

# **What is the status of the San Jose Site?**

**Jaimie Ritchie**

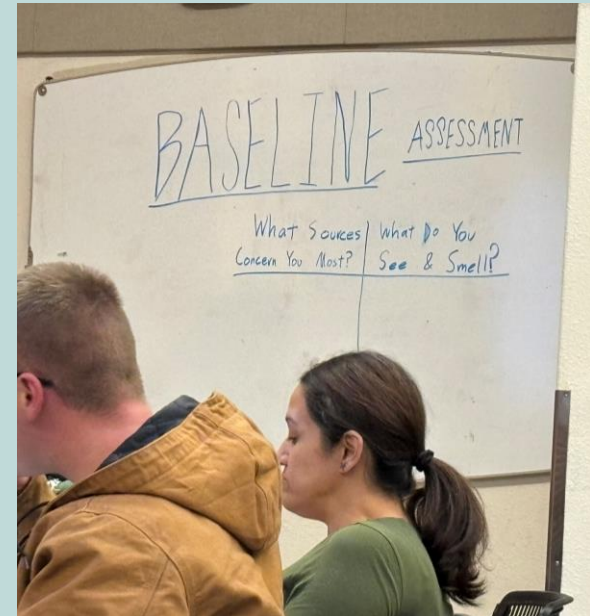
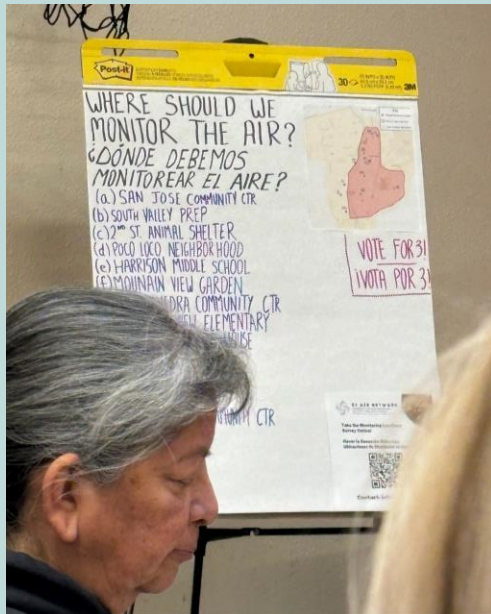
Civil, Construction, and Environmental Engineering

University of New Mexico

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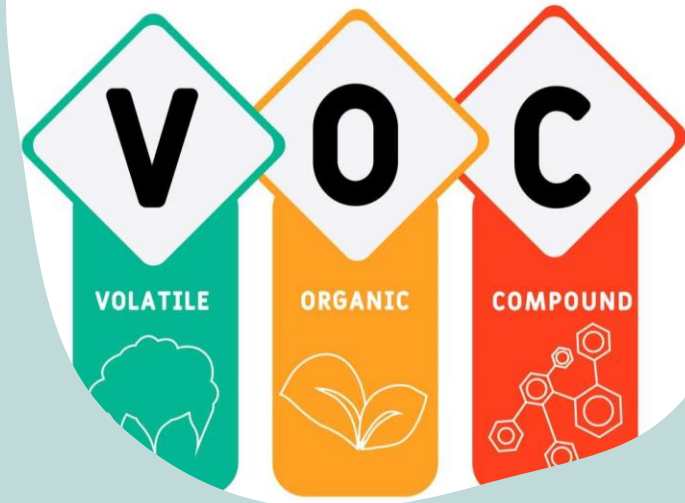
# Overarching Goal

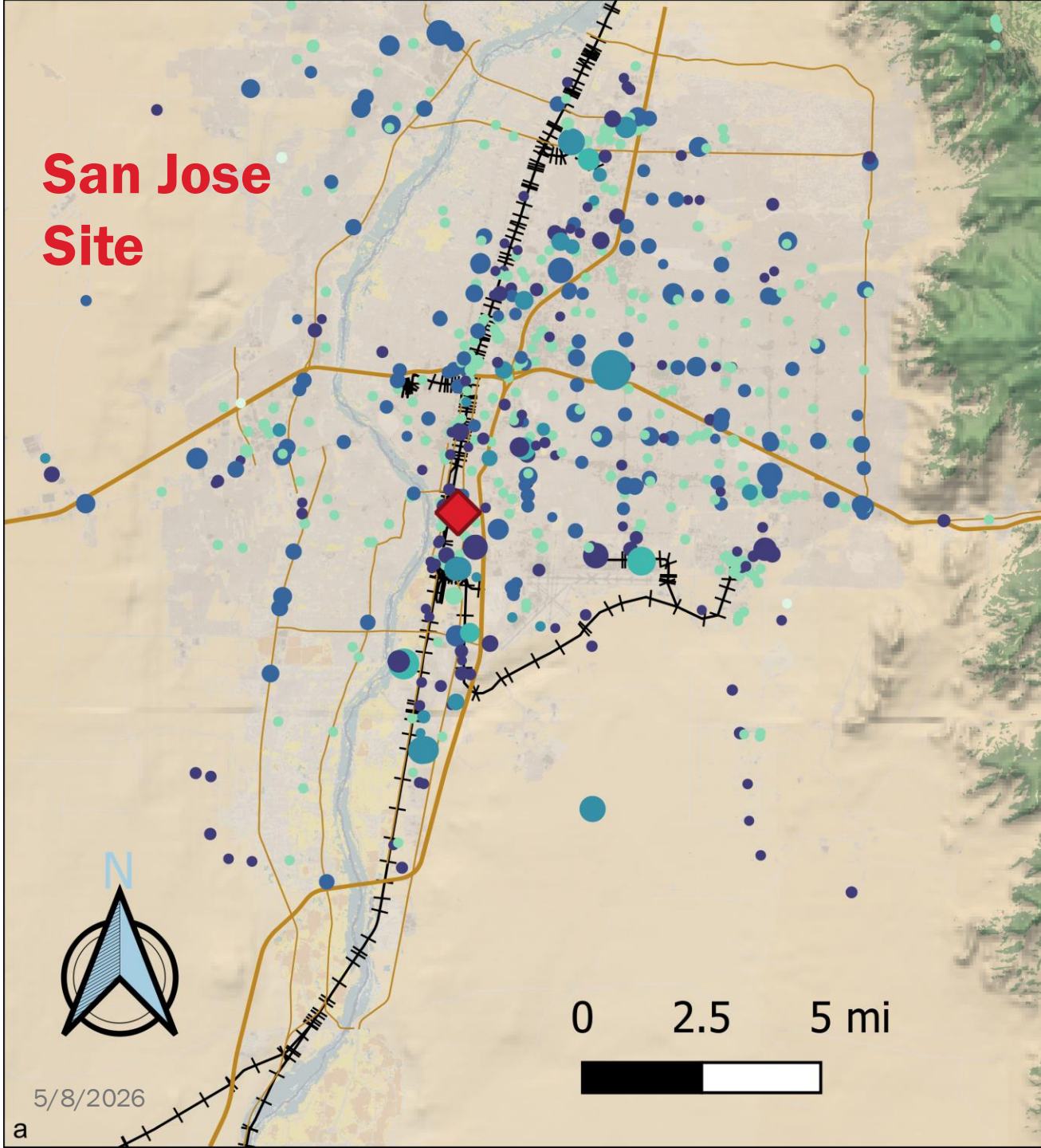
- Understand the tendencies of air pollution in Albuquerque through analysis of Volatile Organic Compound (VOC) concentrations



# What are Volatile Organic Compounds (VOCs)?

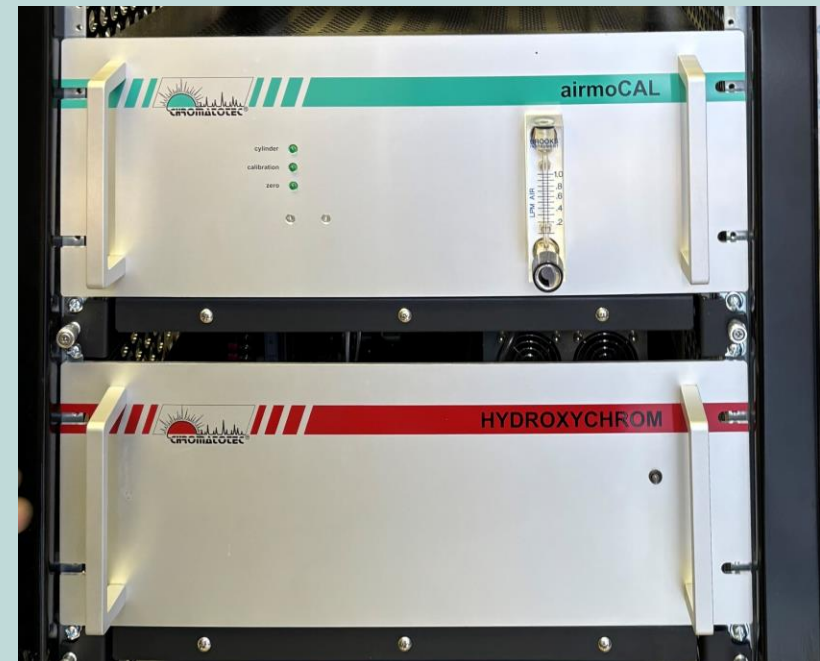
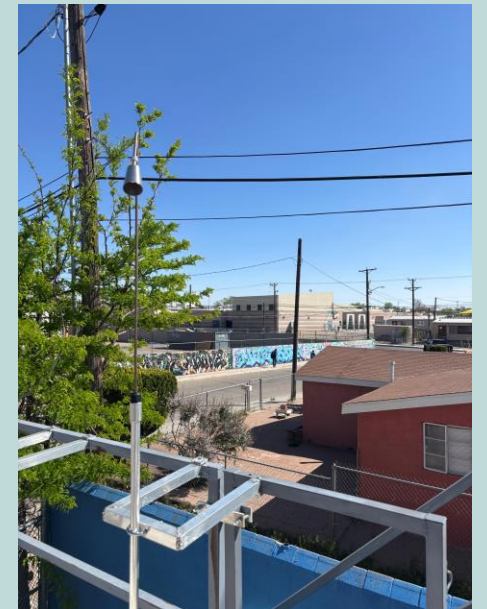
- Why do I care?
- Can be Hazardous
  - Some are Carcinogenic (cause cancer)
  - No outdoor air regulations in the US
  - Some indoor air regulations
- Sources
  - Anthropogenic: Industrial, Cars, Products
  - Biogenic: Wildfires





# Data Measurement

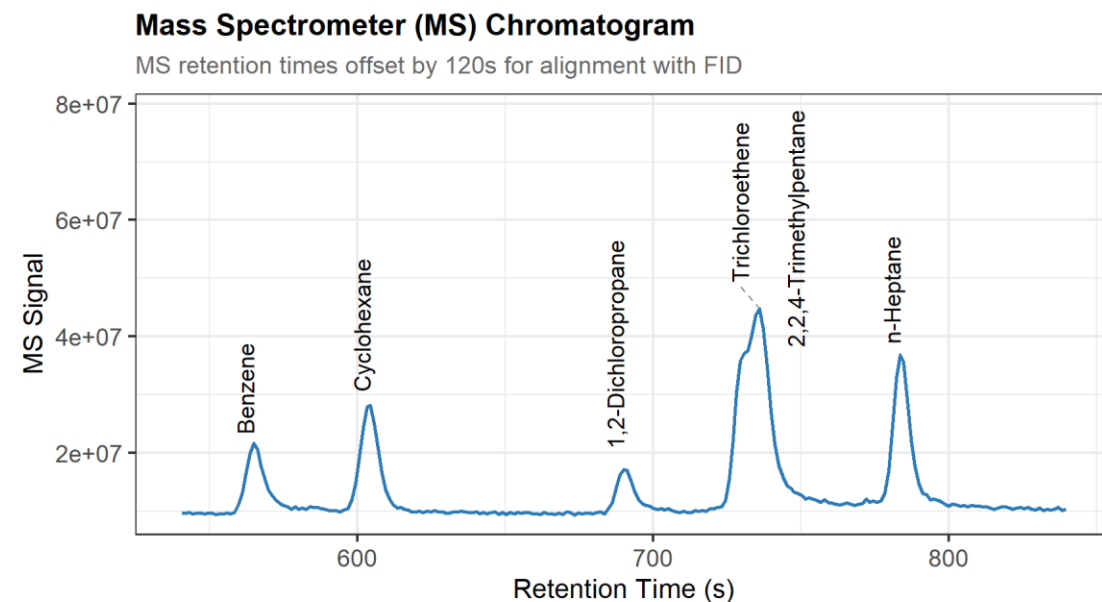
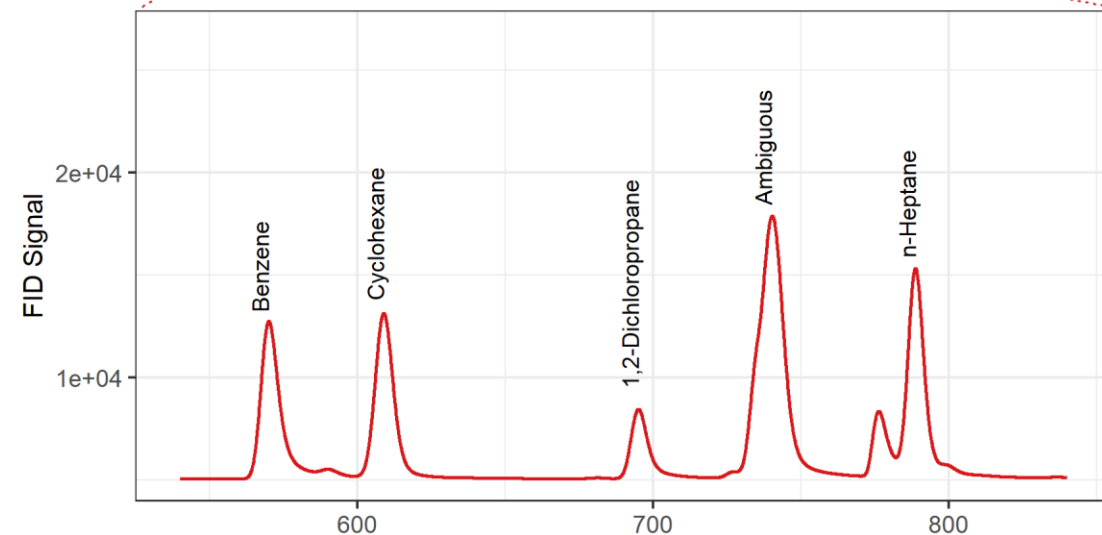
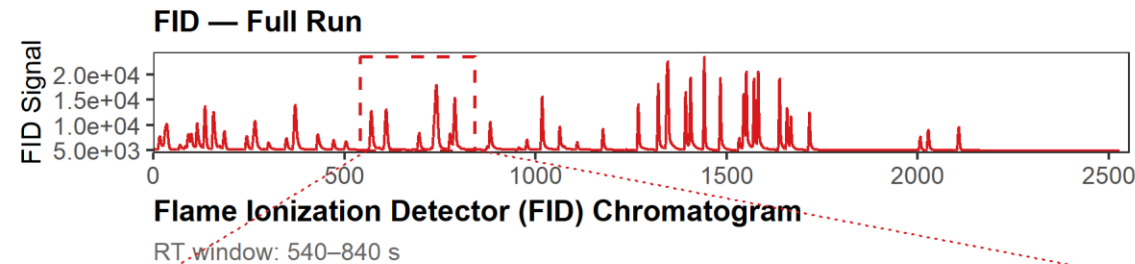
- The site analyzes VOCs every hour
- 2 Measurement Devices:
  - Autonomous gas chromatography flame ionization detector (GC-FID)
  - Quadrupole mass spectrometer (DET-QMS)
  - Inconsistent monitoring: technical difficulties
- Received data from the Environmental Health Department (EHD)
  - Performed Quality Control on data from 2025
  - Technical difficulties with the calibration process, 34 of 75 compounds could be validated



# Chromatograph Comparison

- Compare FID and MS Cylinder runs for Jan 4, 2026
  - Only C6C12
  - C2C6 MS not readable (Curt Mowry)
- Issues (expected from setup)
  - MS off by 120s
  - MS large air pulse before 120s
- Used the cylinder comparison to correct all cylinder files in 2025 for drift
  - 34 compounds validated

5/8/2026



# Objectives

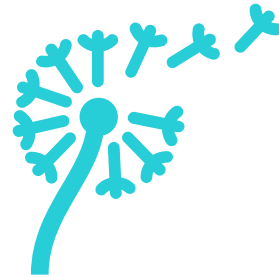
## What does the VOC data mean?

### EXPOSURE



How do VOC concentrations compare to regulations?

### SOURCES



Where do the VOCs come from?

### VARIABILITY



How do sources change over time?

# Exposure



Which VOCs  
are high?



How do VOC levels  
compare to  
regulations?

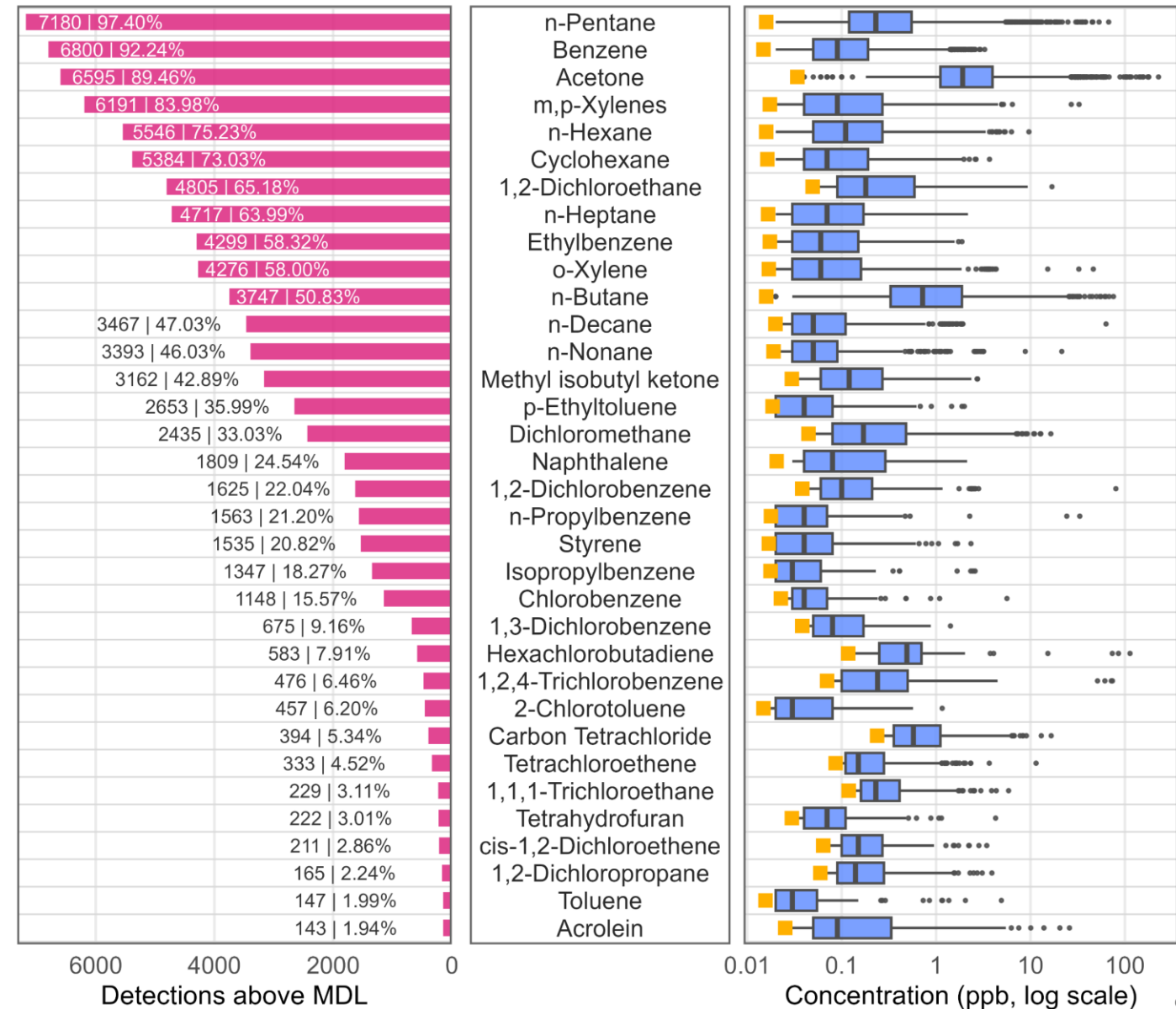
# Measurements

- 5 most frequently detected:
  - *n*-pentane (97.40%)
  - Benzene (92.24%)
  - Acetone (89.64%)
  - *m*-xylene & *p*-xylene (83.98%)
  - *n*-hexane (75.23%)
- Highest max measurements:
  - acetone (227 ppb)
  - hexachlorobutadiene (113 ppb)
- Highest median:
  - acetone (1.91 ppb)
  - *n*-butane (0.72 ppb)
  - carbon tetrachloride (0.575 ppb)
  - Hexachlorobutadiene (0.49 ppb)

## VOC Concentration Count and Distribution

n = 7,372 total measurements

■ Detections above MDL    
 ■ Method Detection Limit (MDL)    
 ■ Concentration distribution

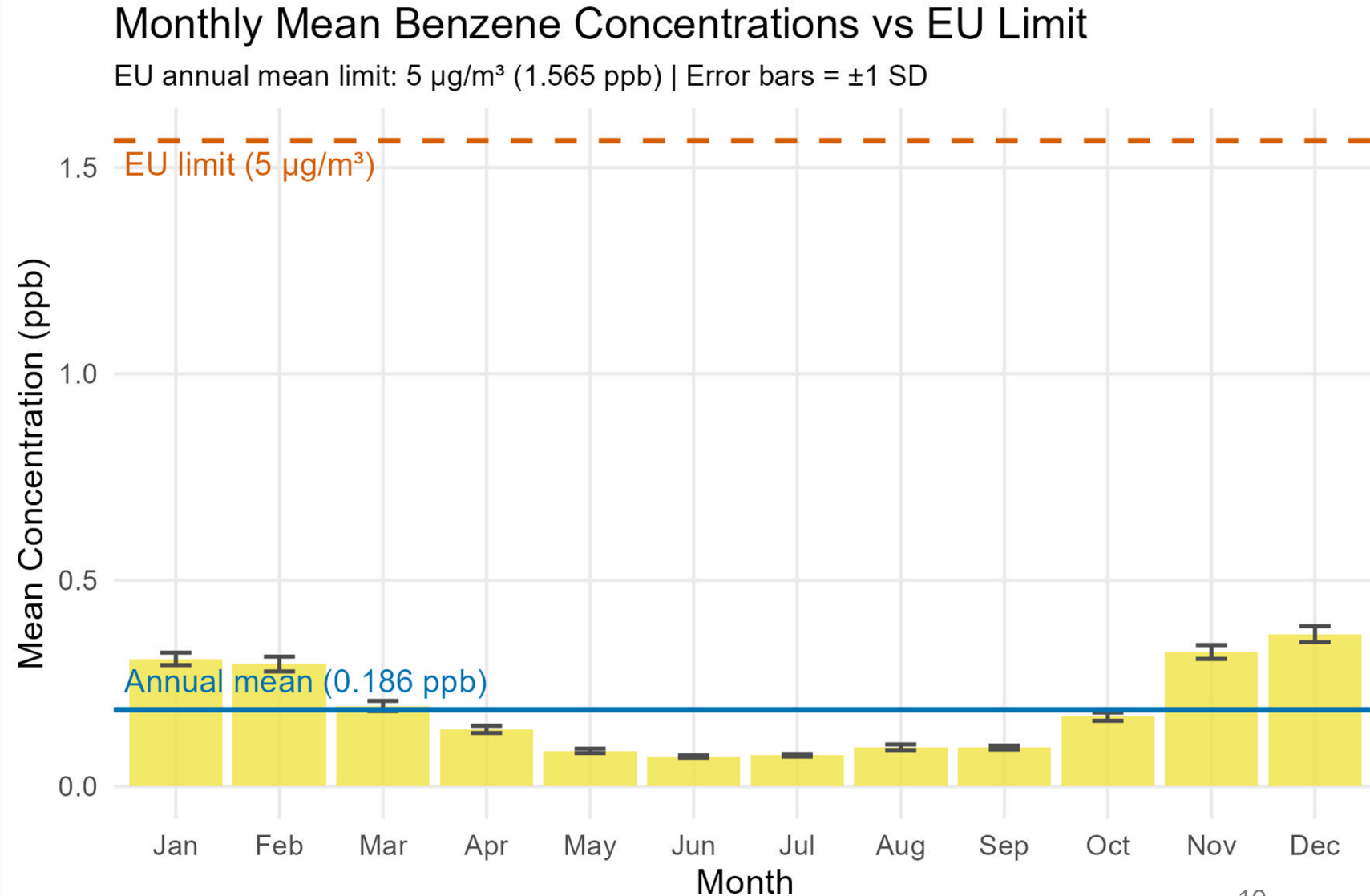


# Outdoor Regulations

- No compounds regulated outdoors in the US
- One compound is regulated in outdoor air in the European Union (EU)
  - Benzene

## Key Takeaway:

Benzene is 8.5x below the EU outdoor ambient regulation

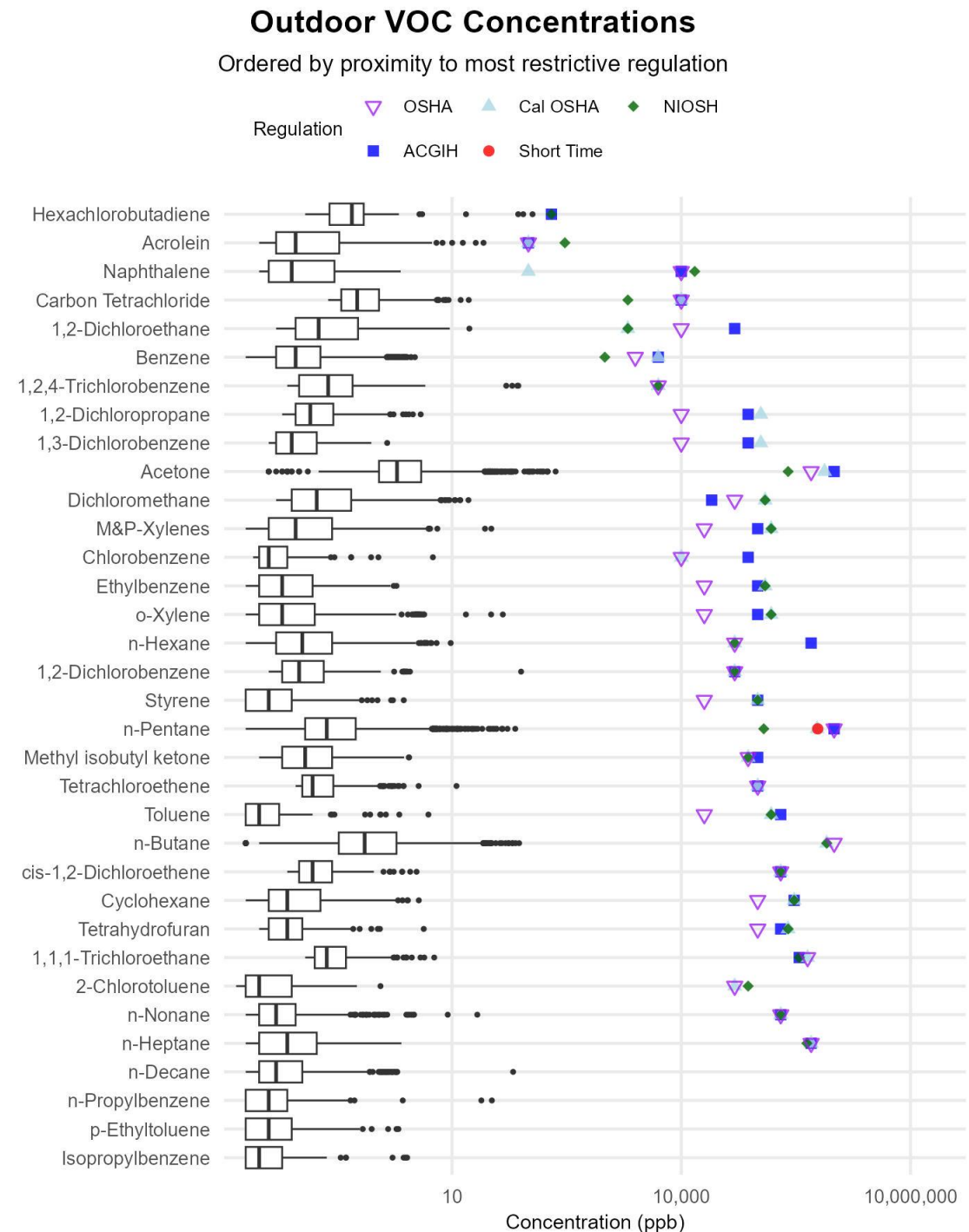


# Indoor Regulations

- Indoor air regulations are shown as points
- Outdoor air concentrations are boxplots
  - 0s replaced with  $\frac{1}{2}$  MDL
  - Log scale
  - All data in ppb(v)
- Ordered by closeness of median to regulation

## Key Takeaway:

Almost all compounds are <0.1% of the indoor air regulations



# Source Characterization



Which sources are prevalent?

## **Tool:**

### Positive Matrix Factorization

- Developed by EPA
- Identifies sources based on correlations of compounds

# What is Positive Matrix Factorization (PMF)?

Given: Amount of Sugar, Caramel Color, Citric Acid, Cola Flavoring, Caffeine



PMF Factors are Soda Flavors

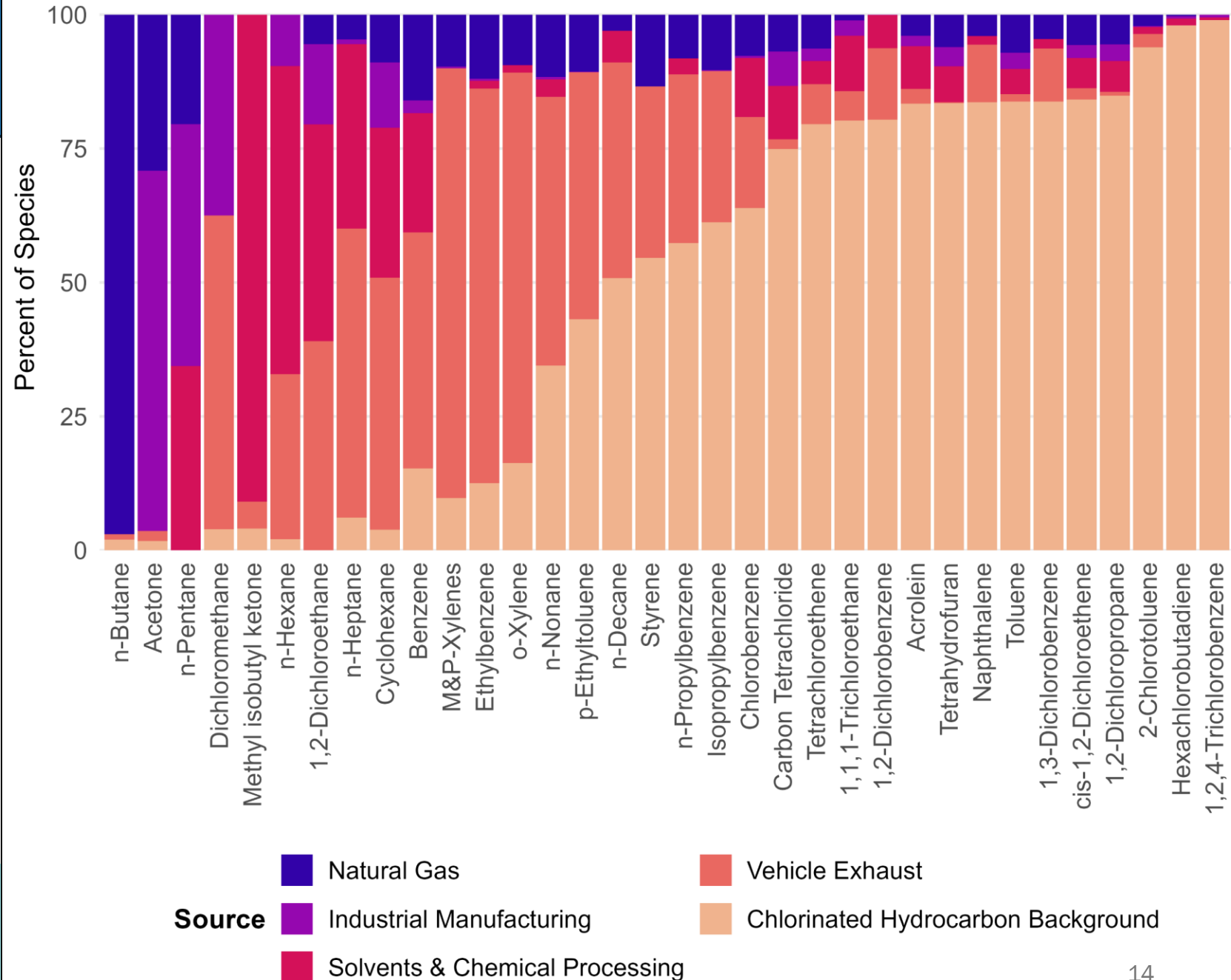
	Cherry Coke	Coke	Sprite	Diet Coke	Mt Dew
Anna	16%	20%	13%	19%	32%
Bruce	20%	30%	9%	28%	13%
Carlos	25%	2%	26%	29%	19%
Donna	10%	30%	29%	12%	19%
Emily	34%	9%	35%	12%	10%
Francis	24%	21%	16%	21%	18%
George	3%	11%	30%	17%	38%
Harriet	42%	23%	1%	11%	23%
Inga	19%	27%	8%	37%	9%
John	10%	31%	25%	6%	28%
Karl	29%	15%	25%	25%	5%
Lisa	8%	22%	17%	34%	19%
Michael	0%	37%	38%	7%	18%
Nick	22%	21%	11%	1%	44%
Olga	12%	16%	19%	21%	32%

Rows sum to 100% →

# Sources

- Source labels were determined based on compound literature
- Each compound is listed below the bars
- The percentage of a compound that can be attributed to a source is shown by the bars
- Compounds are ordered by sources

## PMF Source Profiles



## Key Takeaway:

There are 5 sources

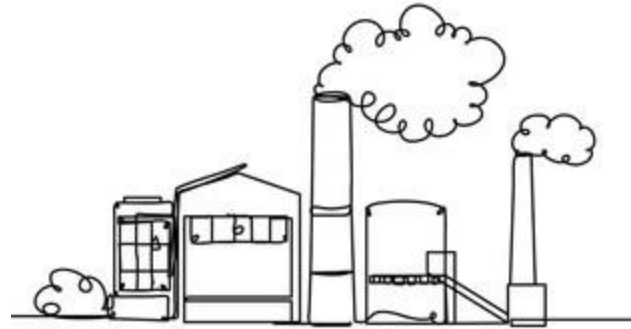
# Source Influences

## Natural Gas

NATURAL GAS  
FURNACES



## Industrial Manufacturing



## Solvents & Chemical Processing



## Chlorinated Background

## Vehicle Exhaust



# Source Behavior



## **Temporal:**

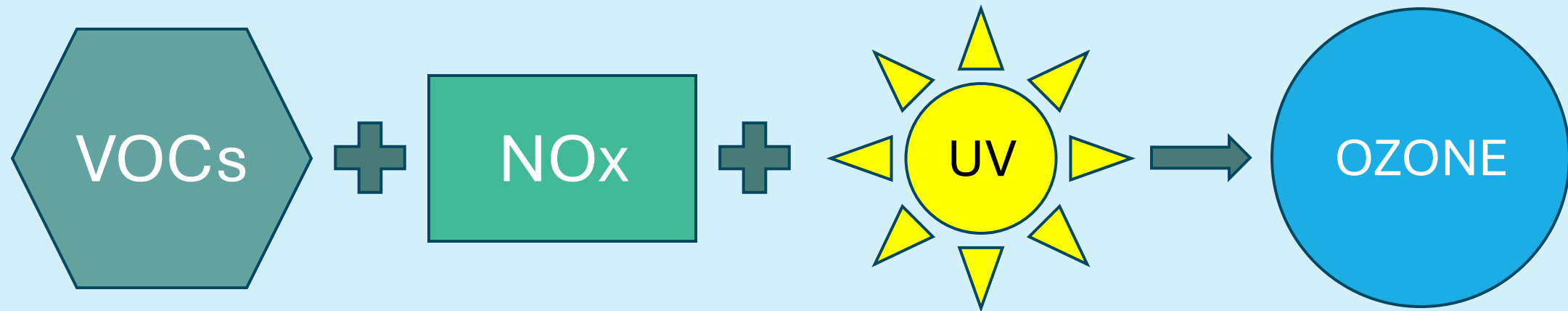
At what time of day do sources peak?



## **Wind:**

Which direction dominates?

# Ozone Formation

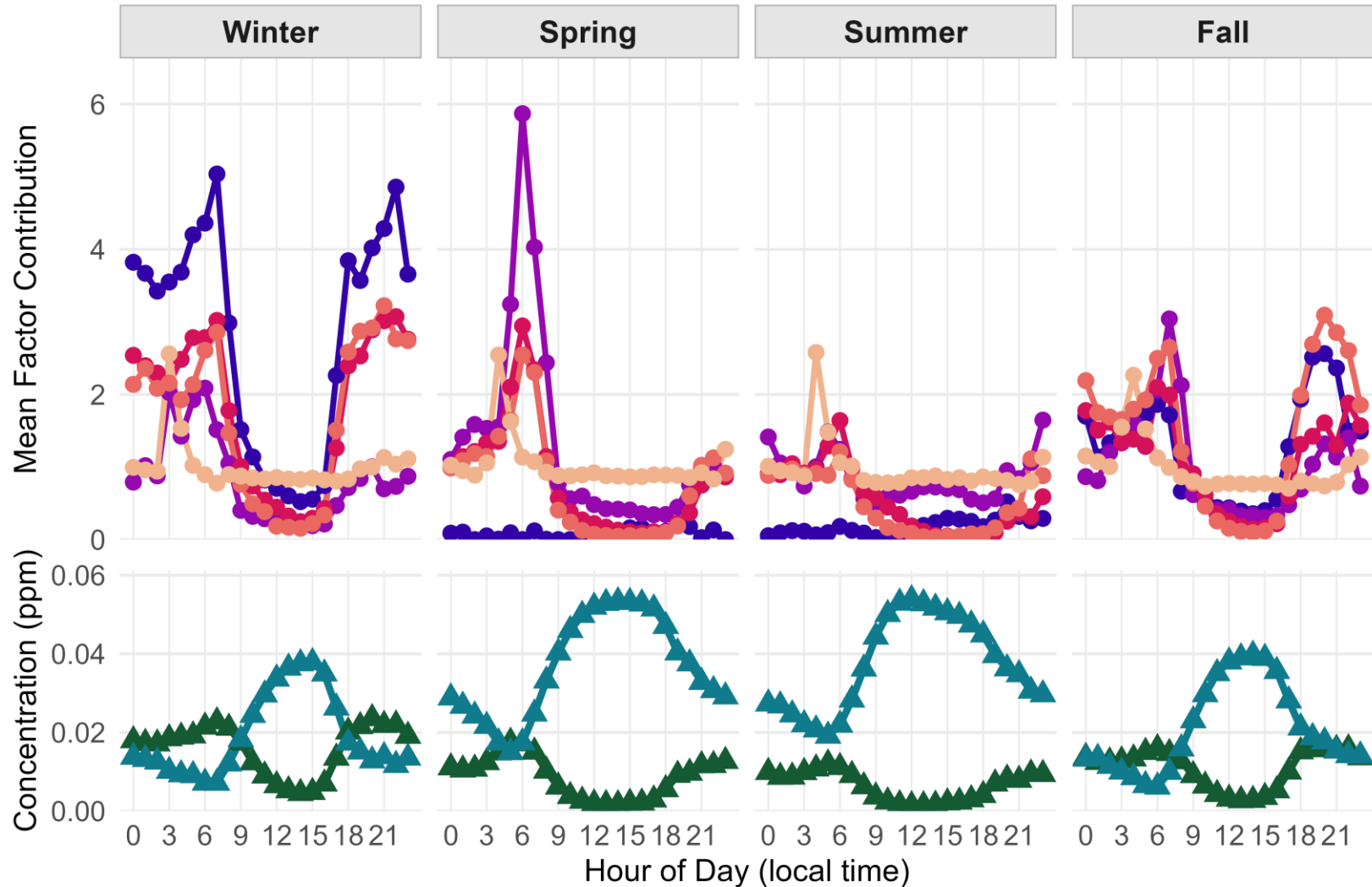


# Temporal

- Diurnal variability by meteorological season
  - i.e., Spring is March-June
- Lower in the Summer
  - Natural Gas especially
- Lower at midday
- Background constant
- Sources behavior
  - Aligns with nitrogen dioxide levels
  - Inverse to ozone levels

## Seasonal Diurnal Patterns

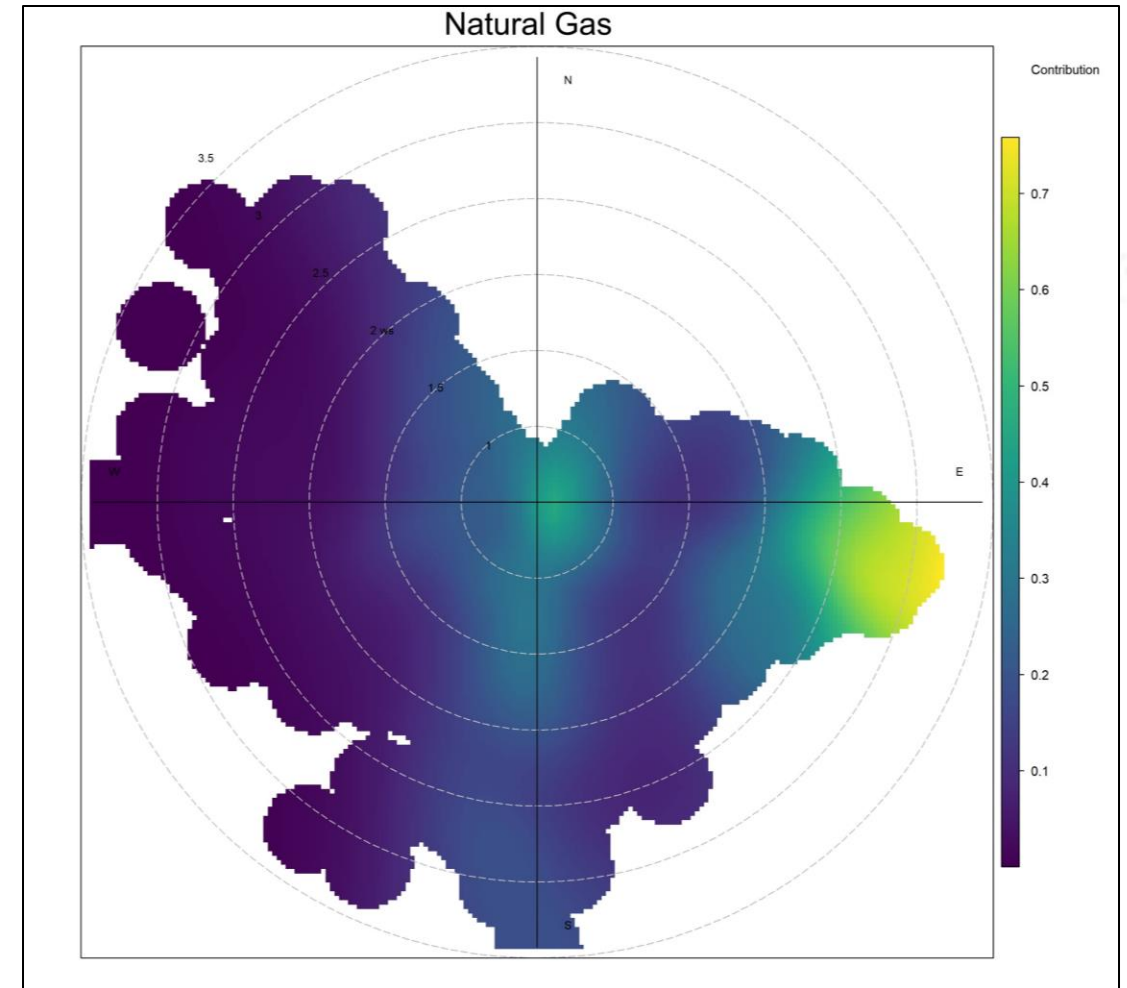
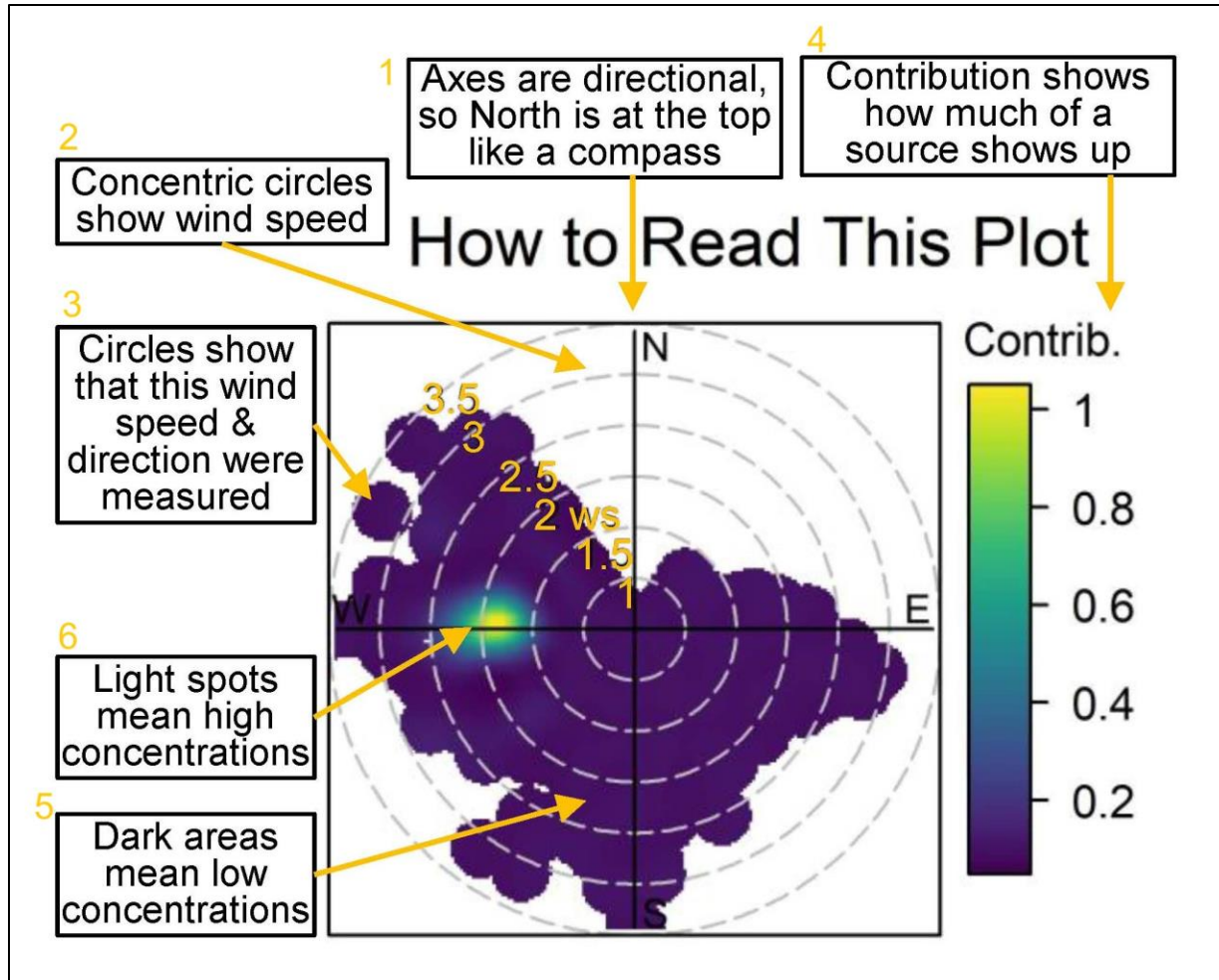
Mean Hourly Values



## Key Takeaway:

Source behavior varies by time of day and by season

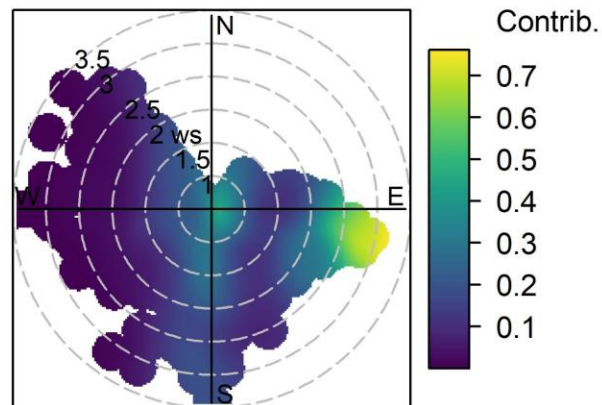
# Polar Wind Plot Interpretation



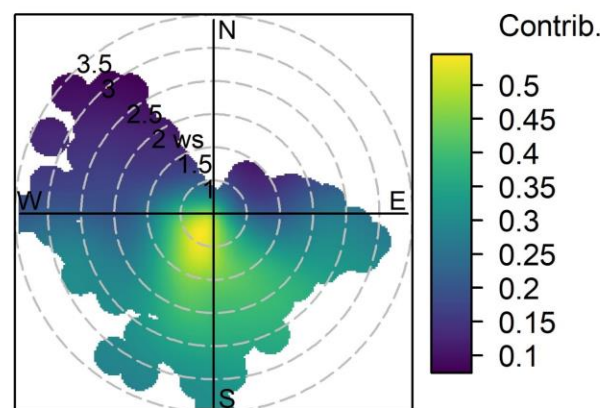
# Dominant Wind Direction of Sources

- Natural Gas
  - east
- Industry
  - South
- Solvents
  - East
- Vehicles
  - Low wind
- Background
  - North

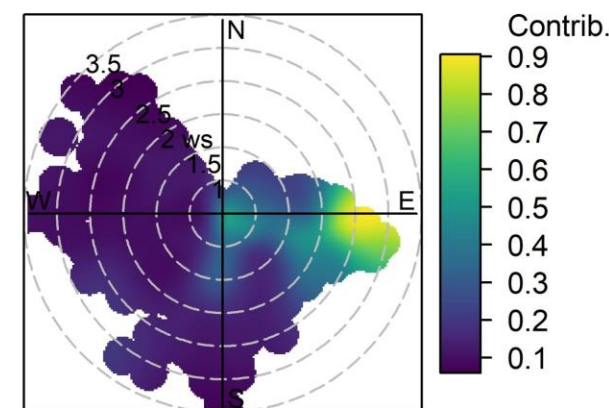
Natural Gas



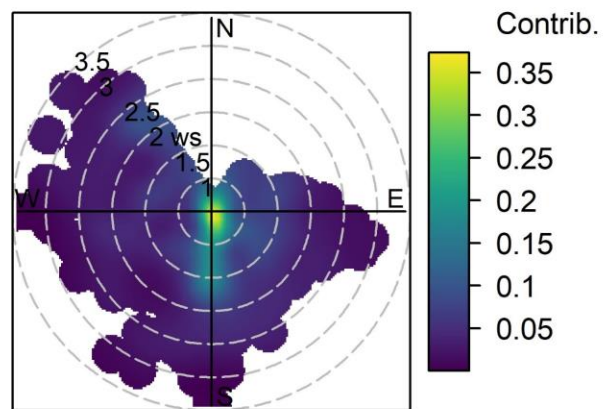
Industrial Manufacturing



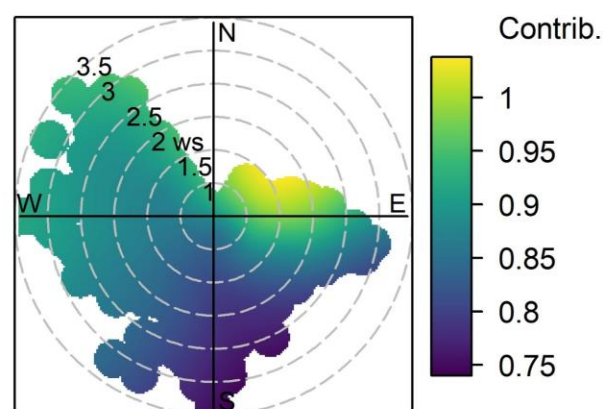
Solvents & Chemical Processing



Vehicle Exhaust



Chlorinated Hydrocarbon Background



**How to Read This Plot**

- Axes are directional, so North is at the top like a compass
- Concentric circles show wind speed
- Circles show that this wind speed & direction were measured
- Light spots mean high concentrations
- Dark areas mean low concentrations
- Contribution shows how much of a source shows up

The plot shows wind speed in 'ws' (1, 1.5, 2, 2.5, 3, 3.5) and contribution from 0.2 to 1.0. The highest contribution is from the north (N).

## Key Takeaway:

Each source has different wind direction patterns

# How This Relates to the HEEI Rule

- Health, Environment, and Equity Impacts (HEEI) Rule
  - Established 2024, effective 2025
  - Intended to increase pollution controls in disadvantaged areas
- Applies to 15 VOCs; 8 of those are in the 34 detected
  - Acrolein
  - Benzene
  - Carbon tetrachloride
  - Ethyl benzene
  - Methylene chloride
  - Naphthalene
  - Toluene
  - Xylenes (as o-xylene, and m & p-xylenes)

# Recommendations

- Work with a VOC specialist to manage the data collected by the Special Purpose Monitoring Site
- Review data beyond 2025 to understand levels, trends, and changes
- Move the Site to another measurement location for a number of years

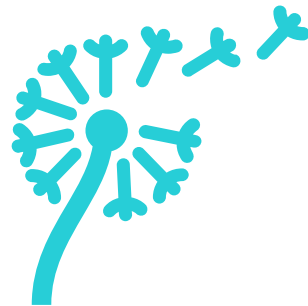
# Objectives Answered

## EXPOSURE



All VOCs are well below the regulations

## SOURCES



VOCs come from 5 sources

## VARIABILITY



Sources show daily and seasonal variability

# Final Thoughts

- 34 VOCs in 2025 were evaluated
  - Varying levels of detection and concentrations
  - All were well below regulations
- The VOCs in Albuquerque come from 5 sources:
  - Natural Gas
  - Industrial Manufacturing
  - Solvents & Chemical Processing
  - Vehicle Exhaust
  - Chlorinated Hydrocarbon Background
- Not all species listed in the HEEI rule were addressed
- Spatial analyses could be improved by moving the San Jose Special Purpose Monitoring Site

# What is the status of the San Jose Site?

Jaimie Ritchie  
April 30, 2025

Contact Jaimie:



## Thank You!

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