

Magellan Dupont Monthly Report

November 19 – December 17, 2024

Introduction

As part of CDPHE's commitment to measuring air quality in disproportionately impacted communities, the Magellan Dupont gasoline storage facility terminal was selected for air monitoring beginning November 19. To monitor potential air toxics emitted from the Magellan Dupont terminal, an Entanglement Technologies AROMA-TOX-EtO was deployed within a Mobile Air Remote Monitoring Trailer (MARMOT) for near real-time detection of benzene, toluene, ethyl benzene and xylenes (BTEX), which are air toxics present in gasoline. Data from this deployment can be found in the [ATOPs data repository](#). These measurements were taken to determine whether the Magellan Dupont gasoline terminal is the dominant contributor of BTEX air toxics within this community. This report describes data collected for the first month of the deployment.

Methods

These measurements were performed using an Entanglement Technologies AROMA-TOX-EtO (hereafter referred to as AROMA). The AROMA consists of three main components: traps to collect BTEX and other volatile organic compounds (VOCs) from the air, a thermal separator to separate the sample into individual compounds (like benzene, toluene, ethyl benzene, and xylenes), and a detector to identify and quantify the concentrations of each compound in air approximately every 12 minutes per sample.

To perform these measurements, the AROMA was deployed in a MARMOT trailer with a Gill Maximet GMX501 meteorological station on the west side of the South Adams County Water & Sanitation District in Commerce City ([39.842073, -104.917620](#)) located just North from Dupont Elementary School on 11/19/2024. The Maximet meteorological station measures wind speed, wind direction, temperature, solar radiation, and relative humidity. These meteorological measurements are used to determine the direction in which air toxics measured by the AROMA are coming from. A Sensit Technologies Sensor Pod (SPOD) was co-located with the MARMOT to provide 1 minute measurements of total volatile organic compounds (tVOCs). While the SPOD does not measure specific air toxics, its high time resolution and ability to provide alerts of elevated tVOC concentrations via cellular network to AROMA operators was determined to be valuable to quickly respond to any health guideline value exceedances of air toxics.

The South Adams County Water & Sanitation District provided shore power for the instruments, computer, and temperature control of the MARMOT shelter. This sampling location is approximately 1500 feet from the center of the Magellan Dupont gasoline storage facility

(39.845498, -104.914442) and 1200 feet from the Mesa Oil petroleum product recycler (39.842850, -104.913498), see Figure 1. The range of wind directions likely to incorporate emissions from Magellan Dupont or Mesa Oil (i.e., source winds) are greater than 13° and less than 64° (see map and photo in Figure 1).



Figure 1. Aerial view of the Magellan Dupont gasoline storage facility (red pin), including the location of the Marvin MARMOT monitoring station (blue tram), Dupont Elementary School (yellow pin), Mesa Oil petroleum product recycler (red pin), surrounding communities, and the range of wind directions coming from Magellan and Mesa Oil.

Results

Over the first month of deployment, the AROMA had a data coverage of 88.1%. This resulted in a total of 3,198 samples of BTEX. As benzene is the air toxic of primary concern, the results will be described in detail below. Statistics of the deployment are found in Table 1.

For the first month of sampling, the average benzene concentration was observed to be 0.62 ppb. This is greater than the median value of 0.38 ppb, demonstrating a higher frequency of concentrations measured below the average. The maximum benzene mixing ratio was 4.9 ppb, observed on 12/07/2024 at 4:38 pm (Figure 2). This measurement was associated with a wind

direction of 53°. This resulted in a maximum 1-hour rolling benzene concentration of 4.2 ppb during the period of 4:01-5:01 pm, which is below the one-hour health guideline value for benzene (9 ppbV). This wind direction suggests that the source of this individual measurement is from the direction of the Magellan Dupont gasoline storage facility during a time of low wind speeds.

There were many periods of elevated benzene concentrations (Figure 2), but these were not clearly associated with winds coming from the Magellan Dupont terminal, or the Mesa Oil petroleum product recycler. Of the 3,198 benzene measurements, 20% were greater than 1 ppb, and 4% were greater than 2 ppb. Benzene was well correlated with toluene, ethyl benzene, and xylenes (the other components of BTEX), suggesting a common source of these air toxics.

Benzene concentrations did not correlate with other meteorological parameters such as temperature and relative humidity (Figure 3). In order to evaluate the source winds of benzene pollution, polar plots were generated (Figure 4). These plots show the wind direction (described by angle) and wind speed (shown as distance from the plot center) measured for each benzene sample. By color coding the plot by benzene concentration, the source direction of benzene pollution can be identified. The highest benzene concentrations are observed only when there are calm winds (wind speed < 2.5 mph), as shown in Figure 4. There is no specific direction at low wind speeds that correlate with elevated benzene concentrations. This suggests that the Magellan Dupont gasoline storage facility is not the only contributor of BTEX air toxics pollution in the neighborhood where the AROMA is sampling. These results cannot exclude the possibility that the Magellan Dupont terminal is a contributor to BTEX air toxics pollution in the surrounding neighborhood, but it demonstrates that it is not the sole source.

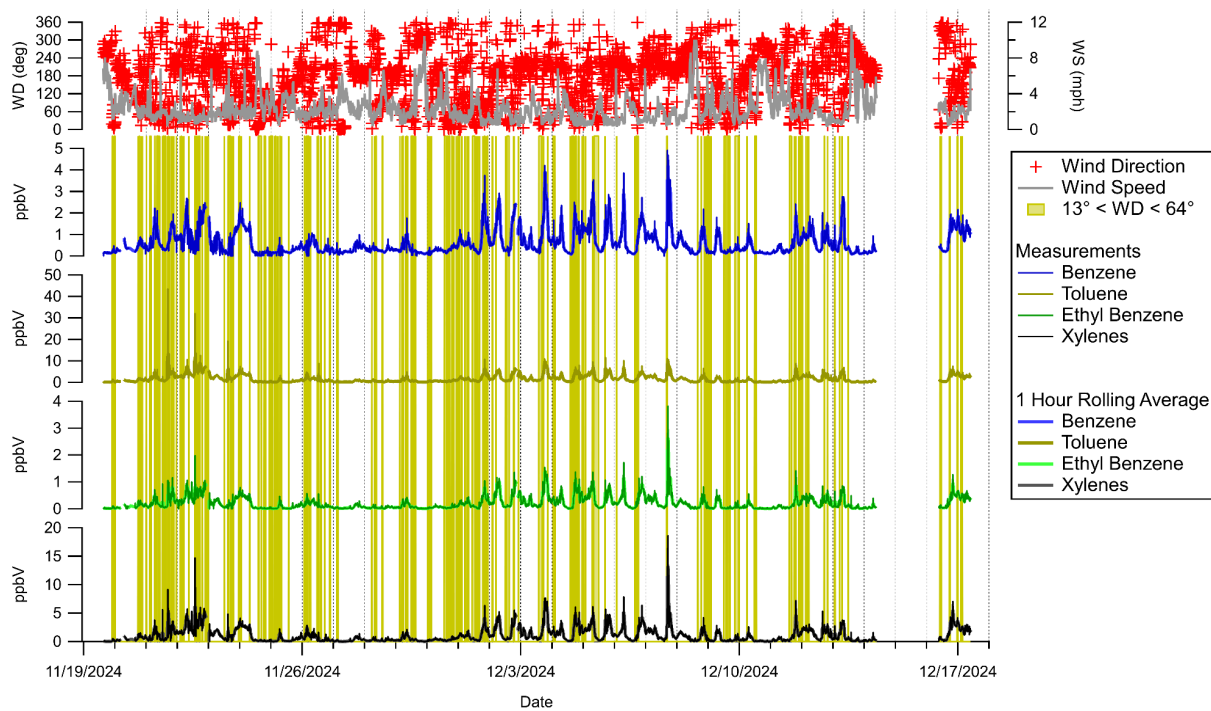


Figure 2. Five panels, from top to bottom, showing time series measurements of wind direction in degrees (left axis, red markers) and wind speed in mph (right axis, gray line), benzene in ppbV (blue lines), toluene in ppbV (yellow lines), ethyl benzene in ppbV (green lines), and xylenes in ppbV (grey and black lines). The 1-hour rolling averages are averages of the measurements preceding and proceeding 30 minutes of that time point. The yellow shaded areas of the plot indicate times when the wind was likely coming from the direction of the Magellan Dupont gasoline storage facility (wind direction above 13° and below 64°).

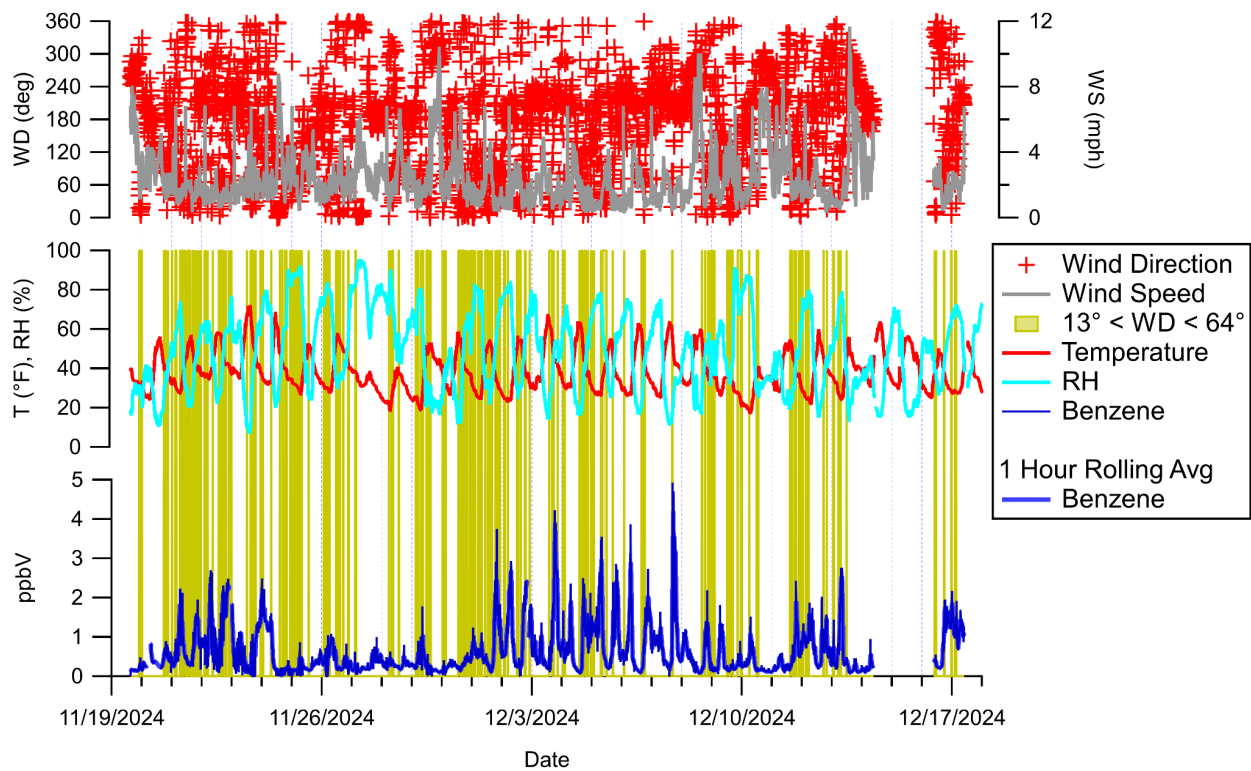


Figure 3. Three panels showing measurements, from top to bottom, of wind direction in degrees (left axis, red markers), wind speed in mph (right axis, gray line), temperature (°F, red line), relative humidity (RH, %, cyan line), and benzene in ppbV (blue lines). Benzene, wind direction and wind speed plotted with AROMA time resolution (~12 minutes), temperature and relative humidity plotted with 1 minute time resolution. The 1-hour rolling averages are averages of the measurements preceding and proceeding 30 minutes of that time point. The yellow shaded areas of the plot indicate times when the wind was likely coming from the source (wind direction above 13° and below 64°).

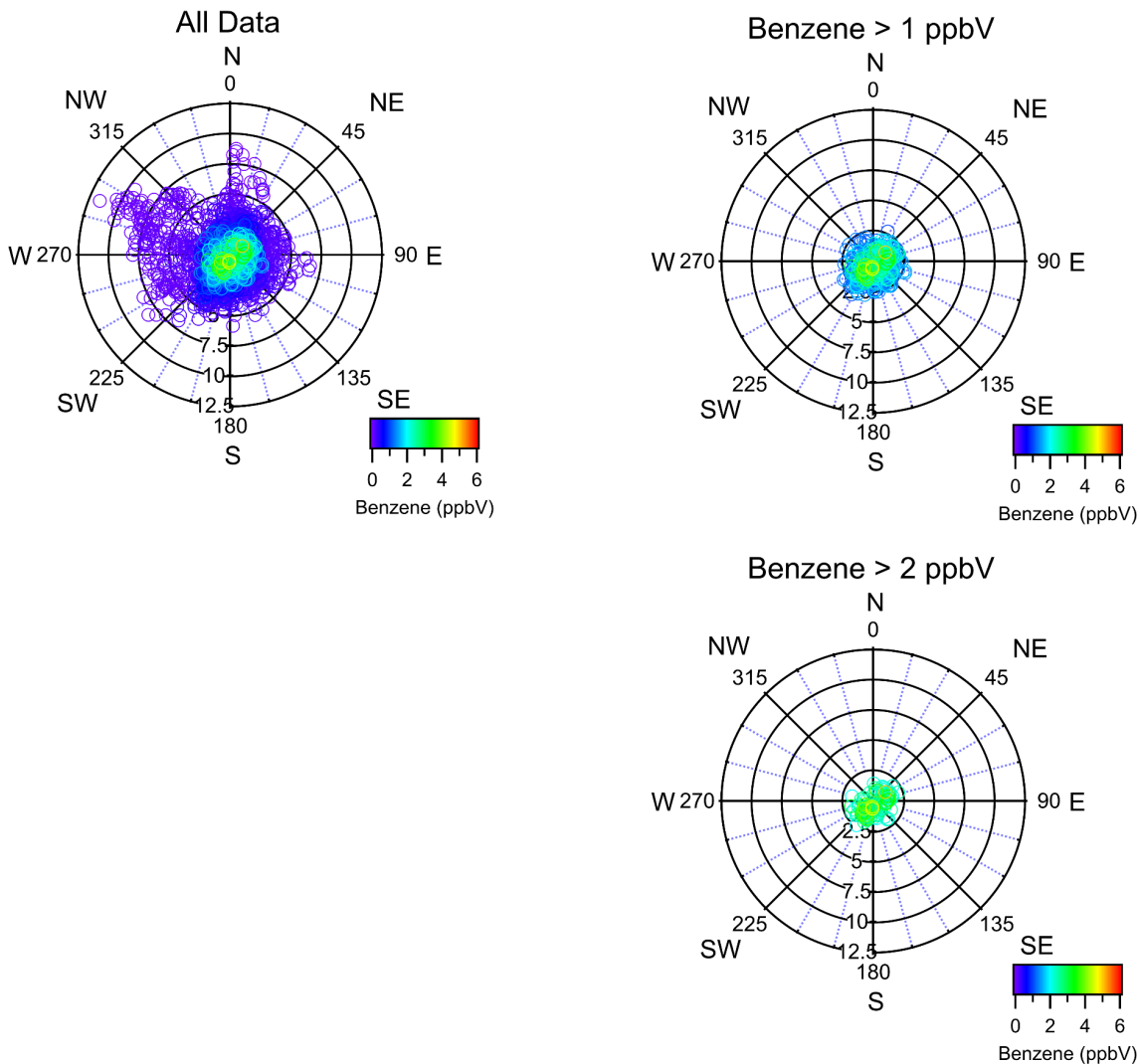


Figure 4. Three pollution polar plots for benzene. The angle data is wind direction in degrees and cardinal direction, and the radial data is wind speed in mph. The three polar plots show data for all benzene concentrations (top left), measurements where benzene concentrations are greater than 1 ppbV (top right), and measurements where benzene concentrations are greater than 2 ppbV (bottom right). Color coding is the benzene concentration determined at the same time a given wind speed and direction measurement is made to demonstrate the potential source winds of the pollution.

Table 1. Statistical data (min, max, median, average, standard deviation) for the monthly (11/19/2024 - 12/17/2024) sampling period. Benzene, toluene, ethyl benzene, and xylenes statistics from AROMA sampling time resolution (~12 minutes). Meteorological statistics (wind speed, temperature, relative humidity) from 1 minute averages of 1 second data.

	Min	Max	Median	Avg	Std. Dev.
Benzene (ppbV)	0.04	4.9	0.38	0.62	0.60
Toluene (ppbV)	0.04	43.5	0.97	1.7	2.0
Ethyl Benzene (ppbV)	0.05	3.8	0.11	0.22	0.26
Xylenes (ppbV)	0.06	18.6	0.61	1.1	1.3
Wind Speed (mph)	0.1	12.8	1.8	2.2	1.6
Temperature (°F)	17.1	72.1	37.4	38.6	10.3
Relative Humidity (%)	7	95	51.5	50.2	21.2

Summary

During the measurement period of November 19 to December 17, 2024, average benzene concentrations were 0.62 ppb. A maximum measurement of 4.9 ppb occurred on 12/07/2024 at 4:38 pm, resulting in a rolling one-hour average benzene concentration of 4.2 ppb from 4:01 pm - 5:01 pm. Elevated benzene concentrations were observed at low wind speeds from all directions, suggesting that the Magellan Dupont gasoline storage facility is not the sole source of BTEX air toxics in the neighborhood.