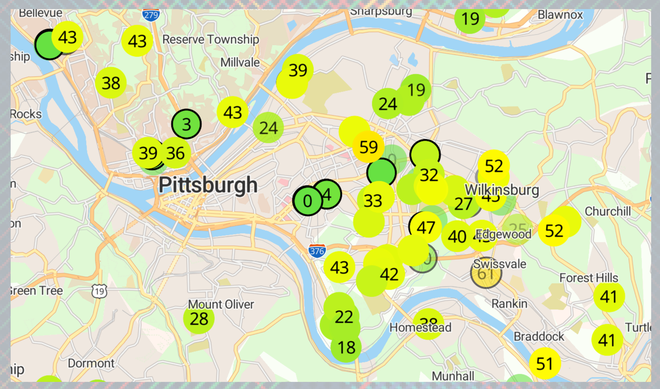
# Mapping Particulate Pollution in Allegheny County

## SITUATION + TASK

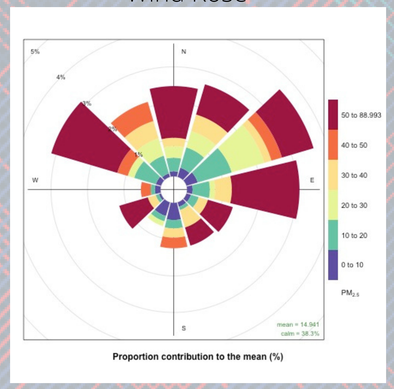
- Air quality can vary greatly in Allegheny County due to its topography. The Allegheny County Health Department (ACHD) measures air quality at only ten sites, so localized variations can be easily missed.
- Incorporating air quality information from non-ACHD sensors can lead to a more nuanced and detailed view of air quality throughout the county.
- Each sensor records PM2.5 concentrations in one-hour increments.
- PM2.5 is a fine particulate matter that can travel into the respiratory tract and cause respiratory symptoms such as coughing, sneezing, difficulty breathing.
- Sources of PM2.5 include vehicle exhaust and fires.
- The figure to the right shows PM2.5 concentrations from non-ACHD sensors in Allegheny County.



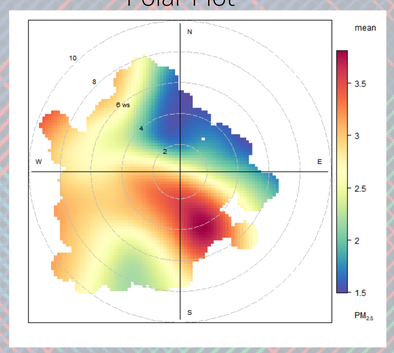

## ACTION

- We combine data from ACHD and non-ACHD (Purple Air) sensors, the latter being accessed through the AirSensor package in R.
- With these data, we generate rose plots and polar plots like the ones displayed here. These plots combine information about wind direction, wind speed, and particulate pollution, and allow the ACHD to identify possible pollution sources.
- To generate these plots, we used the OpenAir package in R. Wind data for these plots is from the nearest NOAA station to the sensor.

Wind Rose

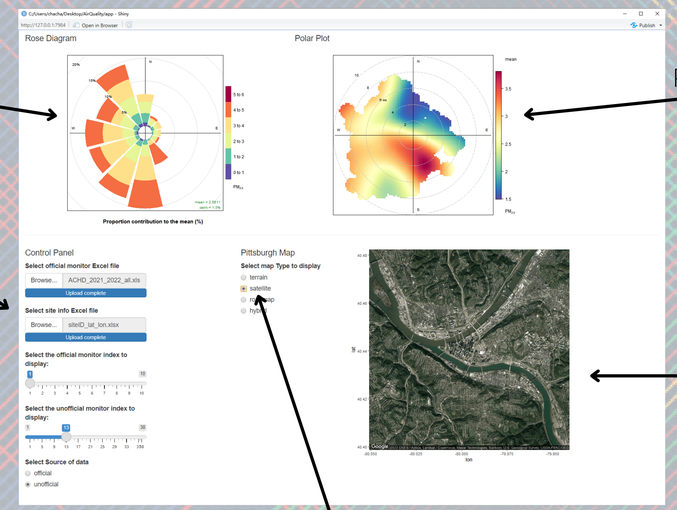



Polar Plot

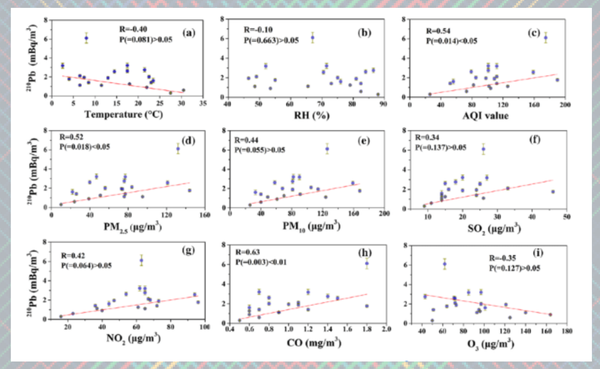



## RESULT

- We incorporate our rose plots into an R Shiny app that allows users to upload and visualize ACHD or PurpleAir sensor data.

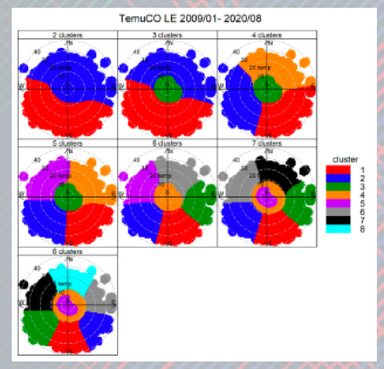



Regression Analysis




https://www.researchgate.net/publication/338784360_Temporal_variation_of_210Pb_concentration_in_the_urban_aerosols_of_Shanghai_China

Cluster Analysis




https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7697898/

- Tracking transient spikes in pollutants as well as recurring pollution within communities.
- Monitoring and analyzing pollutants in real time.
- Identifying local pollutant centers using cluster analysis similar to the right above.
- Analyzing relationships between pollutants and meteorological conditions to generate. plots such as the one to the left above.
- Analyzing pollutant concentrations over time (monthly, daily, night vs. day)

## FUTURE WORK

STEPHANIE ERICKSON, YIFAN WANG, YILIN WANG, HARINE CHOI, ADVISOR: PETER FREEMAN