

Physico-chemical Characterization of Dust: A Comprehensive Study of Particulate Matter in the Environmental Justice Community of Eastern Coachella Valley

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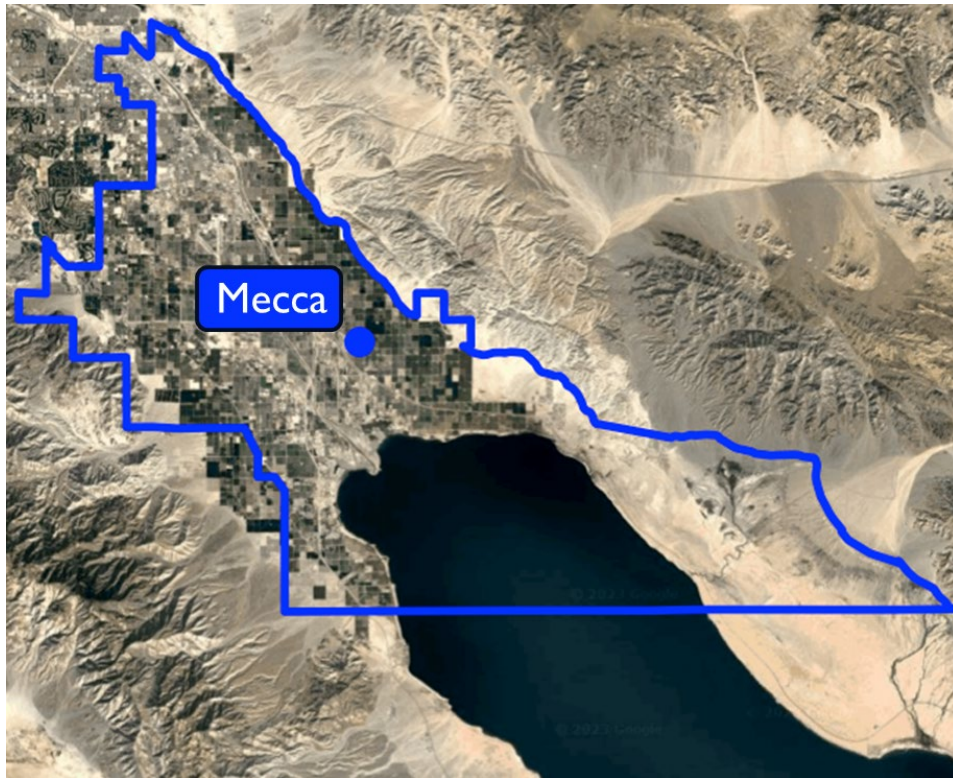
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STUDY OBJECTIVES AND PLAN



■ Main objectives:

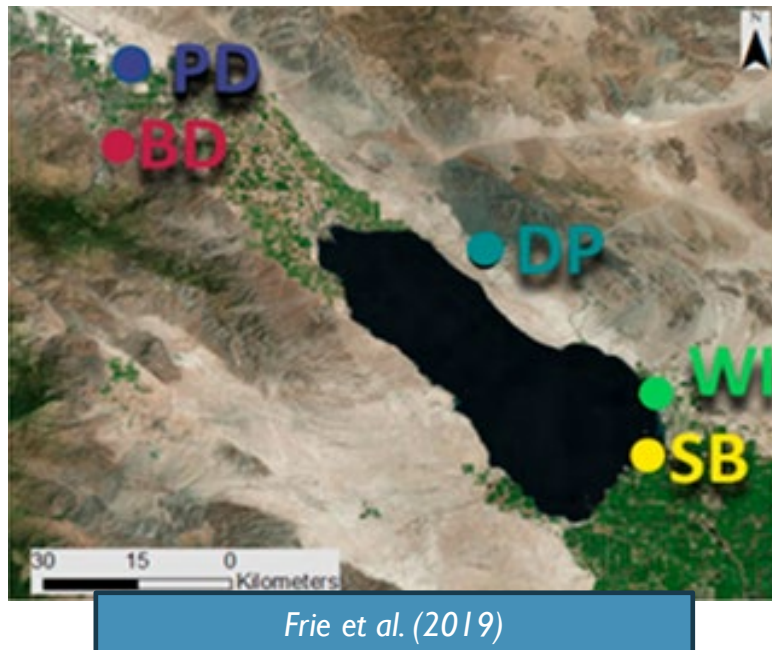
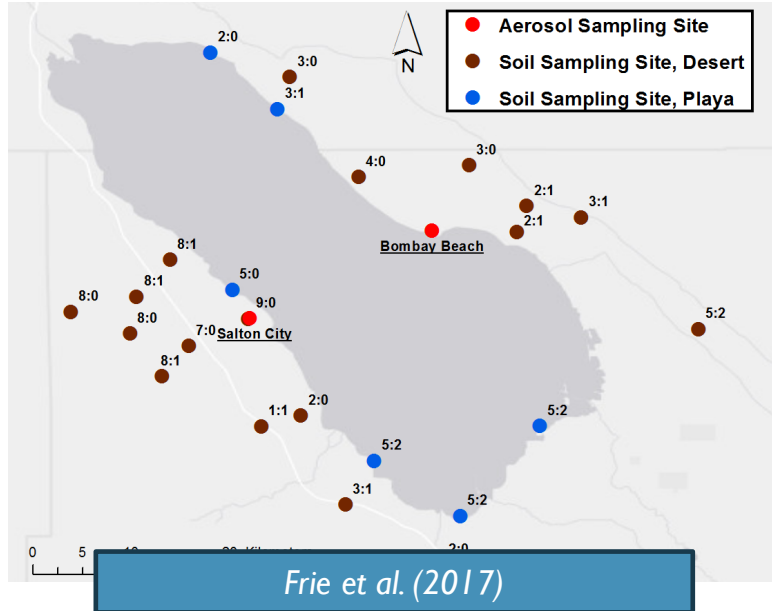
- Distinguish between PM/dust from different sources (e.g., Salton Sea playa, surrounding deserts, agricultural activities)
- Identify main sources and quantify their contributions to ambient PM levels

■ Site selection:

- Located in a residential neighborhood in Mecca to be representative of potential community exposure
- Potentially impacted by multiple air pollution sources: desert dust, playa emissions, sea spray, road dust, agricultural burning, local and Colorado Alluvium

PREVIOUS WORK

- Two previous source apportionment studies in the area focused on Salton Sea playa emissions (Frie et al., 2017 & 2019)
- Aerosol and dust samples were collected and analyzed in the lab (i.e., time-integrated sampling)
- Identified sources included: desert dust, playa emissions, road dust, agricultural burning, sea spray, local and Colorado Alluvium



OVERVIEW OF MEASUREMENTS



Sample Collection
+
Laboratory Analysis

6 Samplers



Continuous Measurements

8 Continuous Monitors

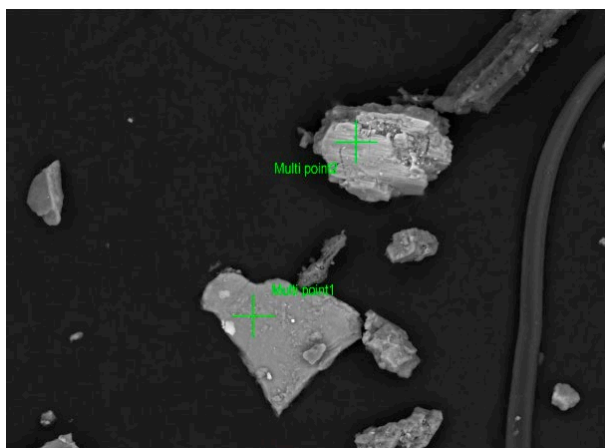
- **Study measurement period from Jan. 2022 – May 2023**
- **Continuous measurements are ongoing**

SAMPLE COLLECTION + LABORATORY ANALYSIS



Time-integrated filter samples

- High-volume and PQ100 samplers
- Samples collected 1-in-6 days, for 24 hr
- Samples analyzed for:
 - Elements and metals (ICP-MS)
 - Anions and cations (IC)
 - Elemental and organic carbon (thermal-optical carbon analyzer)
- Full speciation performed for both TSP and PM10 size fractions



Time-integrated glass substrates

- Samples collected passively ~1-in-24 days, for ~6-7 days
- Samples analyzed for morphology and composition (SEM-EDS and XRD)

POLLUTANTS MEASURED CONTINUOUSLY



Xact 625i
(Metal
Monitor)



TCA
(Total
Carbon)



AE 33
(Black
Carbon)



T-640 (PM_{2.5},
PM₁₀
Monitor)



T200
(NO_x
Monitor)



Picarro
(Ammonia
Monitor)



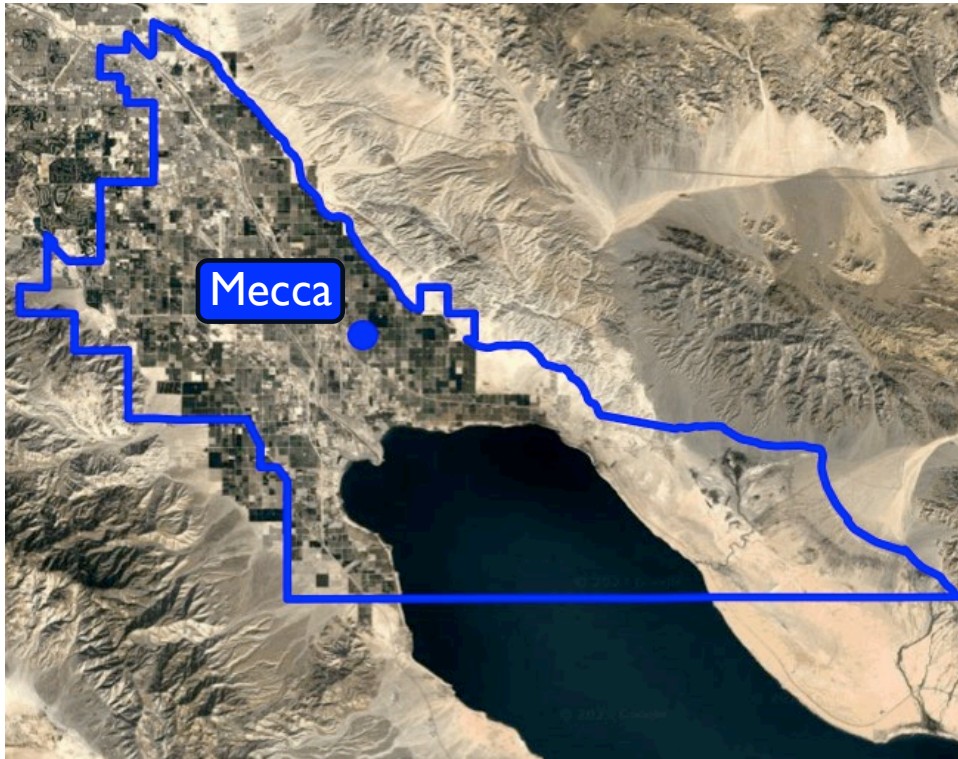
T-101
(H₂S
Monitor)



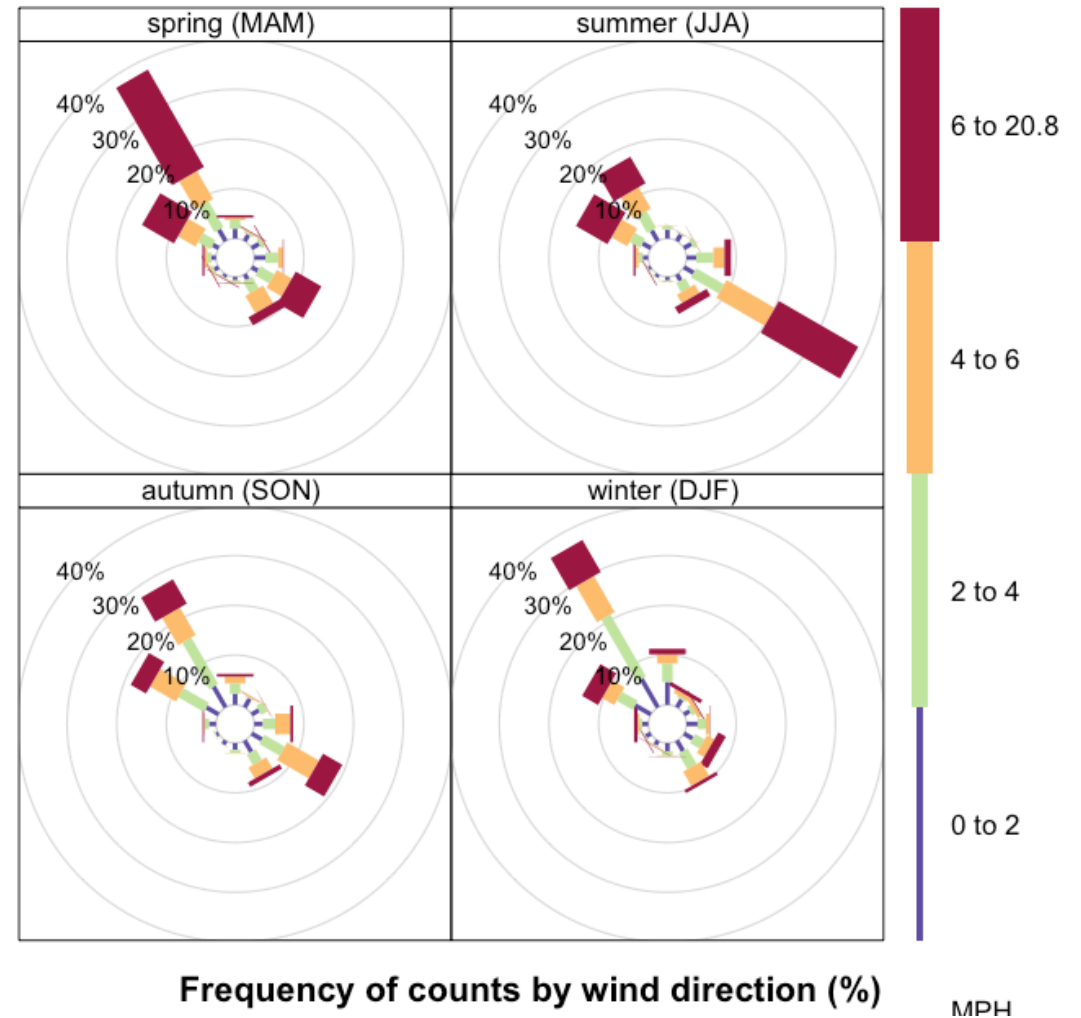
T-400
(O₃
Monitor)



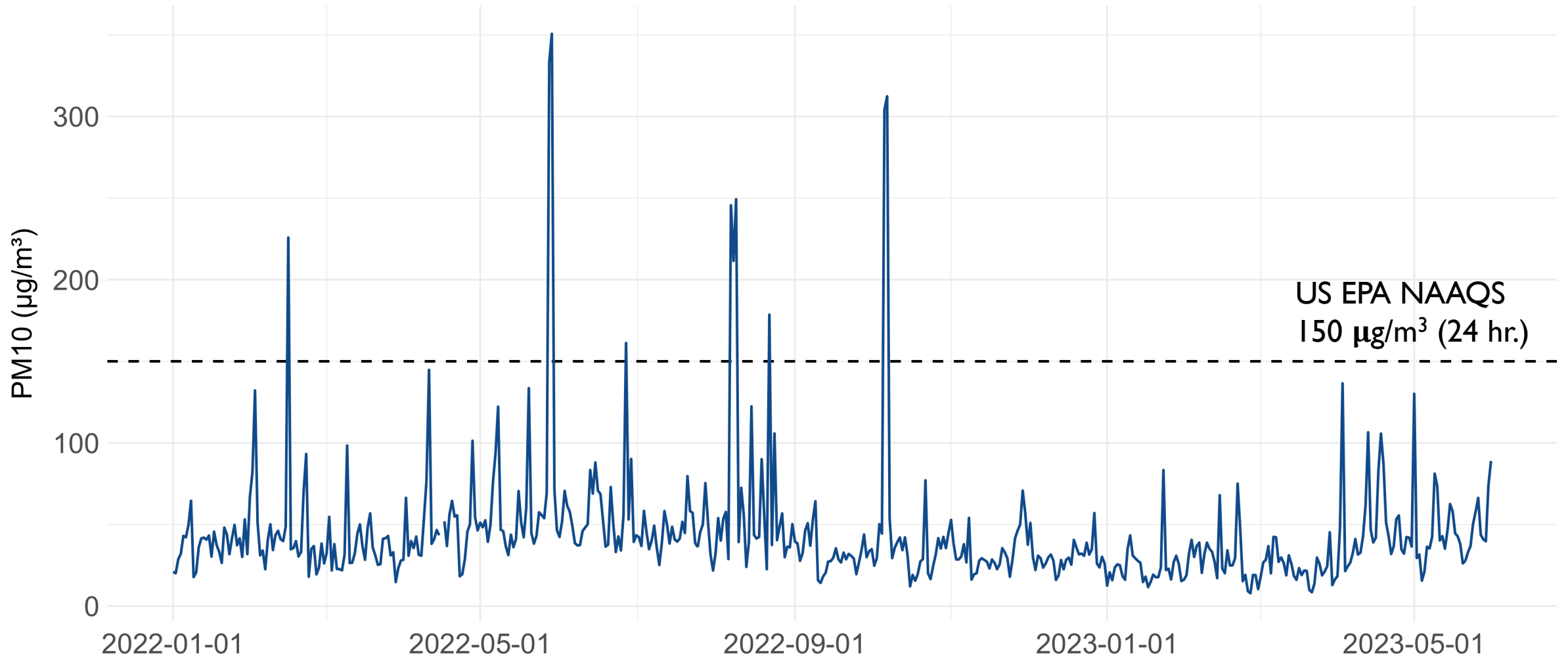
WIND PATTERNS



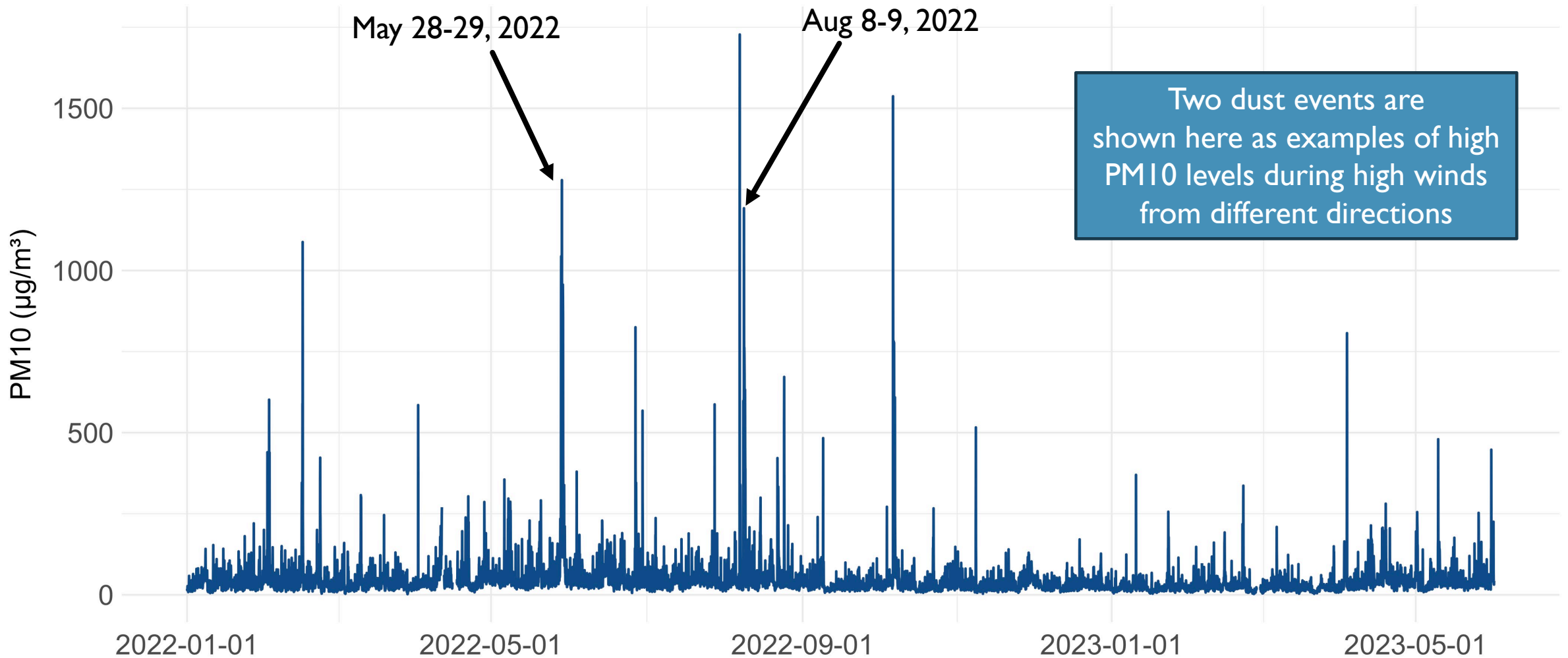
- Wind direction shows seasonal dependence with high winds mostly coming from NW in spring and SE in summer



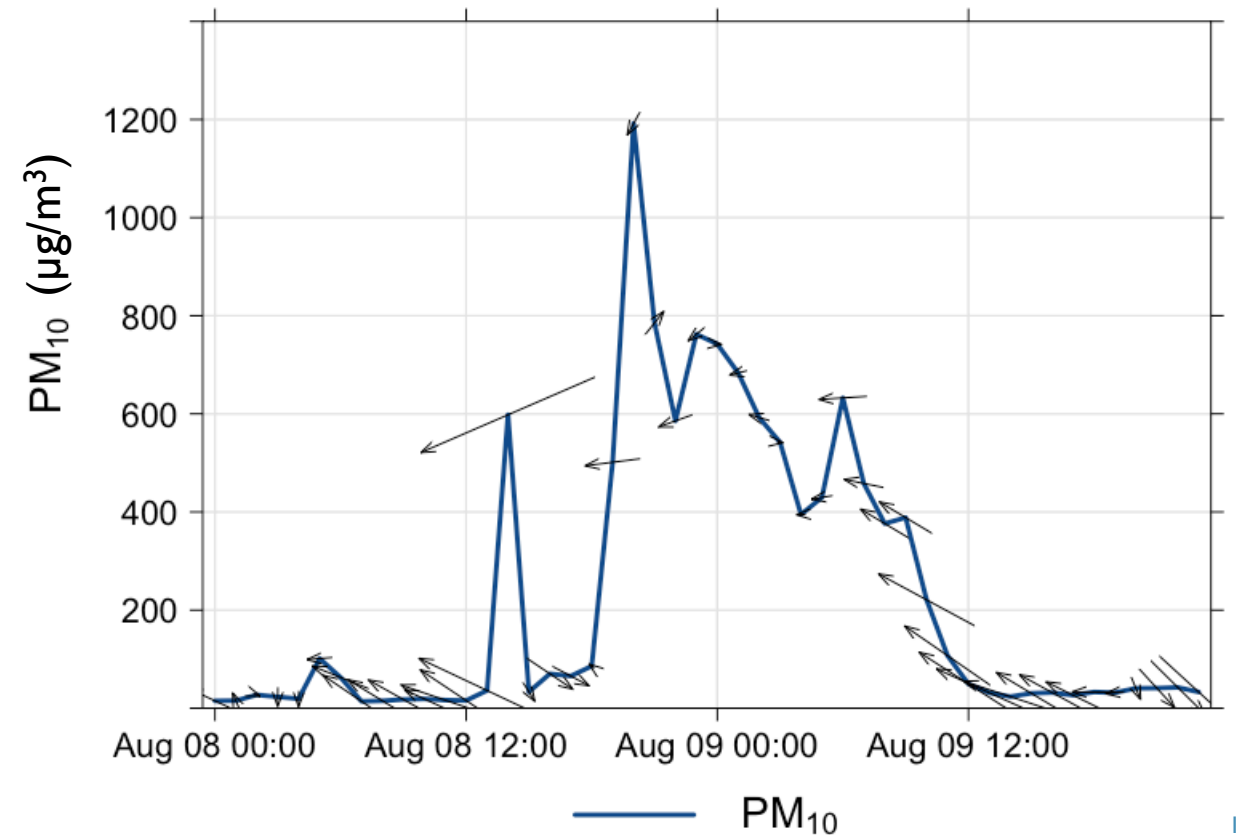
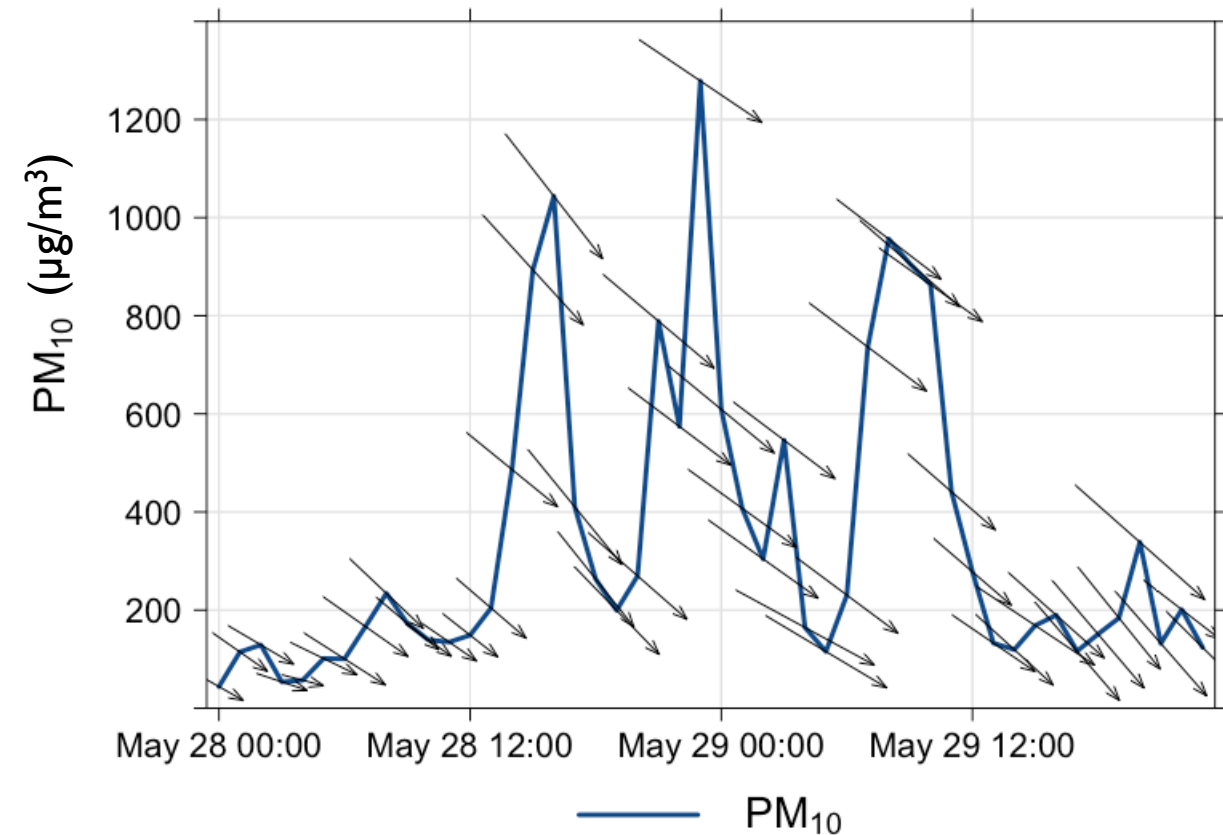
DAILY PM10 CONCENTRATIONS



HOURLY PM10 CONCENTRATIONS

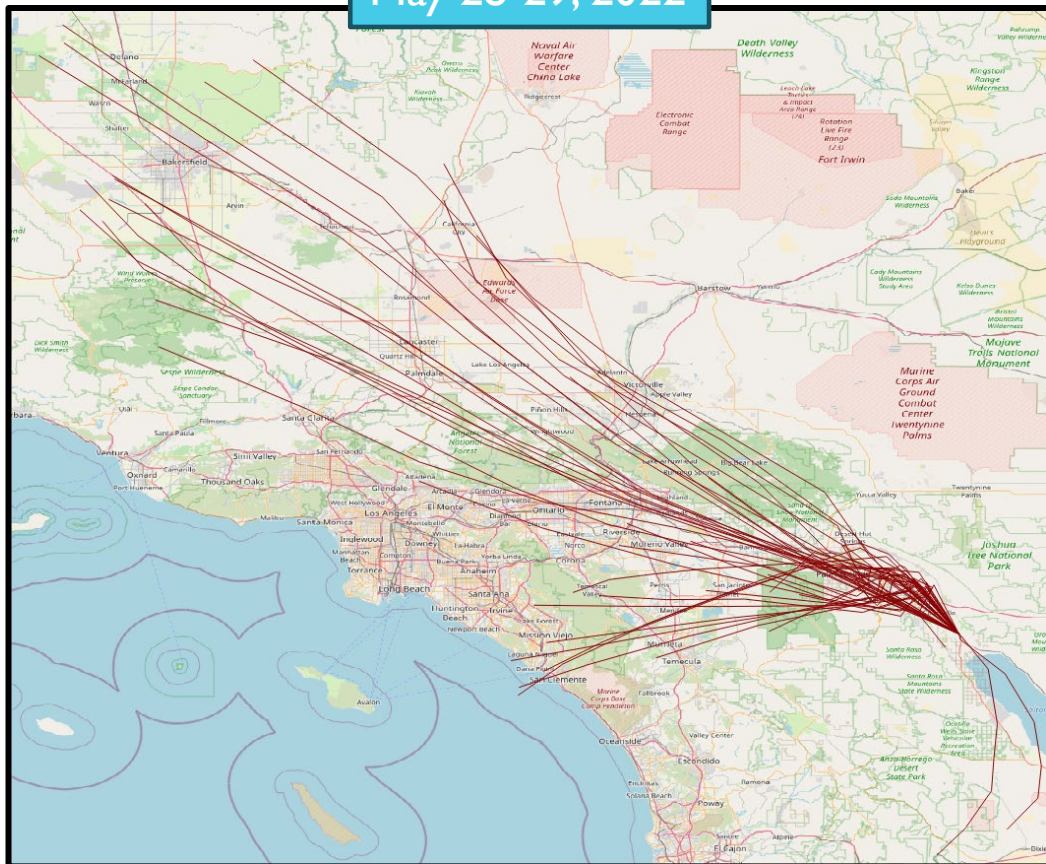


WIND PATTERNS DURING HIGH PM10 EVENTS

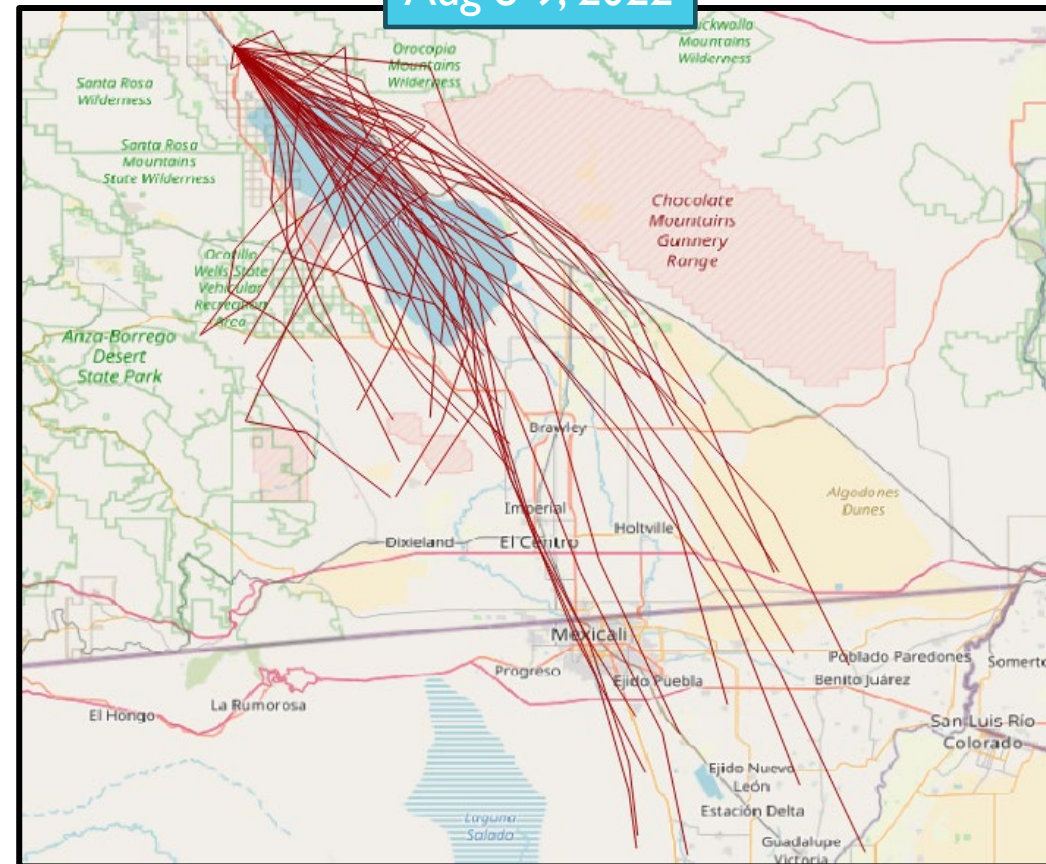


BACK TRAJECTORY ANALYSIS

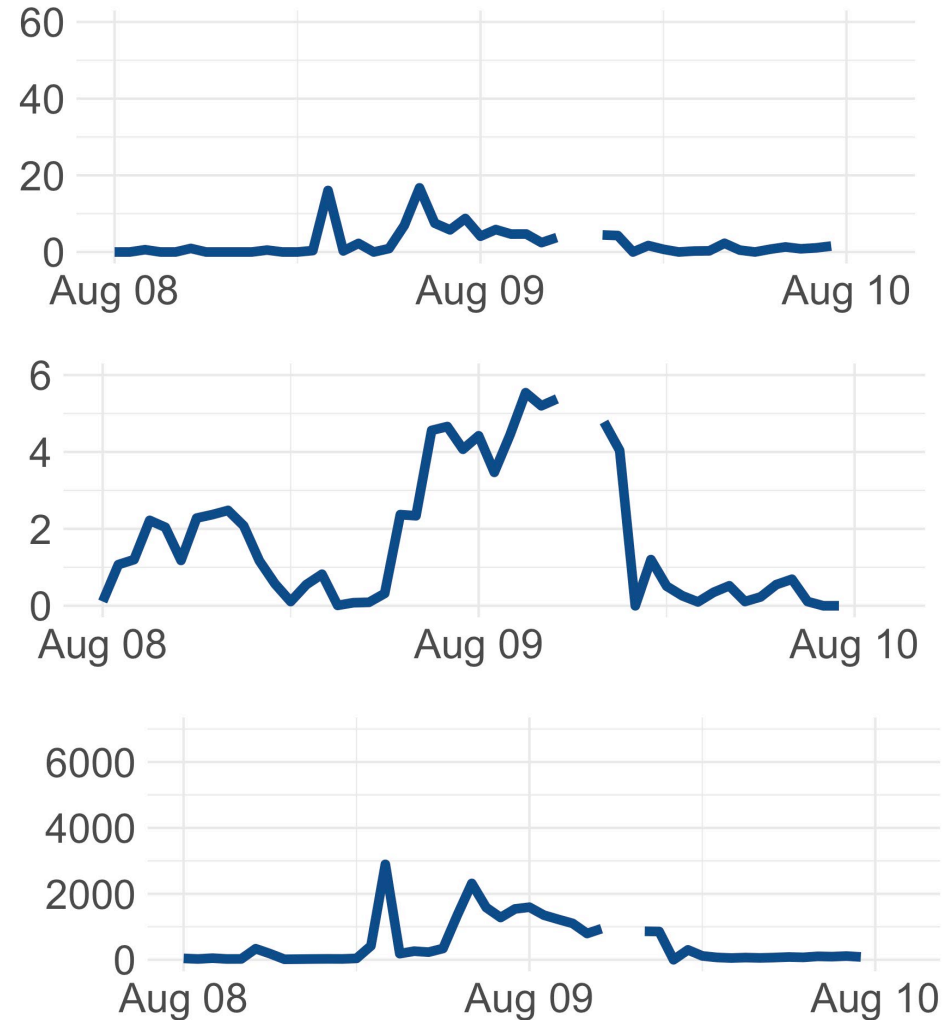
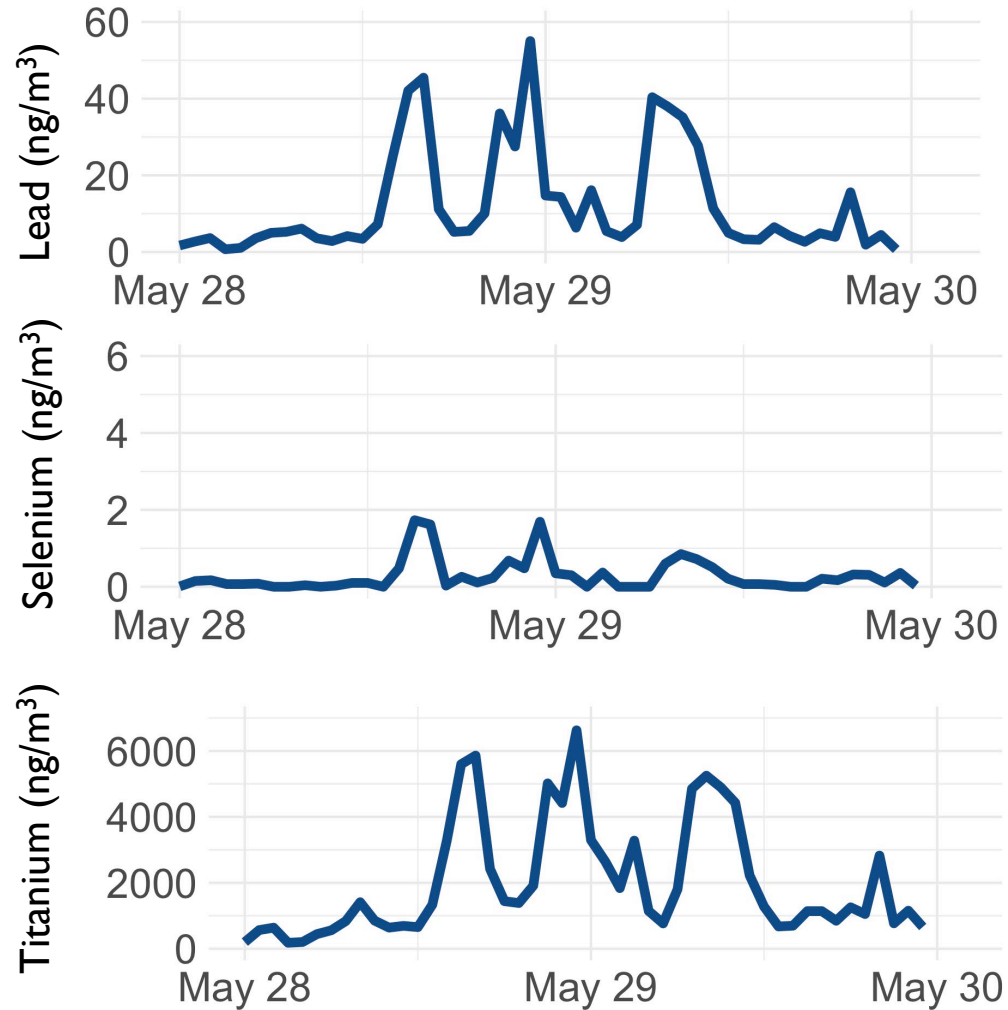
May 28-29, 2022



Aug 8-9, 2022

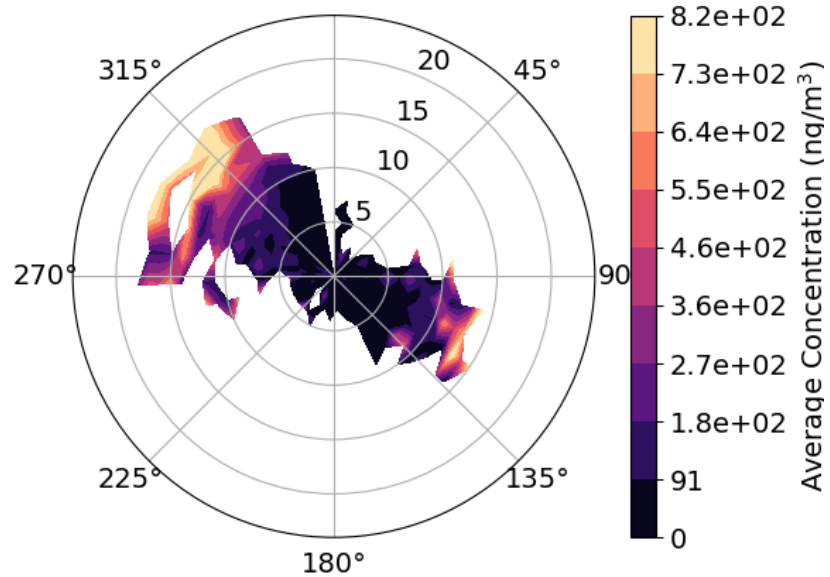


SELECTED METAL CONCENTRATIONS DURING HIGH PM EVENTS

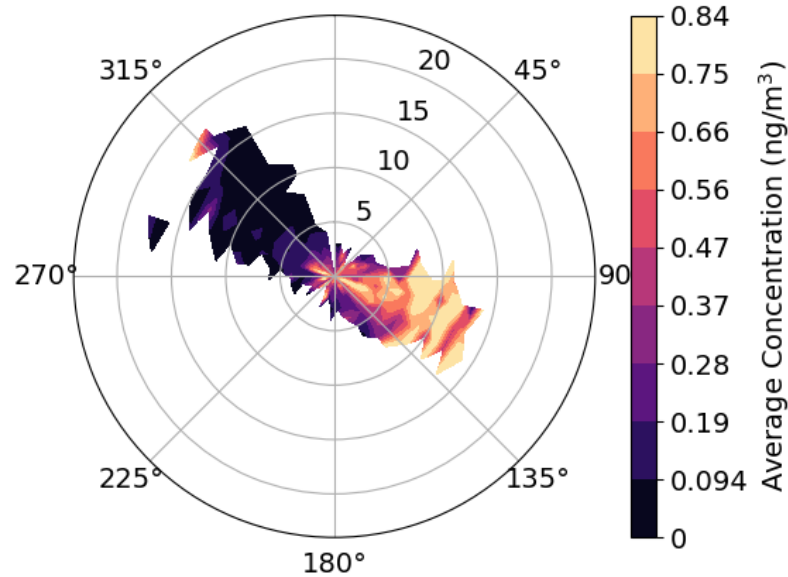


POLLUTION POLAR PLOTS FOR THE ENTIRE STUDY PERIOD

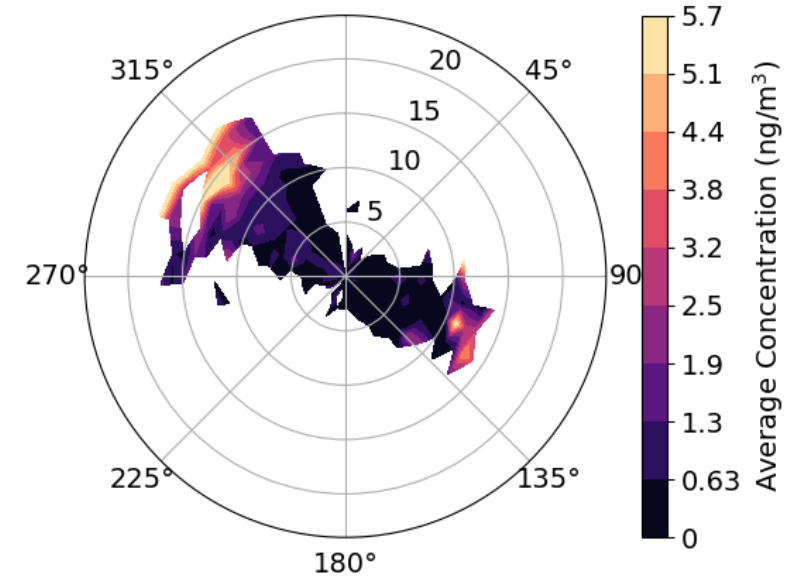
Titanium
0°



Selenium
0°



Lead
0°



SUMMARY & NEXT STEPS

- Continuous and time-integrated data for dust characterization have been collected from January 2022 through May 2023
- High levels of PM10 associated with high wind events are common in ECV
- Full chemical speciation on the collected time-integrated samples allows for a mass balance analysis of the resulting data
- High time resolution data allows to study short-lived dust episodes and to evaluate which source(s) may contribute to the elevated PM/dust levels observed during these events
- Future source apportionment analysis will shed more light on the relative contribution of various sources to ambient PM10 levels

QUESTIONS & COMMENTS ?

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<http://www.aqmd.gov/nav/about/initiatives/environmental-justice/ab617-134/ab-617-community-air-monitoring>