9.21	6.331	5.22	4.082	2.143
Spot 2 delta attenuation:	7.312	5.277	4.381	3.423	1.966

Black carbon

	UV	Blue	Green	Red	IR
Average concentration (ng/m^3):	687	648	591	543	377
Point-to-Point data variability (ng/m^3):	704	610	563	532	389
Deviation as BC Increment (pg/cm^2):	4095.1	3548.31	3274.92	3094.59	2262.77

Map

Show route

Table

Row	Serial Number	Datum…	Sess…	Data F…	Firm…	App V…	Date Time	Timez…	Date L…	Time L…	GPS Lat	GPS Long	GPS Speed	GPS S…	Timebase	Status
1	MA200-0301	99796	17	1	1.10	1.4	2022-11-18T16:00:00	-480	2022/1…	16:00:…	0	0	0.0	3	300	6
2	MA200-0301	99797	17	1	1.10	1.4	2022-11-18T16:05:00	-480	2022/1…	16:05:…	37.3621…	-118.417…	0.3	8	300	6
3	MA200-0301	99798	17	1	1.10	1.4	2022-11-18T16:10:00	-480	2022/1…	16:10:…	37.3621…	-118.417…	0.2	10	300	6
4	MA200-0301	99799	17	1	1.10	1.4	2022-11-18T16:15:00	-480	2022/1…	16:15:…	37.3621…	-118.417…	0.2	11	300	6
5	MA200-0301	99800	17	1	1.10	1.4	2022-11-18T16:20:00	-480	2022/1…	16:20:…	37.3622…	-118.417…	0.2	11	300	6
6	MA200-0301	99801	17	1	1.10	1.4	2022-11-18T16:25:00	-480	2022/1…	16:25:…	37.3621…	-118.417…	0.3	12	300	6
7	MA200-0301	99802	17	1	1.10	1.4	2022-11-18T16:30:00	-480	2022/1…	16:30:…	37.3622…	-118.417…	0.1	12	300	6
8	MA200-0301	99803	17	1	1.10	1.4	2022-11-18T16:35:00	-480	2022/1…	16:35:…	37.3621…	-118.417…	0.2	12	300	6
9	MA200-0301	99804	17	1	1.10	1.4	2022-11-18T16:40:00	-480	2022/1…	16:40:…	37.3622…	-118.417…	0.6	12	300	6
10	MA200-0301	99805	17	1	1.10	1.4	2022-11-18T16:45:00	-480	2022/1…	16:45:…	37.3621…	-118.417…	0.1	12	300	6
11	MA200-0301	99806	17	1	1.10	1.4	2022-11-18T16:50:00	-480	2022/1…	16:50:…	37.3622…	-118.417…	0.1	12	300	6
12	MA200-0301	99807	17	1	1.10	1.4	2022-11-18T16:55:00	-480	2022/1…	16:55:…	37.3621…	-118.417…	0.2	13	300	6
13	MA200-0301	99808	17	1	1.10	1.4	2022-11-18T17:00:00	-480	2022/1…	17:00:…	37.3621…	-118.417…	0.1	12	300	6
14	MA200-0301	99809	17	1	1.10	1.4	2022-11-18T17:05:00	-480	2022/1…	17:05:…	37.3622…	-118.417…	0.0	12	300	6
15	MA200-0301	99810	17	1	1.10	1.4	2022-11-18T17:10:00	-480	2022/1…	17:10:…	37.3622…	-118.417…	0.2	12	300	6
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MA200-0301 data for Nov 19, 2022 at 12:00:00am

Submitted by Emma Ruppell on December 1, 2022 - 9:02am

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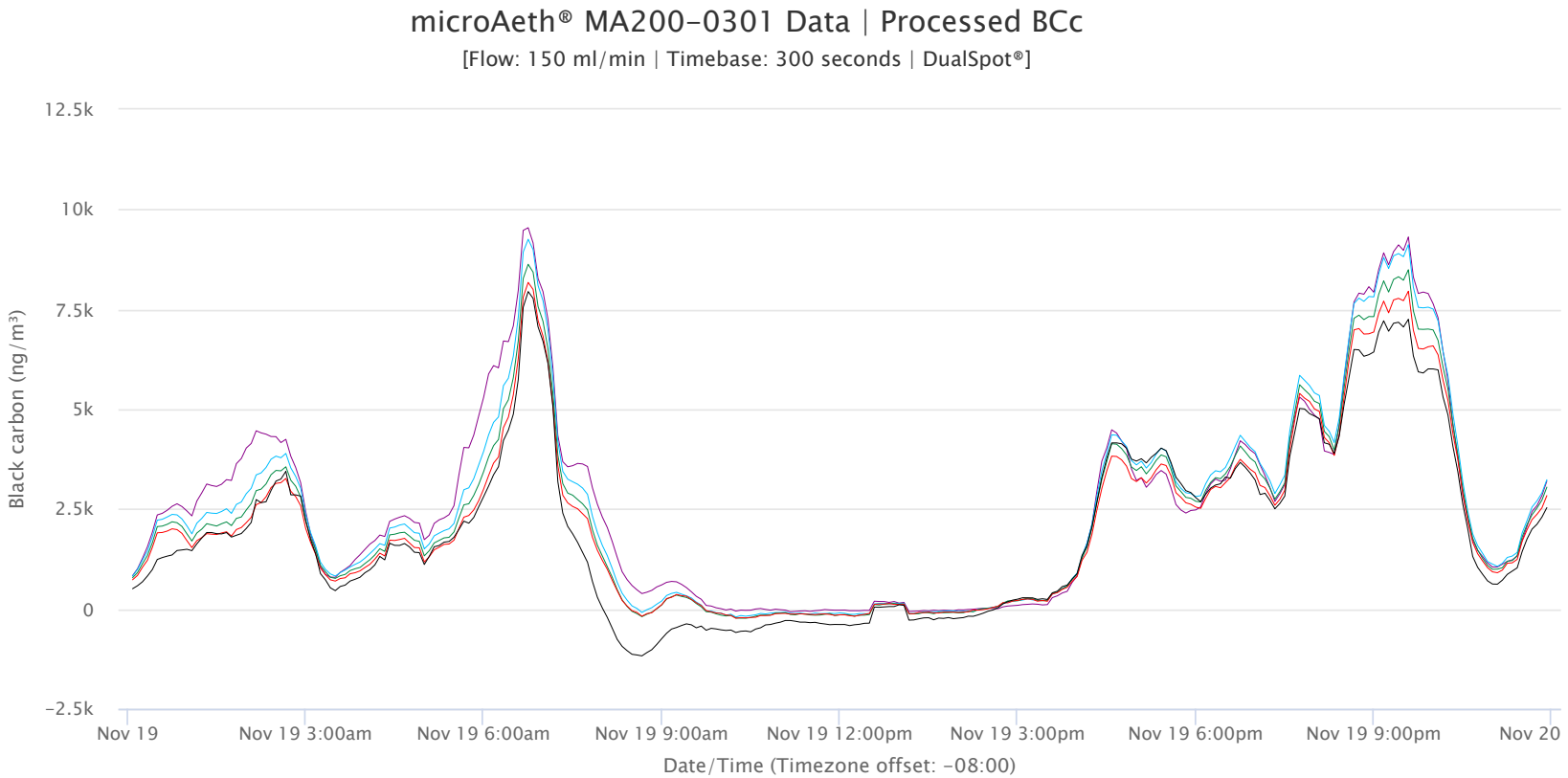
Device record

Smoothing: Centered moving average (7 points)

Flagging: Status errors (No errors found)

Raw BCc Processed BCc



Legend	Nov 19 1:05:00am -0800
UV channel (BCc)	3,008 ng/m³
Blue channel (BCc)	2,283 ng/m³
Green channel (BCc)	2,067 ng/m³
Red channel (BCc)	1,908 ng/m³
IR channel (BCc)	1,944 ng/m³

Settings

Firmware version:	1.10
Sample air flow rate:	150 ml/min
Sampling timebase:	300 seconds
Sampling mode:	DualSpot®

Flow

	Spot 1	Spot 2	Total
Minimum flow:	80.9	65.9	149
Maximum flow:	84	69.2	150.8
Average flow:	82.6	67.4	150
Flow standard deviation:	0.676	0.997	1.069
Air flow per sampling period:	0.413	0.337	0.75

Timing

Start time:	Nov 19, 2022 12:00:00am -0800
End time:	Nov 19, 2022 11:55:00pm -0800
Total run time:	23 hours, 55 minutes
Tape advances:	None

Optics

	UV	Blue	Green	Red	IR
Reference beam stability:	3962	2524	2337	3302	2297
Average reference beam intensity:	829219	871292	817576	918875	942686
Minimum sensing beam 1 intensity:	424840	539431	549643	631546	601007
Minimum sensing beam 2 intensity:	370851	541230	552976	641492	645754
Maximum sensing beam 1 intensity:	766096	841749	809843	869331	752031
Maximum sensing beam 2 intensity:	631226	806567	780815	850517	784791

Attenuation

	UV	Blue	Green	Red	IR
Spot 1 delta attenuation:	58.72	44.348	38.353	31.636	21.813
Spot 2 delta attenuation:	52.883	39.739	34.1	27.836	18.894

Black carbon

	UV	Blue	Green	Red	IR
Average concentration (ng/m^3):	2583	2444	2255	2100	1885
Point-to-Point data variability (ng/m^3):	1469	1385	1341	1340	1282
Deviation as BC Increment (pg/cm^2):	8545.03	8056.41	7800.46	7794.65	7457.27

Map

Show route

Table

Row	Serial Number	Datum...	Sess...	Data F...	Firm...	App V...	Date Time	Timez...	Date L...	Time L...	GPS Lat	GPS Long	GPS Speed	GPS S...	Timebase	Status
1	MA200-0301	99892	17	1	1.10	1.4	2022-11-19T00:00:00	-480	2022/1...	00:00:...	37.3622...	-118.417...	0.2	11	300	6
2	MA200-0301	99893	17	1	1.10	1.4	2022-11-19T00:05:00	-480	2022/1...	00:05:...	37.3622...	-118.417...	0.2	12	300	6
3	MA200-0301	99894	17	1	1.10	1.4	2022-11-19T00:10:00	-480	2022/1...	00:10:...	37.3622...	-118.417...	0.1	12	300	6
4	MA200-0301	99895	17	1	1.10	1.4	2022-11-19T00:15:00	-480	2022/1...	00:15:...	37.3622...	-118.417...	1.5	12	300	6
5	MA200-0301	99896	17	1	1.10	1.4	2022-11-19T00:20:00	-480	2022/1...	00:20:...	37.3621...	-118.417...	0.7	12	300	6
6	MA200-0301	99897	17	1	1.10	1.4	2022-11-19T00:25:00	-480	2022/1...	00:25:...	37.3622...	-118.417...	0.1	12	300	6
7	MA200-0301	99898	17	1	1.10	1.4	2022-11-19T00:30:00	-480	2022/1...	00:30:...	37.3622...	-118.417...	0.1	11	300	6
8	MA200-0301	99899	17	1	1.10	1.4	2022-11-19T00:35:00	-480	2022/1...	00:35:...	37.3622...	-118.417...	0.1	11	300	6
9	MA200-0301	99900	17	1	1.10	1.4	2022-11-19T00:40:00	-480	2022/1...	00:40:...	37.3622...	-118.417...	0.2	11	300	6
10	MA200-0301	99901	17	1	1.10	1.4	2022-11-19T00:45:00	-480	2022/1...	00:45:...	37.3622...	-118.417...	0.4	10	300	6
11	MA200-0301	99902	17	1	1.10	1.4	2022-11-19T00:50:00	-480	2022/1...	00:50:...	37.3622...	-118.417...	0.1	10	300	6
12	MA200-0301	99903	17	1	1.10	1.4	2022-11-19T00:55:00	-480	2022/1...	00:55:...	37.3621...	-118.417...	0.2	10	300	6
13	MA200-0301	99904	17	1	1.10	1.4	2022-11-19T01:00:00	-480	2022/1...	01:00:...	37.3620...	-118.417...	0.1	10	300	6
14	MA200-0301	99905	17	1	1.10	1.4	2022-11-19T01:05:00	-480	2022/1...	01:05:...	37.3622...	-118.417...	0.1	9	300	6
15	MA200-0301	99906	17	1	1.10	1.4	2022-11-19T01:10:00	-480	2022/1...	01:10:...	37.3623...	-118.417...	0.2	10	300	6
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MA200-0301 data for Nov 20, 2022 at 12:00:00am

Submitted by Emma Ruppell on December 1, 2022 - 9:23am

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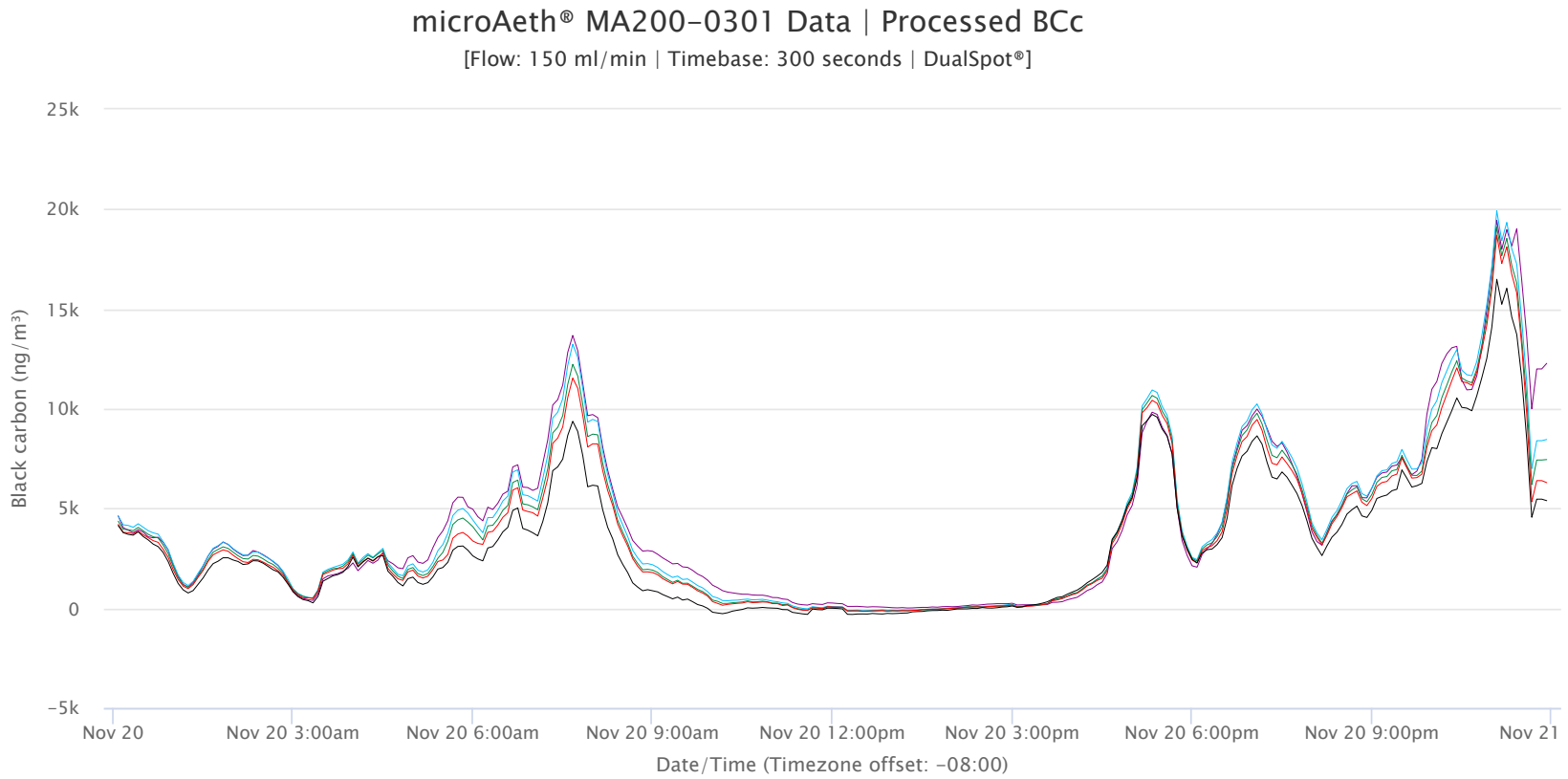
Device record

Smoothing: Centered moving average (7 points)

Flagging: Status errors (No errors found)

Raw BCc Processed BCc



Legend	Nov 20 10:00:00pm -0800
UV channel (BCc)	10,970 ng/m³
Blue channel (BCc)	9,983 ng/m³
Green channel (BCc)	9,302 ng/m³
Red channel (BCc)	8,895 ng/m³
IR channel (BCc)	8,043 ng/m³

Settings

Firmware version:	1.10
Sample air flow rate:	150 ml/min
Sampling timebase:	300 seconds
Sampling mode:	DualSpot®

Flow

	Spot 1	Spot 2	Total
Minimum flow:	81.5	64.8	149.2
Maximum flow:	85	68.8	150.7
Average flow:	82.7	67.2	150
Flow standard deviation:	0.866	1.226	1.274
Air flow per sampling period:	0.4135	0.336	0.75

Timing

Start time:	Nov 20, 2022 12:00:00am -0800
End time:	Nov 20, 2022 11:55:00pm -0800
Total run time:	23 hours, 55 minutes
Tape advances:	10 → 11 on Nov 20 @ 12:35:00pm 11 → 12 on Nov 21 @ 7:25:00am

Optics

	UV	Blue	Green	Red	IR
Reference beam stability:	3118	2376	2260	3247	2134
Average reference beam intensity:	829583	870892	817489	919227	942942
Minimum sensing beam 1 intensity:	395766	495808	506611	581456	564429
Minimum sensing beam 2 intensity:	345993	498126	511001	592894	609320
Maximum sensing beam 1 intensity:	847693	901269	859423	910601	775585
Maximum sensing beam 2 intensity:	686024	852776	819817	883009	802735

Attenuation

	UV	Blue	Green	Red	IR
Spot 1 delta attenuation:	-61.464	-46.763	-40.43	-33.305	-22.492
Spot 2 delta attenuation:	-54.835	-41.819	-35.928	-29.311	-19.662

Black carbon

	UV	Blue	Green	Red	IR
Average concentration (ng/m^3):	4168	4077	3833	3654	3156
Point-to-Point data variability (ng/m^3):	2204	2176	2141	2174	2153
Deviation as BC Increment (pg/cm^2):	12835.97	12672.9	12469.06	12661.25	12538.95

Map

Show route

Table

Row	Serial Number	Datum…	Sess…	Data F…	Firm…	App V…	Date Time	Timez…	Date L…	Time L…	GPS Lat	GPS Long	GPS Speed	GPS S…	Timebase	Status
1	MA200-0301	100180	17	1	1.10	1.4	2022-11-20T00:00:00	-480	2022/1…	00:00:…	37.3622…	-118.417…	0.2	14	300	6
2	MA200-0301	100181	17	1	1.10	1.4	2022-11-20T00:05:00	-480	2022/1…	00:05:…	37.3621…	-118.417…	0.3	14	300	6
3	MA200-0301	100182	17	1	1.10	1.4	2022-11-20T00:10:00	-480	2022/1…	00:10:…	37.3622…	-118.417…	0.1	14	300	6
4	MA200-0301	100183	17	1	1.10	1.4	2022-11-20T00:15:00	-480	2022/1…	00:15:…	37.3622…	-118.417…	0.3	14	300	6
5	MA200-0301	100184	17	1	1.10	1.4	2022-11-20T00:20:00	-480	2022/1…	00:20:…	37.3622…	-118.417…	0.2	14	300	6
6	MA200-0301	100185	17	1	1.10	1.4	2022-11-20T00:25:00	-480	2022/1…	00:25:…	37.3622…	-118.417…	0.1	13	300	6
7	MA200-0301	100186	17	1	1.10	1.4	2022-11-20T00:30:00	-480	2022/1…	00:30:…	37.3622…	-118.417…	0.5	13	300	6
8	MA200-0301	100187	17	1	1.10	1.4	2022-11-20T00:35:00	-480	2022/1…	00:35:…	37.3622…	-118.417…	0.1	13	300	6
9	MA200-0301	100188	17	1	1.10	1.4	2022-11-20T00:40:00	-480	2022/1…	00:40:…	37.3622…	-118.417…	0.2	12	300	6
10	MA200-0301	100189	17	1	1.10	1.4	2022-11-20T00:45:00	-480	2022/1…	00:45:…	37.3622…	-118.417…	0.1	12	300	6
11	MA200-0301	100190	17	1	1.10	1.4	2022-11-20T00:50:00	-480	2022/1…	00:50:…	37.3621…	-118.417…	0.2	12	300	6
12	MA200-0301	100191	17	1	1.10	1.4	2022-11-20T00:55:00	-480	2022/1…	00:55:…	37.3621…	-118.417…	0.1	12	300	6
13	MA200-0301	100192	17	1	1.10	1.4	2022-11-20T01:00:00	-480	2022/1…	01:00:…	37.3622…	-118.417…	0.0	11	300	6
14	MA200-0301	100193	17	1	1.10	1.4	2022-11-20T01:05:00	-480	2022/1…	01:05:…	37.3622…	-118.417…	0.2	12	300	6
15	MA200-0301	100194	17	1	1.10	1.4	2022-11-20T01:10:00	-480	2022/1…	01:10:…	37.3620…	-118.417…	0.3	13	300	6
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MA200-0301 data for Nov 21, 2022 at 12:00:00am

Submitted by Emma Ruppell on December 1, 2022 - 9:25am

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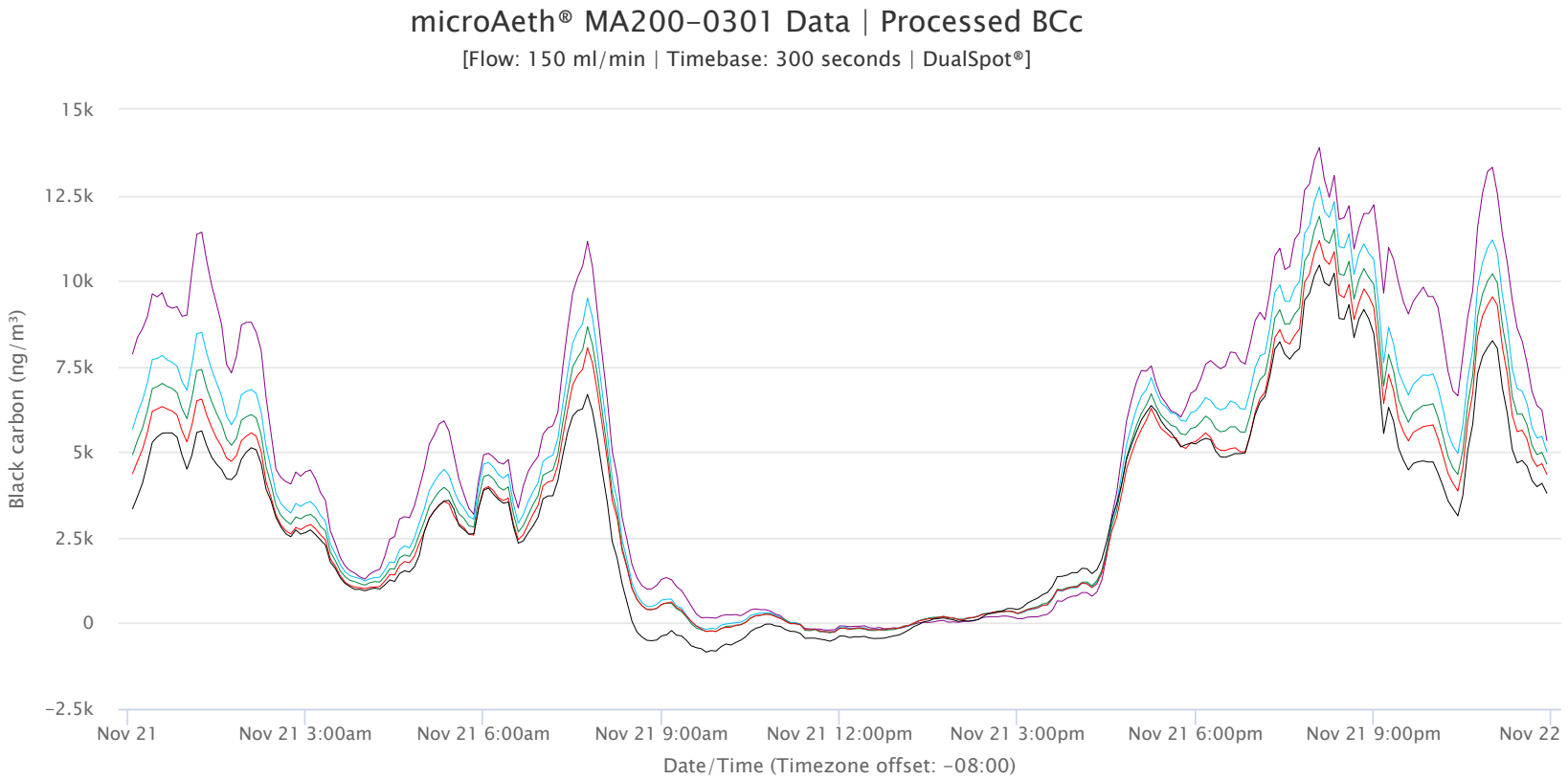
Device record

Smoothing: Centered moving average (7 points)

Flagging: Status errors (No errors found)

Raw BCc Processed BCc



Legend	Nov 21 11:35:00pm -0800
UV channel (BCc)	7,592 ng/m³
Blue channel (BCc)	6,405 ng/m³
Green channel (BCc)	5,791 ng/m³
Red channel (BCc)	5,370 ng/m³
IR channel (BCc)	4,585 ng/m³

Settings

Firmware version:	1.10
Sample air flow rate:	150 ml/min
Sampling timebase:	300 seconds
Sampling mode:	DualSpot®

Flow

	Spot 1	Spot 2	Total
Minimum flow:	80.4	63.1	149.2
Maximum flow:	86.6	69.9	150.7
Average flow:	82.6	67.3	149.9
Flow standard deviation:	1.645	2.342	2.372
Air flow per sampling period:	0.413	0.3365	0.7495

Timing

Start time:	Nov 21, 2022 12:00:00am -0800
End time:	Nov 21, 2022 11:55:00pm -0800
Total run time:	23 hours, 55 minutes
Tape advances:	12 → 13 on Nov 22 @ 4:55:00am

Optics

	UV	Blue	Green	Red	IR
Reference beam stability:	5865	2343	5165	5903	5210
Average reference beam intensity:	831098	871074	818520	920356	945052
Minimum sensing beam 1 intensity:	378414	488100	505688	586081	568724
Minimum sensing beam 2 intensity:	327593	489649	509374	597112	611242
Maximum sensing beam 1 intensity:	854644	880906	924750	989391	862468
Maximum sensing beam 2 intensity:	705877	834667	891468	967437	897207

Attenuation

	UV	Blue	Green	Red	IR
Spot 1 delta attenuation:	26.676	18.95	16.021	12.917	8.511
Spot 2 delta attenuation:	21.297	14.832	12.396	9.863	6.349

Black carbon

	UV	Blue	Green	Red	IR
Average concentration (ng/m^3):	4904	4117	3736	3441	3081
Point-to-Point data variability (ng/m^3):	2525	2386	2307	2300	2221
Deviation as BC Increment (pg/cm^2):	14687.68	13879.13	13419.59	13378.87	12919.34

Map

Show route

Table

Row	Serial Number	Datum...	Sess...	Data F...	Firm...	App V...	Date Time	Timez...	Date L...	Time L...	GPS Lat	GPS Long	GPS Speed	GPS S...	Timebase	Status
1	MA200-0301	100468	17	1	1.10	1.4	2022-11-21T00:00:00	-480	2022/1...	00:00:...	37.3621...	-118.417...	0.2	14	300	6
2	MA200-0301	100469	17	1	1.10	1.4	2022-11-21T00:05:00	-480	2022/1...	00:05:...	37.3622...	-118.417...	0.1	14	300	7
3	MA200-0301	100470	17	1	1.10	1.4	2022-11-21T00:10:00	-480	2022/1...	00:10:...	37.3622...	-118.417...	0.2	14	300	6
4	MA200-0301	100471	17	1	1.10	1.4	2022-11-21T00:15:00	-480	2022/1...	00:15:...	37.3622...	-118.417...	0.0	14	300	6
5	MA200-0301	100472	17	1	1.10	1.4	2022-11-21T00:20:00	-480	2022/1...	00:20:...	37.3623...	-118.417...	0.4	14	300	6
6	MA200-0301	100473	17	1	1.10	1.4	2022-11-21T00:25:00	-480	2022/1...	00:25:...	37.3622...	-118.417...	0.1	13	300	6
7	MA200-0301	100474	17	1	1.10	1.4	2022-11-21T00:30:00	-480	2022/1...	00:30:...	37.3622...	-118.417...	0.2	13	300	6
8	MA200-0301	100475	17	1	1.10	1.4	2022-11-21T00:35:00	-480	2022/1...	00:35:...	37.3622...	-118.417...	0.1	12	300	6
9	MA200-0301	100476	17	1	1.10	1.4	2022-11-21T00:40:00	-480	2022/1...	00:40:...	37.3621...	-118.417...	0.1	12	300	6
10	MA200-0301	100477	17	1	1.10	1.4	2022-11-21T00:45:00	-480	2022/1...	00:45:...	37.3622...	-118.417...	0.3	12	300	6
11	MA200-0301	100478	17	1	1.10	1.4	2022-11-21T00:50:00	-480	2022/1...	00:50:...	37.3621...	-118.417...	0.1	12	300	6
12	MA200-0301	100479	17	1	1.10	1.4	2022-11-21T00:55:00	-480	2022/1...	00:55:...	37.3621...	-118.417...	0.3	12	300	6
13	MA200-0301	100480	17	1	1.10	1.4	2022-11-21T01:00:00	-480	2022/1...	01:00:...	37.3622...	-118.417...	0.3	12	300	6
14	MA200-0301	100481	17	1	1.10	1.4	2022-11-21T01:05:00	-480	2022/1...	01:05:...	37.3622...	-118.417...	0.0	13	300	6
15	MA200-0301	100482	17	1	1.10	1.4	2022-11-21T01:10:00	-480	2022/1...	01:10:...	37.3621...	-118.417...	0.1	13	300	6
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MA200-0301 data for Nov 22, 2022 at 12:00:00am

Submitted by Emma Ruppell on December 1, 2022 - 9:28am

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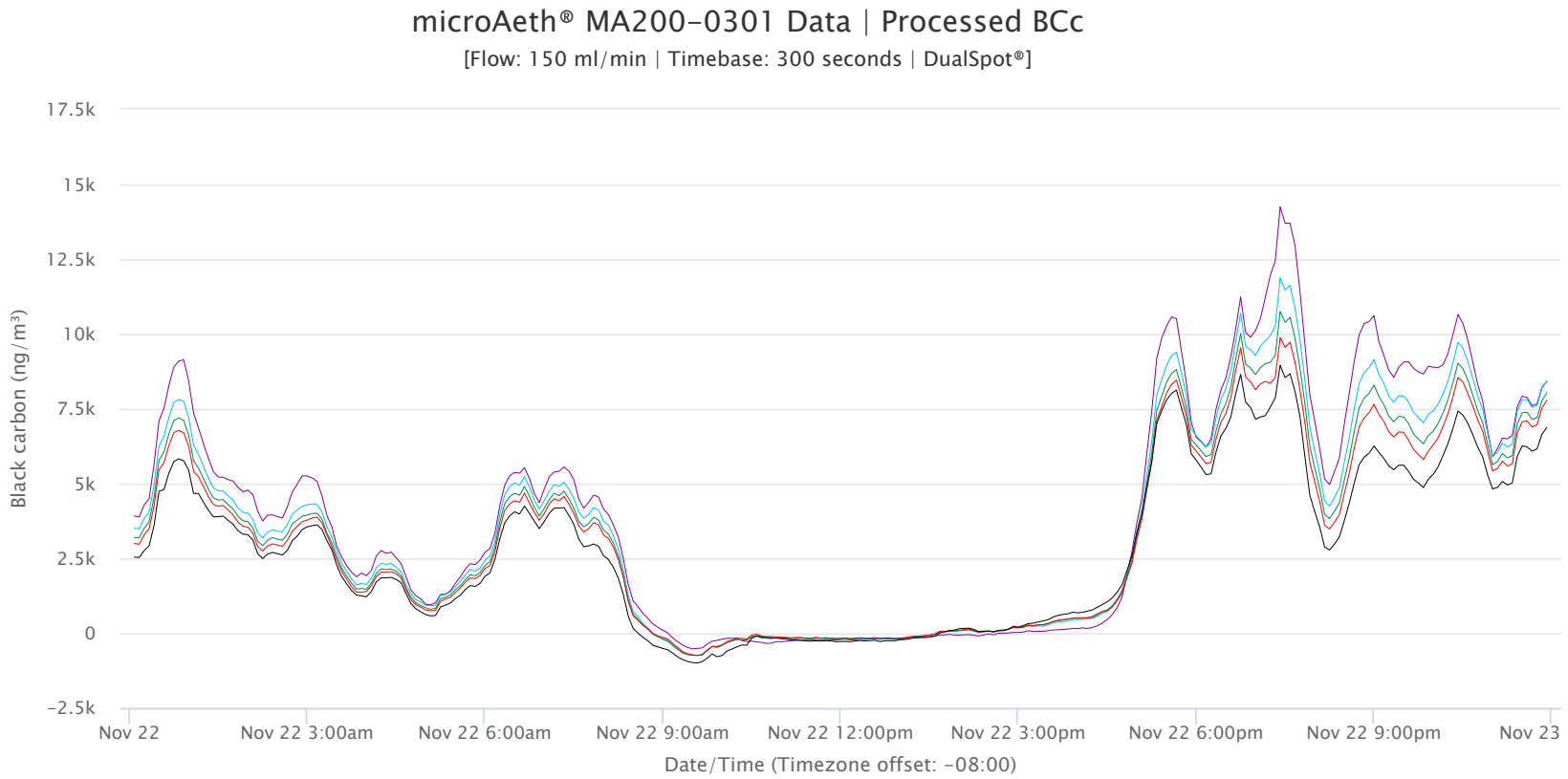
Device record

Smoothing: Centered moving average (7 points)

Flagging: Status errors (No errors found)

Raw BCc Processed BCc



Legend	Nov 22 11:55:00pm -0800
UV channel (BCc)	8,415 ng/m³
Blue channel (BCc)	8,430 ng/m³
Green channel (BCc)	8,034 ng/m³
Red channel (BCc)	7,780 ng/m³
IR channel (BCc)	6,872 ng/m³

Settings

Firmware version:	1.10
Sample air flow rate:	150 ml/min
Sampling timebase:	300 seconds
Sampling mode:	DualSpot®

Flow

	Spot 1	Spot 2	Total
Minimum flow:	83	62.7	149
Maximum flow:	87.1	71.2	154.1
Average flow:	85.3	64.6	150
Flow standard deviation:	0.971	1.447	1.509
Air flow per sampling period:	0.4265	0.323	0.75

Timing

Start time:	Nov 22, 2022 12:00:00am -0800
End time:	Nov 22, 2022 11:55:00pm -0800
Total run time:	23 hours, 55 minutes
Tape advances:	13 → 14 on Nov 23 @ 3:05:00am

Optics

	UV	Blue	Green	Red	IR
Reference beam stability:	3825	2220	3329	4085	3129
Average reference beam intensity:	829994	871129	818442	919339	943393
Minimum sensing beam 1 intensity:	377309	488336	504587	580582	563506
Minimum sensing beam 2 intensity:	342315	508903	525798	608494	620602
Maximum sensing beam 1 intensity:	829450	892355	851643	899458	783069
Maximum sensing beam 2 intensity:	673853	847461	815462	880880	841175

Attenuation

	UV	Blue	Green	Red	IR
Spot 1 delta attenuation:	19.476	14.837	13.047	11.035	7.998
Spot 2 delta attenuation:	15.842	12.26	10.68	8.879	6.136

Black carbon

	UV	Blue	Green	Red	IR
Average concentration (ng/m^3):	3927	3529	3267	3089	2717
Point-to-Point data variability (ng/m^3):	2356	2229	2170	2192	2154
Deviation as BC Increment (pg/cm^2):	14152.59	13389.7	13035.28	13167.44	12939.17

Map

Show route

Table

Row	Serial Number	Datum...	Sess...	Data F...	Firm...	App V...	Date Time	Timez...	Date L...	Time L...	GPS Lat	GPS Long	GPS Speed	GPS S...	Timebase	Status
1	MA200-0301	100756	17	1	1.10	1.4	2022-11-22T00:00:00	-480	2022/1...	00:00:...	37.3621...	-118.417...	0.2	14	300	6
2	MA200-0301	100757	17	1	1.10	1.4	2022-11-22T00:05:00	-480	2022/1...	00:05:...	37.3622...	-118.417...	0.1	14	300	6
3	MA200-0301	100758	17	1	1.10	1.4	2022-11-22T00:10:00	-480	2022/1...	00:10:...	37.3622...	-118.417...	0.2	14	300	6
4	MA200-0301	100759	17	1	1.10	1.4	2022-11-22T00:15:00	-480	2022/1...	00:15:...	37.3622...	-118.417...	0.3	14	300	6
5	MA200-0301	100760	17	1	1.10	1.4	2022-11-22T00:20:00	-480	2022/1...	00:20:...	37.3622...	-118.417...	0.0	13	300	6
6	MA200-0301	100761	17	1	1.10	1.4	2022-11-22T00:25:00	-480	2022/1...	00:25:...	37.3622...	-118.417...	0.2	13	300	6
7	MA200-0301	100762	17	1	1.10	1.4	2022-11-22T00:30:00	-480	2022/1...	00:30:...	37.3622...	-118.417...	0.3	12	300	6
8	MA200-0301	100763	17	1	1.10	1.4	2022-11-22T00:35:00	-480	2022/1...	00:35:...	37.3622...	-118.417...	0.1	12	300	6
9	MA200-0301	100764	17	1	1.10	1.4	2022-11-22T00:40:00	-480	2022/1...	00:40:...	37.3622...	-118.417...	0.3	12	300	6
10	MA200-0301	100765	17	1	1.10	1.4	2022-11-22T00:45:00	-480	2022/1...	00:45:...	37.3621...	-118.417...	0.2	12	300	6
11	MA200-0301	100766	17	1	1.10	1.4	2022-11-22T00:50:00	-480	2022/1...	00:50:...	37.3622...	-118.417...	0.0	12	300	6
12	MA200-0301	100767	17	1	1.10	1.4	2022-11-22T00:55:00	-480	2022/1...	00:55:...	37.3622...	-118.417...	0.2	11	300	6
13	MA200-0301	100768	17	1	1.10	1.4	2022-11-22T01:00:00	-480	2022/1...	01:00:...	37.3622...	-118.417...	0.1	12	300	6
14	MA200-0301	100769	17	1	1.10	1.4	2022-11-22T01:05:00	-480	2022/1...	01:05:...	37.3622...	-118.417...	0.4	13	300	6
15	MA200-0301	100770	17	1	1.10	1.4	2022-11-22T01:10:00	-480	2022/1...	01:10:...	37.3621...	-118.417...	0.4	13	300	6
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MA200-0301 data for Nov 23, 2022 at 12:00:00am

Submitted by Emma Ruppell on December 1, 2022 - 9:30am

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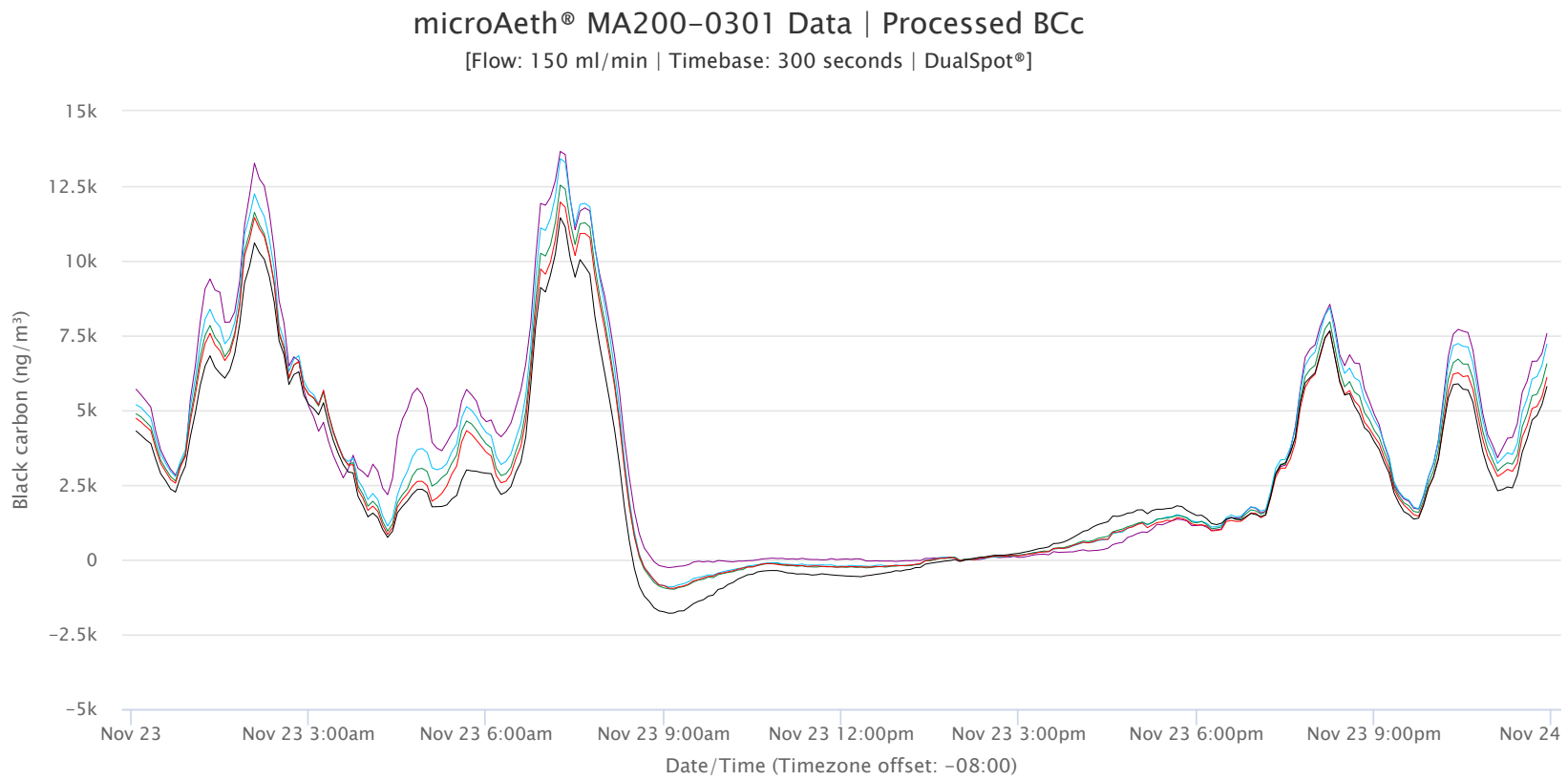
Device record

Smoothing: Centered moving average (7 points)

Flagging: Status errors (No errors found)

Raw BCc Processed BCc



Legend	Nov 23 10:15:00pm -0800
UV channel (BCc)	6,802 ng/m³
Blue channel (BCc)	6,500 ng/m³
Green channel (BCc)	6,032 ng/m³
Red channel (BCc)	5,631 ng/m³
IR channel (BCc)	5,398 ng/m³

Settings

Firmware version:	1.10
Sample air flow rate:	150 ml/min
Sampling timebase:	300 seconds
Sampling mode:	DualSpot®

Flow

	Spot 1	Spot 2	Total
Minimum flow:	79.4	63.1	148.7
Maximum flow:	86.5	70.9	150.7
Average flow:	81.8	68.2	150
Flow standard deviation:	1.975	2.787	2.809
Air flow per sampling period:	0.409	0.341	0.75

Timing

Start time:	Nov 23, 2022 12:00:00am -0800
End time:	Nov 23, 2022 11:55:00pm -0800
Total run time:	23 hours, 55 minutes
Tape advances:	14 → 15 on Nov 23 @ 11:45:00am

Optics

	UV	Blue	Green	Red	IR
Reference beam stability:	3867	2086	2290	2932	2026
Average reference beam intensity:	828818	870981	817916	918731	942889
Minimum sensing beam 1 intensity:	387837	506860	522248	600065	569940
Minimum sensing beam 2 intensity:	358661	530667	546258	631532	632347
Maximum sensing beam 1 intensity:	834658	889921	851539	903143	770135
Maximum sensing beam 2 intensity:	676299	843182	813511	877157	798833

Attenuation

	UV	Blue	Green	Red	IR
Spot 1 delta attenuation:	-4.307	-1.086	-0.661	-0.535	-0.029
Spot 2 delta attenuation:	1.932	3.23	3.098	2.7	2.42

Black carbon

	UV	Blue	Green	Red	IR
Average concentration (ng/m^3):	3442	3186	2961	2829	2553
Point-to-Point data variability (ng/m^3):	1768	1712	1677	1706	1707
Deviation as BC Increment (pg/cm^2):	10184.68	9862.08	9660.46	9827.52	9833.28

Map

Show route

Table

Row	Serial Number	Datum...	Sess...	Data F...	Firm...	App V...	Date Time	Timez...	Date L...	Time L...	GPS Lat	GPS Long	GPS Speed	GPS S...	Timebase	Status
1	MA200-0301	101044	17	1	1.10	1.4	2022-11-23T00:00:00	-480	2022/1...	00:00:...	37.3622...	-118.417...	0.1	14	300	6
2	MA200-0301	101045	17	1	1.10	1.4	2022-11-23T00:05:00	-480	2022/1...	00:05:...	37.3622...	-118.417...	0.6	14	300	6
3	MA200-0301	101046	17	1	1.10	1.4	2022-11-23T00:10:00	-480	2022/1...	00:10:...	37.3622...	-118.417...	0.3	14	300	6
4	MA200-0301	101047	17	1	1.10	1.4	2022-11-23T00:15:00	-480	2022/1...	00:15:...	37.3621...	-118.417...	0.1	13	300	6
5	MA200-0301	101048	17	1	1.10	1.4	2022-11-23T00:20:00	-480	2022/1...	00:20:...	37.3622...	-118.417...	0.2	13	300	6
6	MA200-0301	101049	17	1	1.10	1.4	2022-11-23T00:25:00	-480	2022/1...	00:25:...	37.3622...	-118.417...	0.3	13	300	6
7	MA200-0301	101050	17	1	1.10	1.4	2022-11-23T00:30:00	-480	2022/1...	00:30:...	37.3622...	-118.417...	0.3	12	300	6
8	MA200-0301	101051	17	1	1.10	1.4	2022-11-23T00:35:00	-480	2022/1...	00:35:...	37.3622...	-118.417...	0.1	12	300	6
9	MA200-0301	101052	17	1	1.10	1.4	2022-11-23T00:40:00	-480	2022/1...	00:40:...	37.3622...	-118.417...	0.1	12	300	6
10	MA200-0301	101053	17	1	1.10	1.4	2022-11-23T00:45:00	-480	2022/1...	00:45:...	37.3622...	-118.417...	0.3	12	300	6
11	MA200-0301	101054	17	1	1.10	1.4	2022-11-23T00:50:00	-480	2022/1...	00:50:...	37.3622...	-118.417...	0.2	11	300	6
12	MA200-0301	101055	17	1	1.10	1.4	2022-11-23T00:55:00	-480	2022/1...	00:55:...	37.3622...	-118.417...	0.1	12	300	6
13	MA200-0301	101056	17	1	1.10	1.4	2022-11-23T01:00:00	-480	2022/1...	01:00:...	37.3621...	-118.417...	0.1	13	300	6
14	MA200-0301	101057	17	1	1.10	1.4	2022-11-23T01:05:00	-480	2022/1...	01:05:...	37.3622...	-118.417...	0.2	13	300	6
15	MA200-0301	101058	17	1	1.10	1.4	2022-11-23T01:10:00	-480	2022/1...	01:10:...	37.3622...	-118.417...	0.1	14	300	6
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MA200-0301 data for Nov 24, 2022 at 12:00:00am

Submitted by Emma Ruppell on December 1, 2022 - 9:32am

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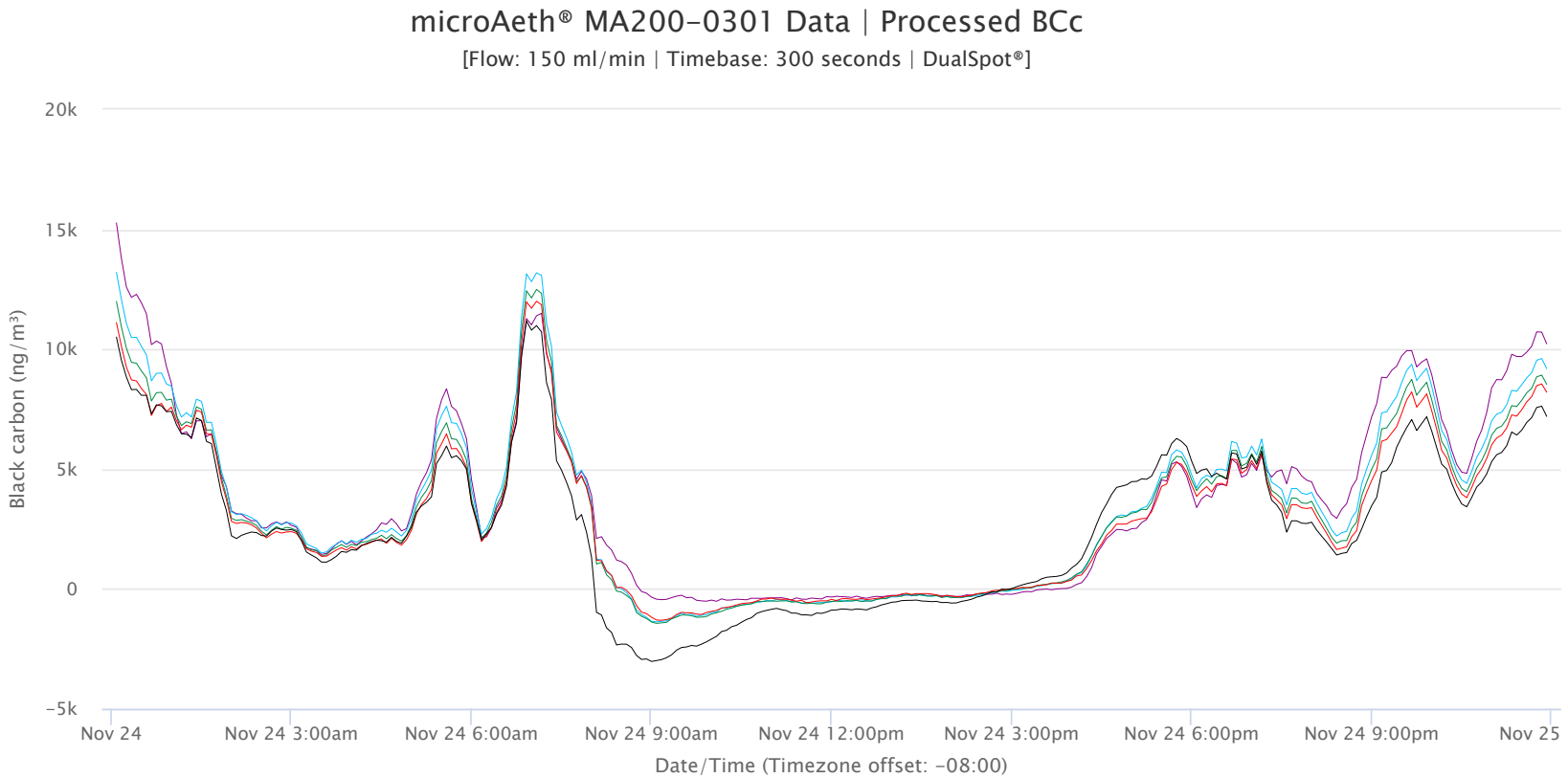
Device record

Smoothing: Centered moving average (7 points)

Flagging: Status errors (No errors found)

Raw BCc Processed BCc



Legend	Nov 24 11:40:00pm -0800
UV channel (BCc)	10,122 ng/m³
Blue channel (BCc)	9,022 ng/m³
Green channel (BCc)	8,369 ng/m³
Red channel (BCc)	8,022 ng/m³
IR channel (BCc)	7,147 ng/m³

Settings

Firmware version:	1.10
Sample air flow rate:	150 ml/min
Sampling timebase:	300 seconds
Sampling mode:	DualSpot®

Flow

	Spot 1	Spot 2	Total
Minimum flow:	78.7	64.8	149.3
Maximum flow:	84.9	71.4	150.7
Average flow:	81.3	68.6	149.9
Flow standard deviation:	1.779	2.529	2.555
Air flow per sampling period:	0.4065	0.343	0.7495

Timing

Start time:	Nov 24, 2022 12:00:00am -0800
End time:	Nov 24, 2022 11:55:00pm -0800
Total run time:	23 hours, 55 minutes
Tape advances:	15 → 16 on Nov 25 @ 3:20:00am

Optics

	UV	Blue	Green	Red	IR
Reference beam stability:	4024	2336	3183	4102	3698
Average reference beam intensity:	830235	870932	817891	918710	943316
Minimum sensing beam 1 intensity:	390946	492047	503912	581138	558611
Minimum sensing beam 2 intensity:	331151	483564	498439	582565	595100
Maximum sensing beam 1 intensity:	836495	893728	849838	898907	766044
Maximum sensing beam 2 intensity:	682925	853983	818961	881832	803730

Attenuation

	UV	Blue	Green	Red	IR
Spot 1 delta attenuation:	-11.676	-10.855	-9.782	-8.264	-6.602
Spot 2 delta attenuation:	-13.948	-12.195	-10.826	-9.074	-6.899

Black carbon

	UV	Blue	Green	Red	IR
Average concentration (ng/m^3):	3569	3380	3121	2952	2604
Point-to-Point data variability (ng/m^3):	1644	1559	1520	1542	1455
Deviation as BC Increment (pg/cm^2):	9412.48	8925.82	8702.54	8828.49	8330.39

Map

Show route

Table

Row	Serial Number	Datum...	Sess...	Data F...	Firm...	App V...	Date Time	Timez...	Date L...	Time L...	GPS Lat	GPS Long	GPS Speed	GPS S...	Timebase	Status
1	MA200-0301	101332	17	1	1.10	1.4	2022-11-24T00:00:00	-480	2022/1...	00:00:...	37.3621...	-118.417...	0.1	14	300	6
2	MA200-0301	101333	17	1	1.10	1.4	2022-11-24T00:05:00	-480	2022/1...	00:05:...	37.3622...	-118.417...	0.0	14	300	6
3	MA200-0301	101334	17	1	1.10	1.4	2022-11-24T00:10:00	-480	2022/1...	00:10:...	37.3622...	-118.417...	0.2	13	300	6
4	MA200-0301	101335	17	1	1.10	1.4	2022-11-24T00:15:00	-480	2022/1...	00:15:...	37.3621...	-118.417...	0.2	13	300	6
5	MA200-0301	101336	17	1	1.10	1.4	2022-11-24T00:20:00	-480	2022/1...	00:20:...	37.3623...	-118.417...	0.5	13	300	6
6	MA200-0301	101337	17	1	1.10	1.4	2022-11-24T00:25:00	-480	2022/1...	00:25:...	37.3621...	-118.417...	0.1	12	300	6
7	MA200-0301	101338	17	1	1.10	1.4	2022-11-24T00:30:00	-480	2022/1...	00:30:...	37.3622...	-118.417...	0.2	12	300	6
8	MA200-0301	101339	17	1	1.10	1.4	2022-11-24T00:35:00	-480	2022/1...	00:35:...	37.3622...	-118.417...	0.1	12	300	6
9	MA200-0301	101340	17	1	1.10	1.4	2022-11-24T00:40:00	-480	2022/1...	00:40:...	37.3621...	-118.417...	0.0	12	300	6
10	MA200-0301	101341	17	1	1.10	1.4	2022-11-24T00:45:00	-480	2022/1...	00:45:...	37.3622...	-118.417...	0.1	11	300	6
11	MA200-0301	101342	17	1	1.10	1.4	2022-11-24T00:50:00	-480	2022/1...	00:50:...	37.3622...	-118.417...	0.2	12	300	6
12	MA200-0301	101343	17	1	1.10	1.4	2022-11-24T00:55:00	-480	2022/1...	00:55:...	37.3622...	-118.417...	0.0	13	300	6
13	MA200-0301	101344	17	1	1.10	1.4	2022-11-24T01:00:00	-480	2022/1...	01:00:...	37.3622...	-118.417...	0.0	13	300	6
14	MA200-0301	101345	17	1	1.10	1.4	2022-11-24T01:05:00	-480	2022/1...	01:05:...	37.3621...	-118.417...	0.2	14	300	6
15	MA200-0301	101346	17	1	1.10	1.4	2022-11-24T01:10:00	-480	2022/1...	01:10:...	37.3621...	-118.417...	0.1	15	300	6
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MA200-0301 data for Nov 25, 2022 at 12:00:00am

Submitted by Emma Ruppell on December 1, 2022 - 9:34am

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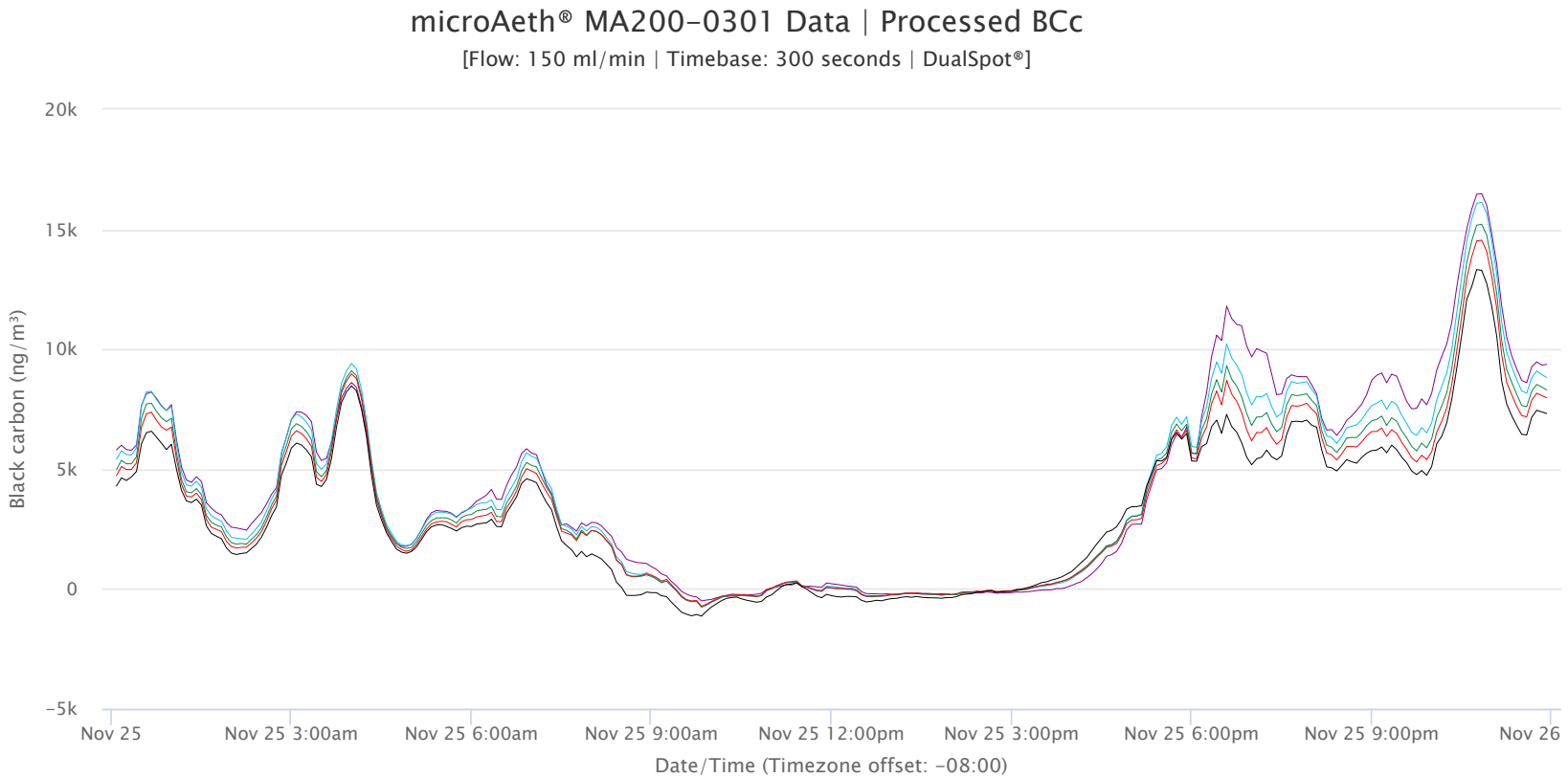
Device record

Smoothing: Centered moving average (7 points)

Flagging: Status errors (No errors found)

Raw BCc Processed BCc



Legend	Nov 25 10:35:00pm -0800
UV channel (BCc)	15,011 ng/m³
Blue channel (BCc)	14,491 ng/m³
Green channel (BCc)	13,600 ng/m³
Red channel (BCc)	12,943 ng/m³
IR channel (BCc)	12,074 ng/m³

Settings

Firmware version:	1.10
Sample air flow rate:	150 ml/min
Sampling timebase:	300 seconds
Sampling mode:	DualSpot®

Flow

	Spot 1	Spot 2	Total
Minimum flow:	81.8	64.1	149.3
Maximum flow:	85.5	68.5	150.7
Average flow:	83.6	66.4	150
Flow standard deviation:	1.113	1.591	1.632
Air flow per sampling period:	0.418	0.332	0.75

Timing

Start time:	Nov 25, 2022 12:00:00am -0800
End time:	Nov 25, 2022 11:55:00pm -0800
Total run time:	23 hours, 55 minutes
Tape advances:	16 → 17 on Nov 26 @ 2:15:00am

Optics

	UV	Blue	Green	Red	IR
Reference beam stability:	3328	2324	2676	3488	2332
Average reference beam intensity:	830795	871264	817868	918640	942890
Minimum sensing beam 1 intensity:	389771	494213	507660	585875	566677
Minimum sensing beam 2 intensity:	352358	512625	527025	612797	625206
Maximum sensing beam 1 intensity:	829451	895749	853365	905476	772033
Maximum sensing beam 2 intensity:	671161	848059	814483	878012	801471

Attenuation

	UV	Blue	Green	Red	IR
Spot 1 delta attenuation:	14.462	12.757	11.594	10.11	7.424
Spot 2 delta attenuation:	14.908	12.689	11.351	9.701	6.939

Black carbon

	UV	Blue	Green	Red	IR
Average concentration (ng/m^3):	4180	3967	3700	3510	3138
Point-to-Point data variability (ng/m^3):	2273	2240	2196	2228	2165
Deviation as BC Increment (pg/cm^2):	13381.89	13187.61	12928.56	13116.96	12746.06

Map

Show route

Table

Row	Serial Number	Datum...	Sess...	Data F...	Firm...	App V...	Date Time	Timez...	Date L...	Time L...	GPS Lat	GPS Long	GPS Speed	GPS S...	Timebase	Status
1	MA200-0301	101620	17	1	1.10	1.4	2022-11-25T00:00:00	-480	2022/1...	00:00:...	37.3622...	-118.417...	0.1	14	300	6
2	MA200-0301	101621	17	1	1.10	1.4	2022-11-25T00:05:00	-480	2022/1...	00:05:...	37.3622...	-118.417...	0.2	13	300	6
3	MA200-0301	101622	17	1	1.10	1.4	2022-11-25T00:10:00	-480	2022/1...	00:10:...	37.3622...	-118.417...	0.2	13	300	6
4	MA200-0301	101623	17	1	1.10	1.4	2022-11-25T00:15:00	-480	2022/1...	00:15:...	37.3621...	-118.417...	0.2	13	300	6
5	MA200-0301	101624	17	1	1.10	1.4	2022-11-25T00:20:00	-480	2022/1...	00:20:...	37.3622...	-118.417...	0.2	12	300	6
6	MA200-0301	101625	17	1	1.10	1.4	2022-11-25T00:25:00	-480	2022/1...	00:25:...	37.3622...	-118.417...	0.1	12	300	6
7	MA200-0301	101626	17	1	1.10	1.4	2022-11-25T00:30:00	-480	2022/1...	00:30:...	37.3621...	-118.417...	0.1	12	300	6
8	MA200-0301	101627	17	1	1.10	1.4	2022-11-25T00:35:00	-480	2022/1...	00:35:...	37.3621...	-118.417...	0.0	12	300	6
9	MA200-0301	101628	17	1	1.10	1.4	2022-11-25T00:40:00	-480	2022/1...	00:40:...	37.3622...	-118.417...	0.2	11	300	6
10	MA200-0301	101629	17	1	1.10	1.4	2022-11-25T00:45:00	-480	2022/1...	00:45:...	37.3622...	-118.417...	0.2	12	300	6
11	MA200-0301	101630	17	1	1.10	1.4	2022-11-25T00:50:00	-480	2022/1...	00:50:...	37.3622...	-118.417...	0.2	13	300	6
12	MA200-0301	101631	17	1	1.10	1.4	2022-11-25T00:55:00	-480	2022/1...	00:55:...	37.3621...	-118.417...	0.0	13	300	6
13	MA200-0301	101632	17	1	1.10	1.4	2022-11-25T01:00:00	-480	2022/1...	01:00:...	37.3622...	-118.417...	0.1	14	300	6
14	MA200-0301	101633	17	1	1.10	1.4	2022-11-25T01:05:00	-480	2022/1...	01:05:...	37.3622...	-118.417...	0.1	15	300	6
15	MA200-0301	101634	17	1	1.10	1.4	2022-11-25T01:10:00	-480	2022/1...	01:10:...	37.3621...	-118.417...	0.3	15	300	6
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MA200-0301 data for Nov 26, 2022 at 12:00:00am

Submitted by Emma Ruppell on December 1, 2022 - 9:38am

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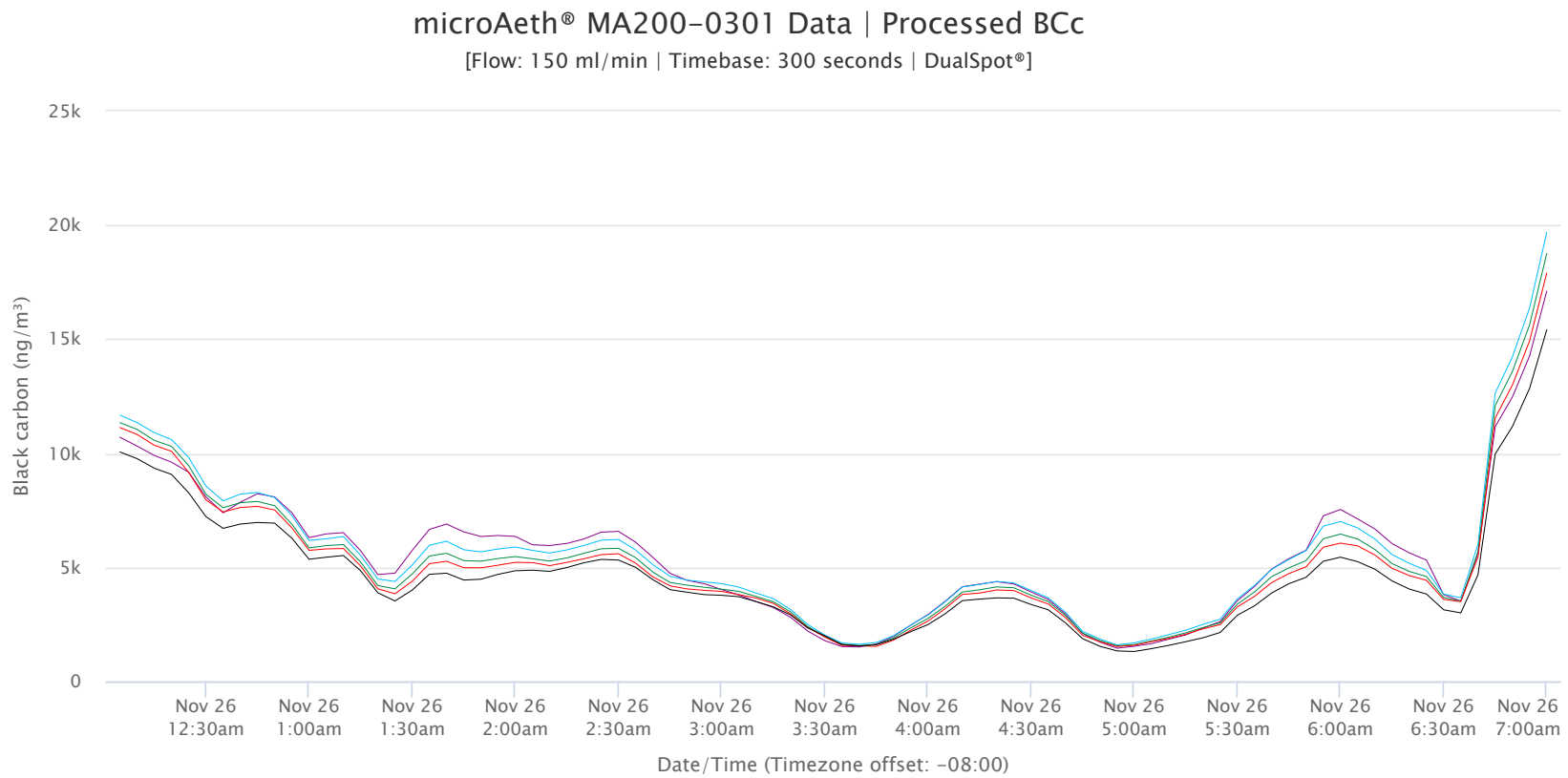
Device record

Smoothing: Centered moving average (7 points)

Flagging: Status errors (No errors found)

Raw BCc Processed BCc



Legend

-●- UV channel (BCc)
-●- Blue channel (BCc)
-●- Green channel (BCc)
-●- Red channel (BCc)
-●- IR channel (BCc)

Settings

Firmware version:	1.10
Sample air flow rate:	150 ml/min
Sampling timebase:	300 seconds
Sampling mode:	DualSpot®

Flow

	Spot 1	Spot 2	Total
Minimum flow:	82.9	65.8	149.3
Maximum flow:	84	67.8	150.7
Average flow:	83.4	66.6	150
Flow standard deviation:	0.238	0.458	0.552
Air flow per sampling period:	0.417	0.333	0.75

Timing

Start time:	Nov 26, 2022 12:00:00am -0800
End time:	Nov 26, 2022 7:00:00am -0800
Total run time:	7 hours
Tape advances:	None

Optics

	UV	Blue	Green	Red	IR
Reference beam stability:	2461	1597	1804	5455	1654
Average reference beam intensity:	829885	871634	817214	917149	942347
Minimum sensing beam 1 intensity:	378604	481306	496365	512566	559422
Minimum sensing beam 2 intensity:	329940	483661	500704	521936	603781
Maximum sensing beam 1 intensity:	472589	584763	587930	666225	626040
Maximum sensing beam 2 intensity:	407829	582354	587529	672926	668922

Attenuation

	UV	Blue	Green	Red	IR
Spot 1 delta attenuation:	22.381	18.871	17.055	14.868	11.317
Spot 2 delta attenuation:	21.4	17.969	16.121	13.908	10.307

Black carbon

	UV	Blue	Green	Red	IR
Average concentration (ng/m^3):	5533	5644	5349	5153	4688
Point-to-Point data variability (ng/m^3):	1877	1998	2022	2130	2257
Deviation as BC Increment (pg/cm^2):	11024.07	11734.73	11875.69	12510	13255.9

Map

Show route

Table

Row	Serial Number	Datum...	Sess...	Data F...	Firm...	App V...	Date Time	Timez...	Date L...	Time L...	GPS Lat	GPS Long	GPS Speed	GPS S...	Timebase	Status
1	MA200-0301	101908	17	1	1.10	1.4	2022-11-26T00:00:00	-480	2022/1...	00:00:...	37.3622...	-118.417...	0.2	15	300	6
2	MA200-0301	101909	17	1	1.10	1.4	2022-11-26T00:05:00	-480	2022/1...	00:05:...	37.3620...	-118.417...	0.2	14	300	6
3	MA200-0301	101910	17	1	1.10	1.4	2022-11-26T00:10:00	-480	2022/1...	00:10:...	37.3622...	-118.417...	0.1	14	300	6
4	MA200-0301	101911	17	1	1.10	1.4	2022-11-26T00:15:00	-480	2022/1...	00:15:...	37.3622...	-118.417...	0.1	13	300	6
5	MA200-0301	101912	17	1	1.10	1.4	2022-11-26T00:20:00	-480	2022/1...	00:20:...	37.3622...	-118.417...	0.1	13	300	6
6	MA200-0301	101913	17	1	1.10	1.4	2022-11-26T00:25:00	-480	2022/1...	00:25:...	37.3622...	-118.417...	0.0	13	300	6
7	MA200-0301	101914	17	1	1.10	1.4	2022-11-26T00:30:00	-480	2022/1...	00:30:...	37.3621...	-118.417...	0.1	13	300	6
8	MA200-0301	101915	17	1	1.10	1.4	2022-11-26T00:35:00	-480	2022/1...	00:35:...	37.3622...	-118.417...	0.1	12	300	6
9	MA200-0301	101916	17	1	1.10	1.4	2022-11-26T00:40:00	-480	2022/1...	00:40:...	37.3622...	-118.417...	0.2	13	300	6
10	MA200-0301	101917	17	1	1.10	1.4	2022-11-26T00:45:00	-480	2022/1...	00:45:...	37.3621...	-118.417...	0.0	14	300	6
11	MA200-0301	101918	17	1	1.10	1.4	2022-11-26T00:50:00	-480	2022/1...	00:50:...	37.3621...	-118.417...	0.5	14	300	6
12	MA200-0301	101919	17	1	1.10	1.4	2022-11-26T00:55:00	-480	2022/1...	00:55:...	37.3621...	-118.417...	0.1	15	300	6
13	MA200-0301	101920	17	1	1.10	1.4	2022-11-26T01:00:00	-480	2022/1...	01:00:...	37.3622...	-118.417...	0.1	15	300	6
14	MA200-0301	101921	17	1	1.10	1.4	2022-11-26T01:05:00	-480	2022/1...	01:05:...	37.3622...	-118.417...	0.2	16	300	6
15	MA200-0301	101922	17	1	1.10	1.4	2022-11-26T01:10:00	-480	2022/1...	01:10:...	37.3622...	-118.417...	0.2	16	300	6
16																

Notes

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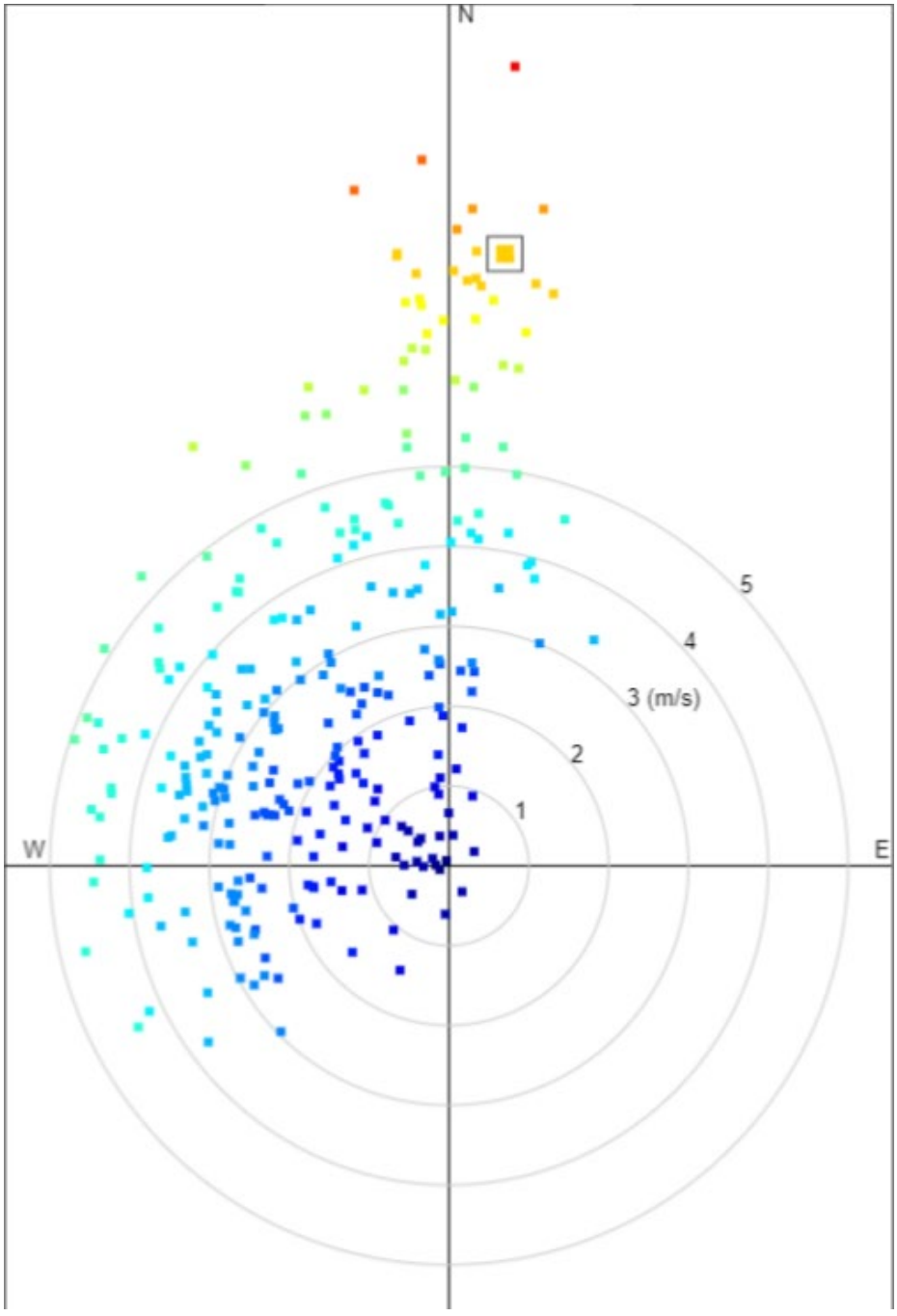
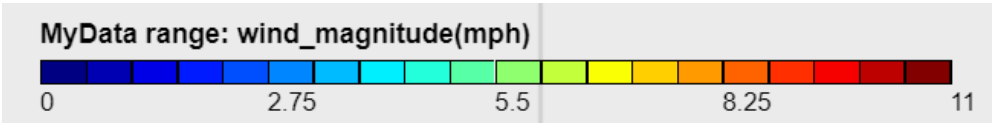
APPENDIX E – DATA ANALYSIS USING RETIGO

The process used for analysis of the microaeth data in the US EPA tool RETIGO (Real Time Geospatial Data Viewer) is as follows:

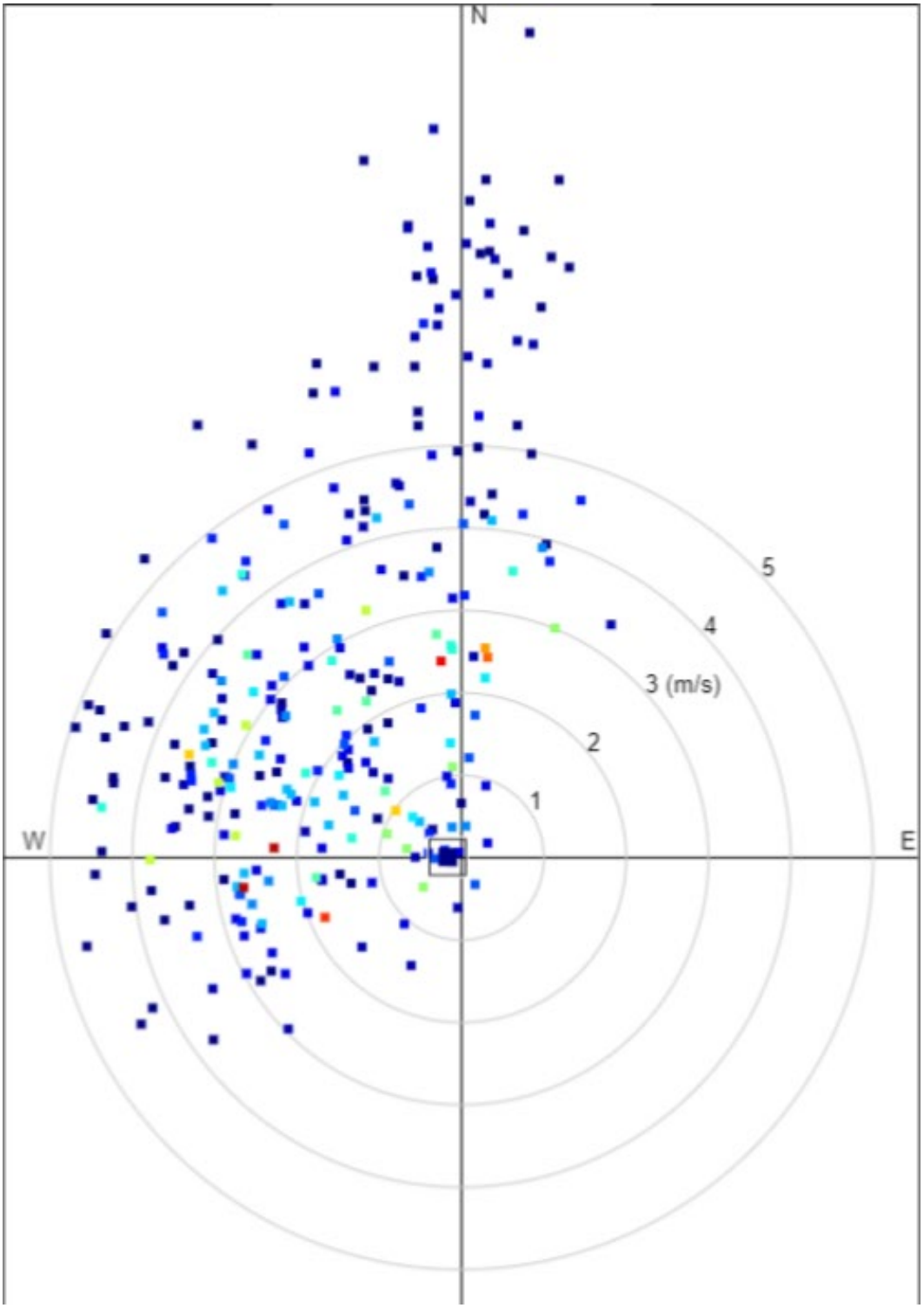
1. The raw data files as downloaded from Aeth Manager Software were used for the basis of the dataset to import rather than the downloaded smoothed (ONA, or CMA) datasets due to discrepancies in completion of values in the IR channel in the smoothed datasets for black carbon compensated (BCc or total black carbon, recorded in ng/m3) value. As a reminder, these all are 5-minute data.
2. The dataset was truncated for the relevant records (records containing measurements), and the dataset for IR was separated out by selecting only the "IR BCc" value. *This step was repeated for the UV data ("UV BCc" only was selected as a separate dataset).*
3. The data was processed in excel to remove negative values of BC, which were treated as 0. Additionally, any blanks were treated as 0's (there was only 1, immediately following concentration values of 0). The data column for BC from ng/m3 was converted into ug/m3 for entry into RETIGO.
4. The RETIGO timestamp converter was used to create compatible timestamps: https://ofmpub.epa.gov/rsig/rsigserver?retigo/stable/timestamp_converter.html
5. Wind data recorded by the Tribe's monitoring equipment for the duration of the sampling run was downloaded from QREST.net in 5-minute format (Wind Direction Resultant and Wind Speed Resultant). This was added into the microaeth IR file in excel. For compatibility with RETIGO, wind speed units was converted from mph into m/s.
6. Additions were made to the file to gain the format acceptable to RETIGO, which includes an identifying field (column name = "ID(-)" for which we entered "microaeth IR"), and the GPS coordinate columns, for which the AQS site coordinates were entered.
7. As this study was stationary, the map in RETIGO actually was not used, only the graphing capabilities. Time-series plots and wind roses as published above were created and saved as image files.
8. All charts made in RETIGO are displayed in PST.
9. Browser cache is cleared between each loading of data file into RETIGO.
10. Adjustments must be made to the wind compass size and display in RETIGO and browser window to show all bins and data points- the 2022 study roses fully capture the dataset, whereas others may be cut off in the visualization.

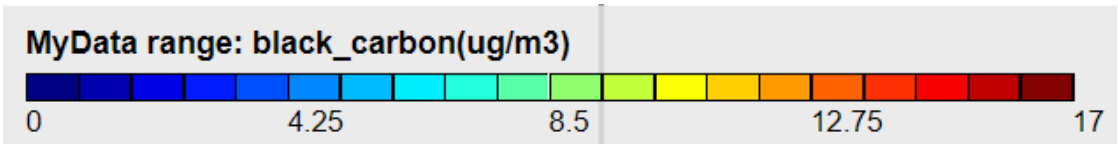
WIND ROSE, 11/23/22, WIND SPEED mph



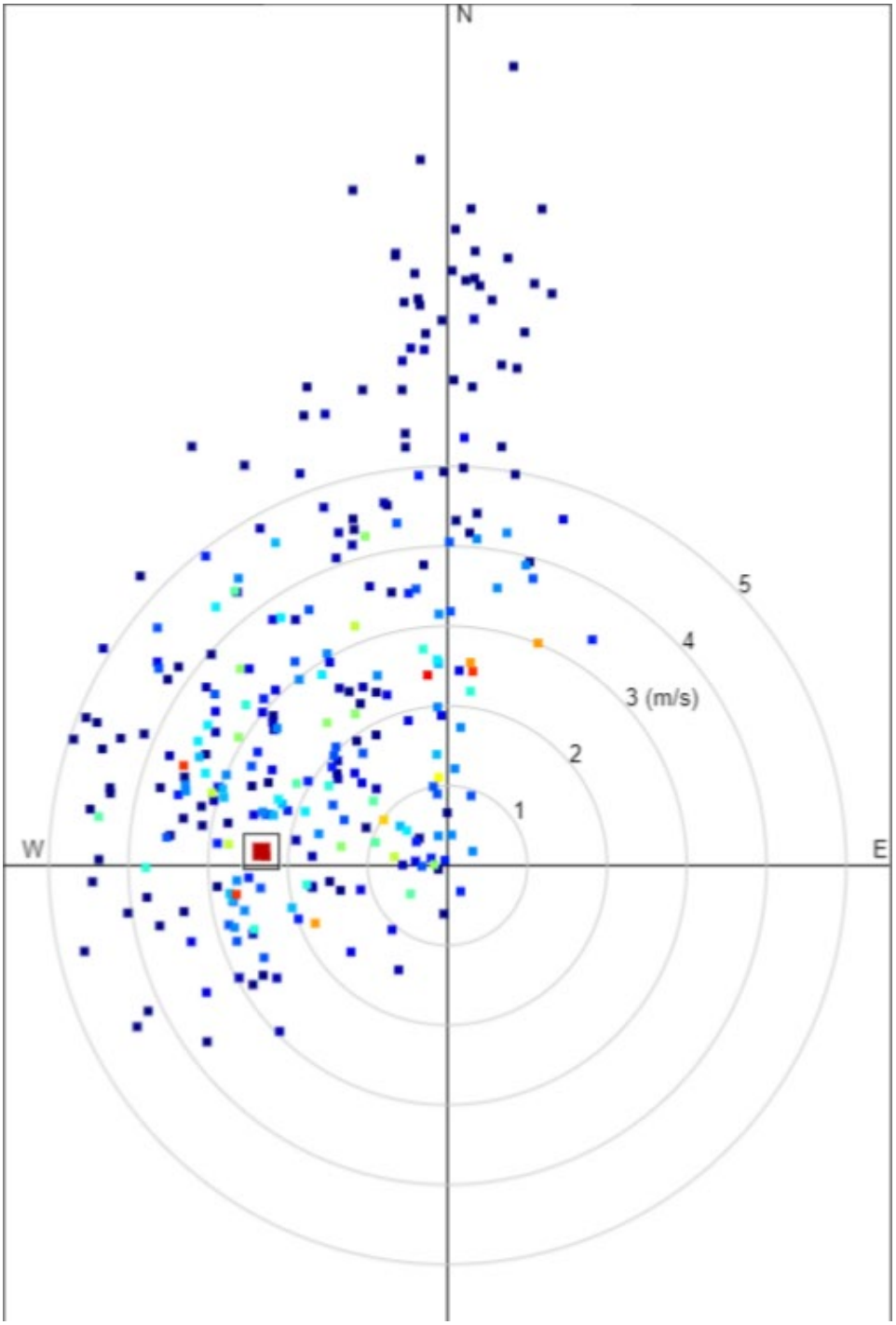


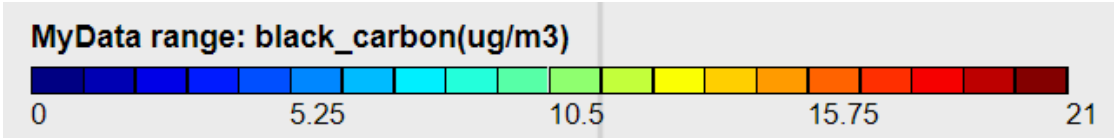
POLLUTION ROSES, 11/23/22, TOTAL BLACK CARBON IR CHANNEL



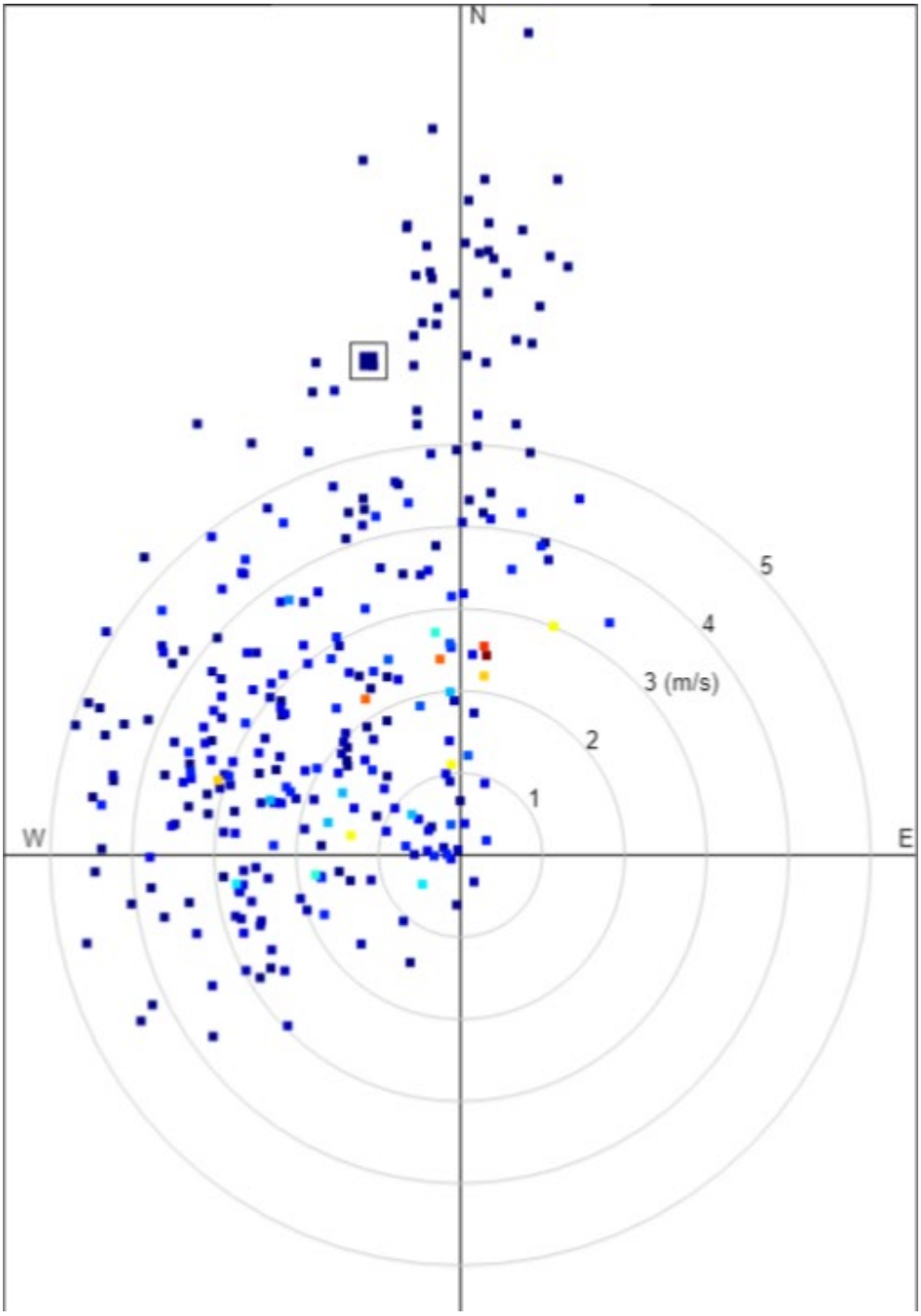


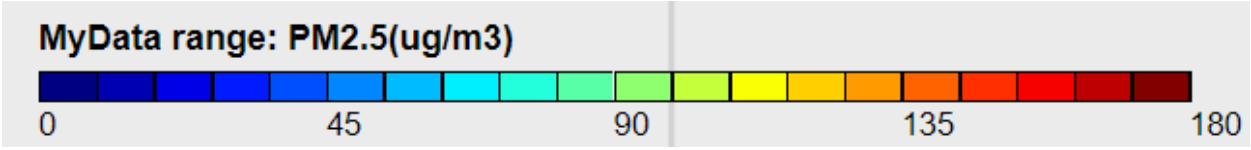
POLLUTION ROSES, 11/23/22, TOTAL BLACK CARBON UV CHANNEL



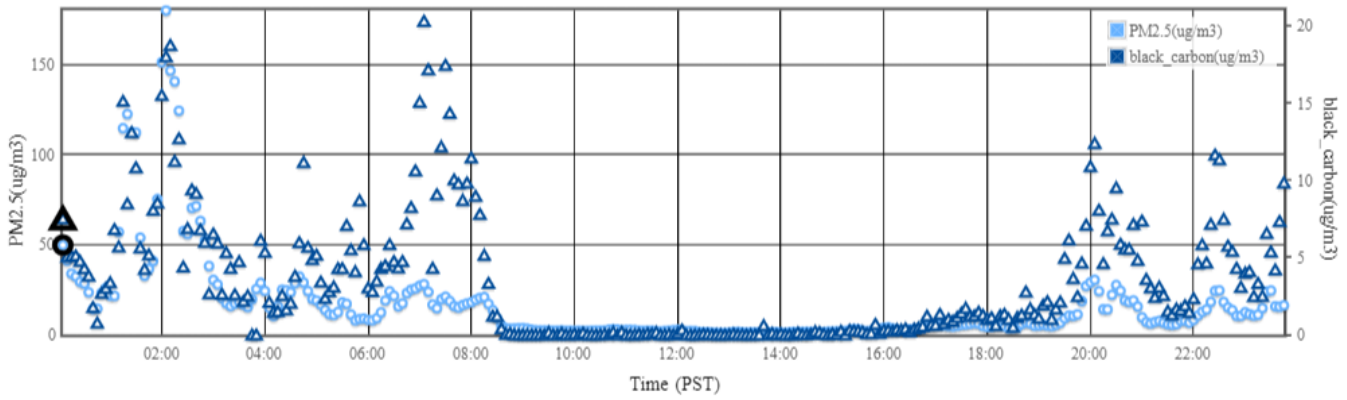


POLLUTION ROSES, 11/23/22, TOTAL BLACK CARBON T640 PM2.5

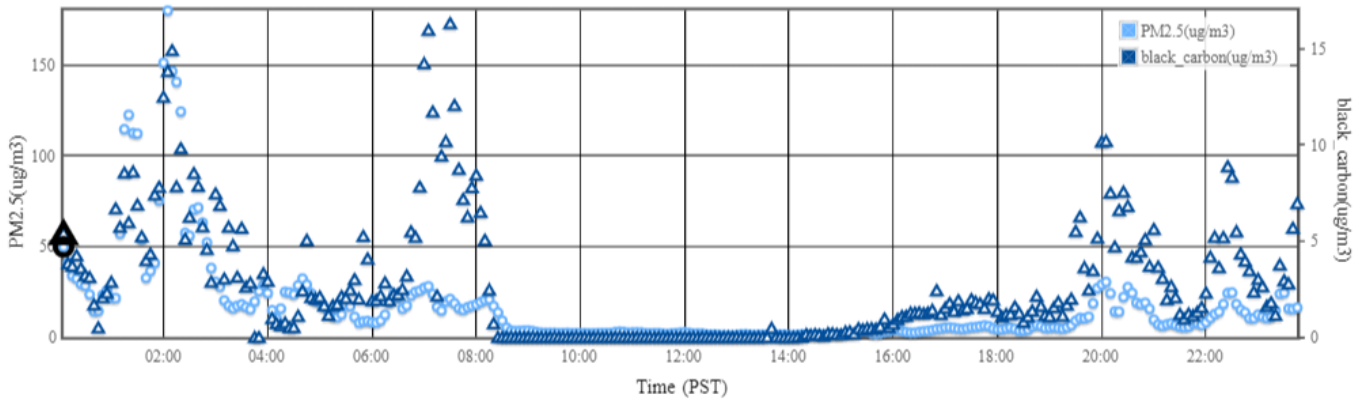




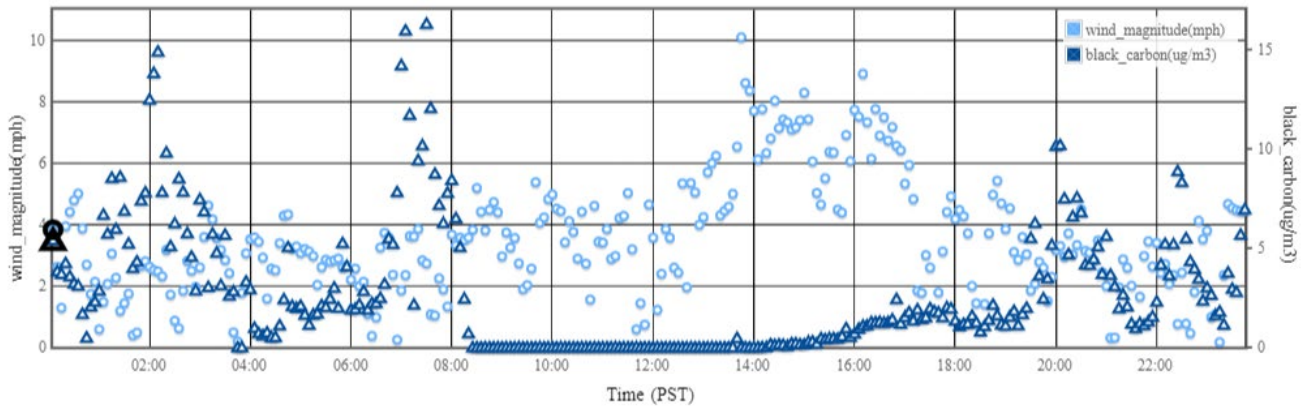
SELECTION TIME-SERIES: 11/23/22, TOTAL BLACK CARBON UV CHANNEL (ug/m3) AND PM2.5 (ug/m3)



SELECTION TIME-SERIES: 11/23/22, TOTAL BLACK CARBON IR CHANNEL (ug/m3) AND PM2.5 (ug/m3)



SELECTION TIME-SERIES: 11/23/22, WIND SPEED (mph) v TOTAL BLACK CARBON IR CHANNEL (ug/m3)



SELECTION TIME-SERIES: 11/23/22, 12:00 – 23:55, WIND SPEED (mph) v TOTAL BLACK CARBON IR CHANNEL (ug/m3)