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# Something in the Air:

## Wildfires and their impact on air quality

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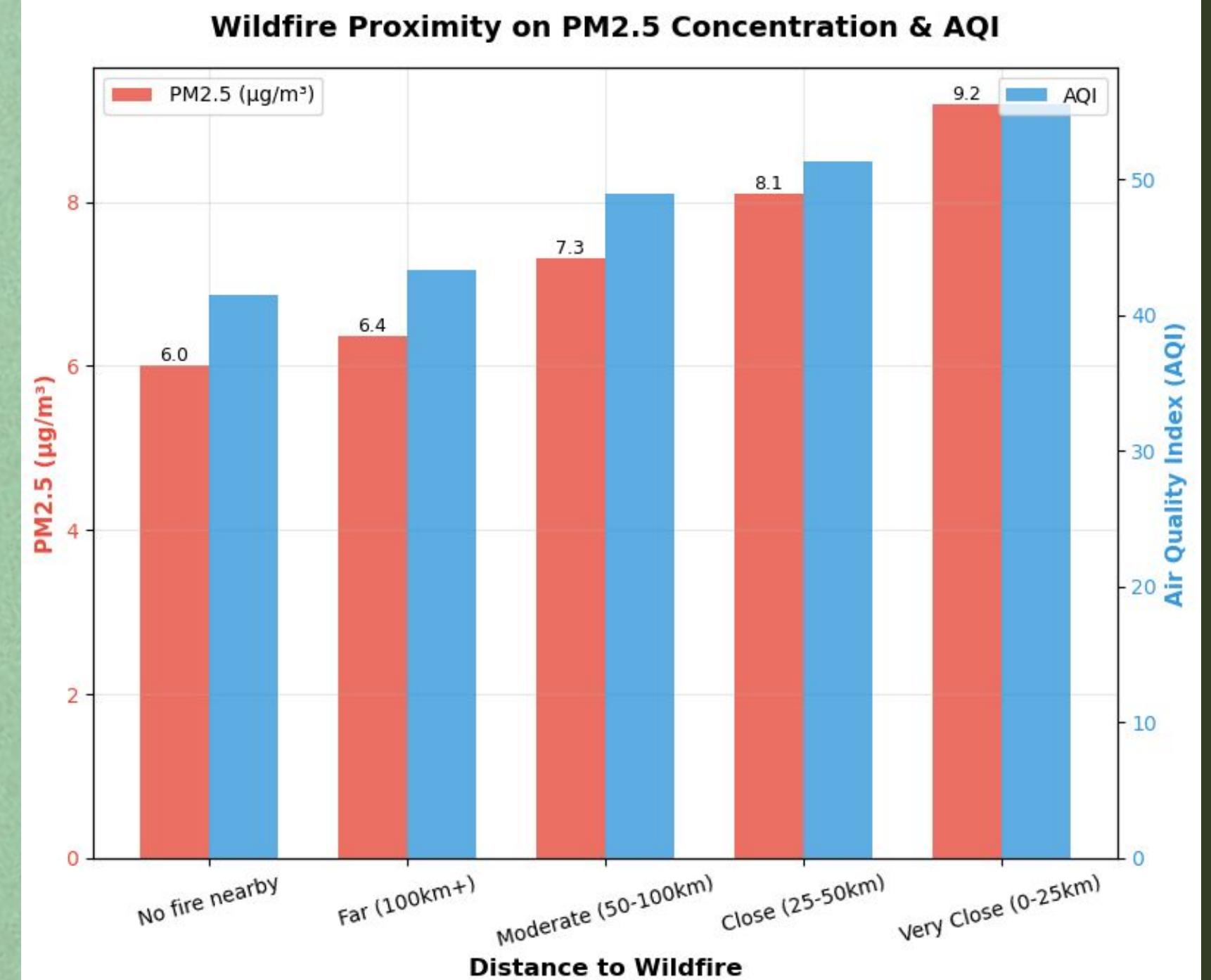
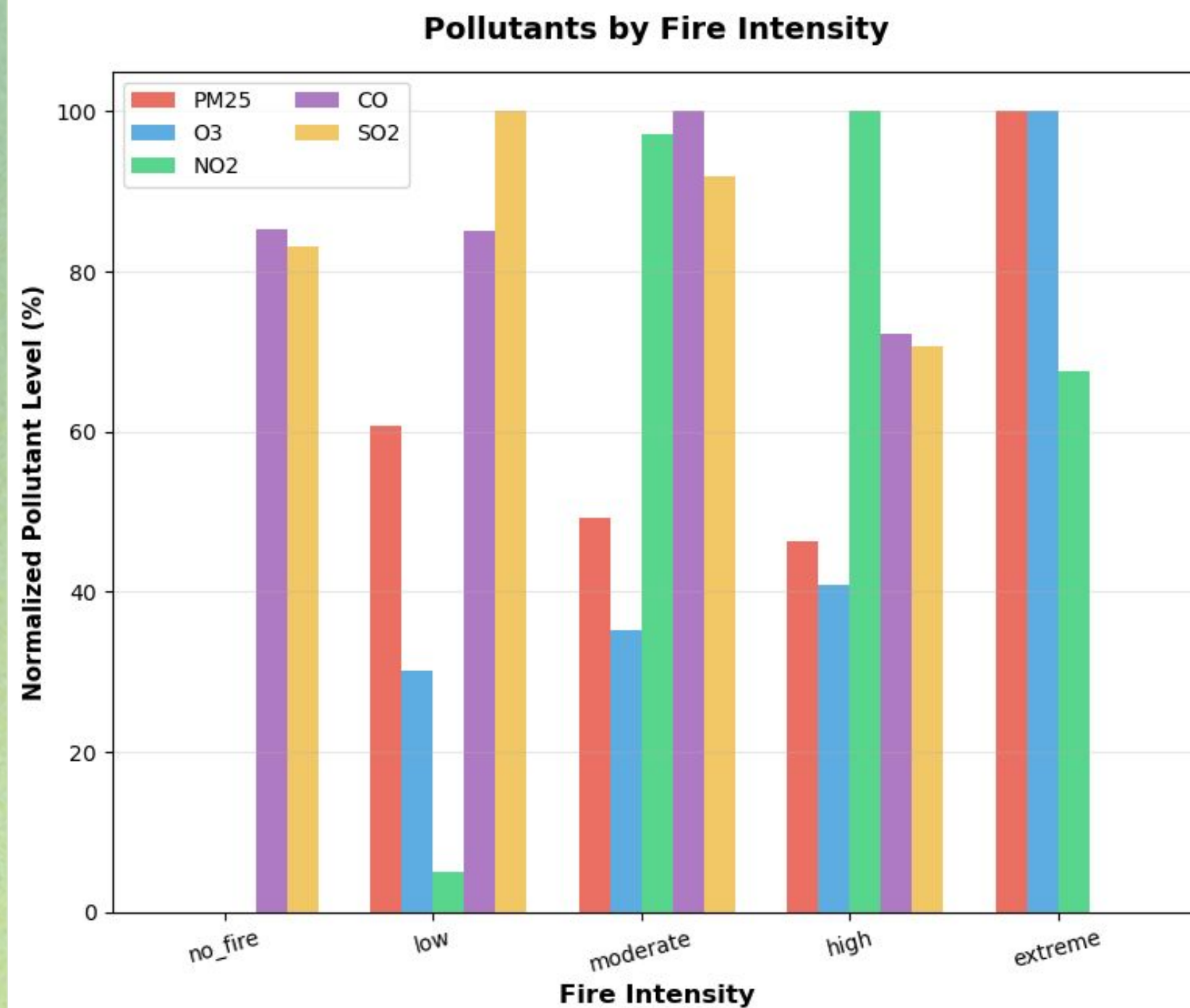
# Data & Variables

- **Sources:** NASA satellite fire detections, EPA air quality monitoring, and Open-Meteo API weather data
- **Dataset:** 20K observations from 75 monitoring sites across 40 states, each row corresponding to a daily observation
- ***Target variable:*** PM2.5 concentration ( $\mu\text{g}/\text{m}^3$ ), i.e., fine particulate matter
- ***Air quality measurements:*** CO, O3, NO2, SO2, AQI
- ***Fire features:*** dist to nearest fire, intensity, brightness, fire counts within 50-100 km radius
- ***Weather conditions:*** temperature, humidity, wind speed, precipitation, evapotranspiration, weather description
- ***Temporal factors:*** season, month, day of week, wildfire season





# Exploratory Data Visualizations





# Research Questions:

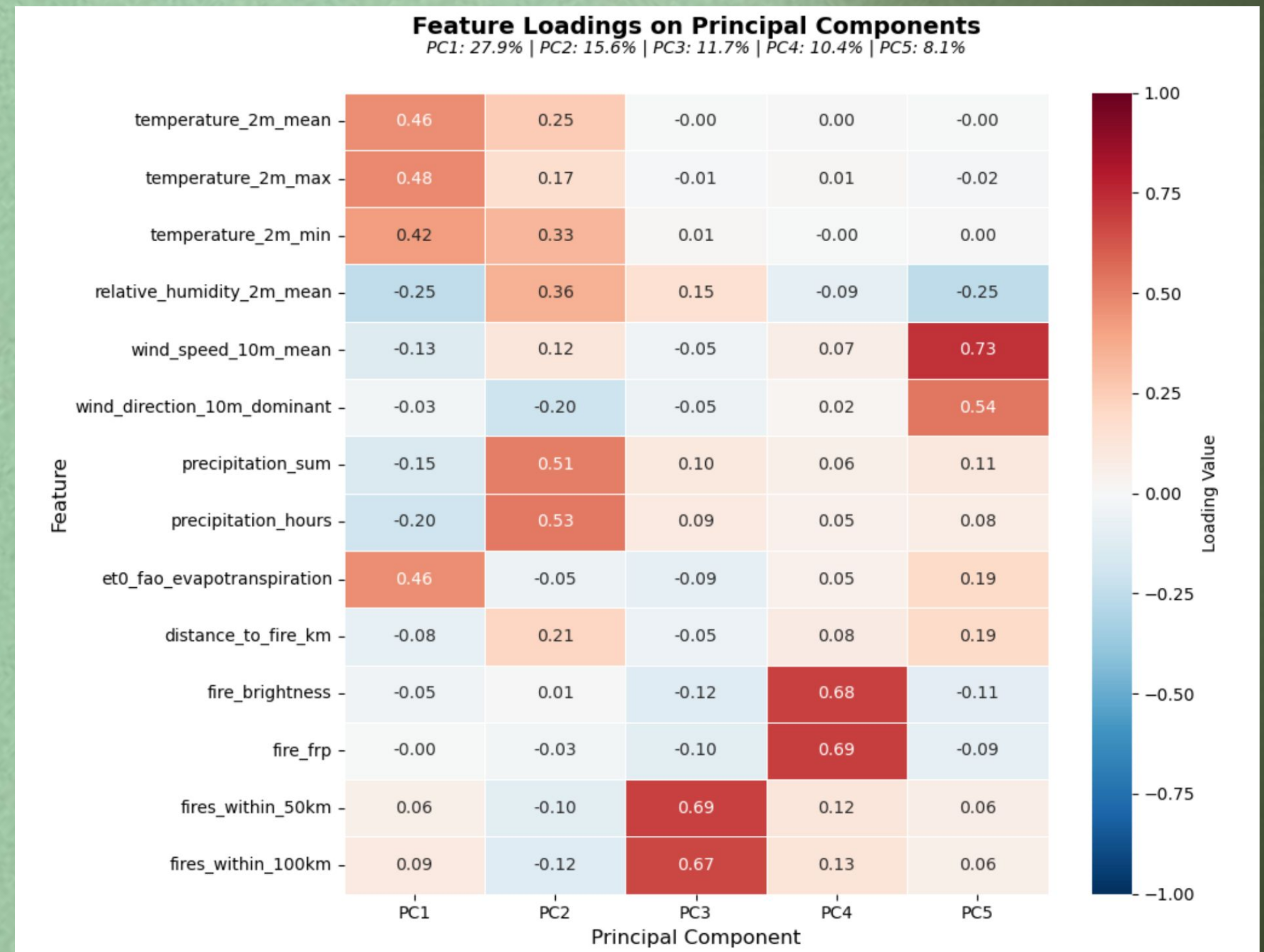
How does fire proximity affect PM<sub>2.5</sub>?

Do weather conditions moderate these fire impacts?



# Which predictors impact PM2.5 most?

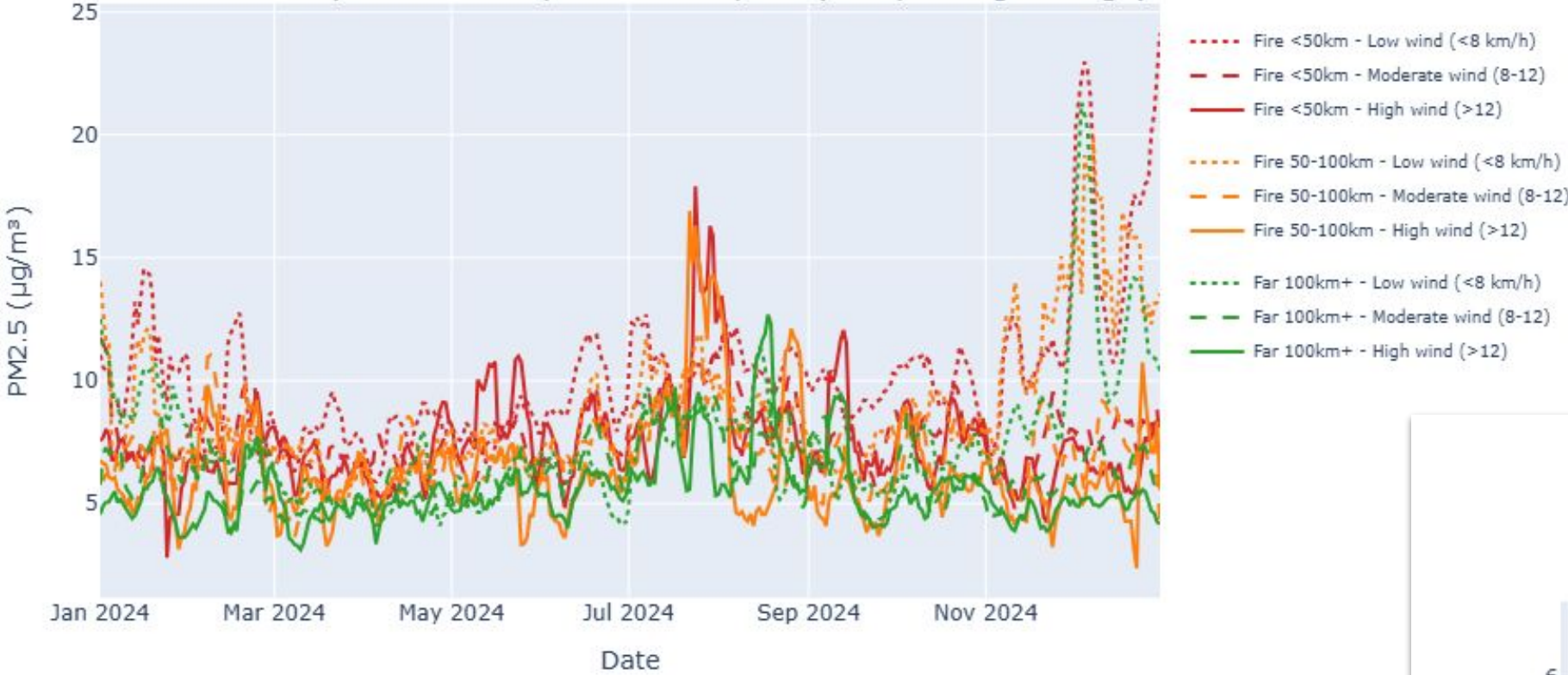
- First 3 PCAs only capture **55.1% of variability**
- Natural groupings
  - PC1 ~ temperature
  - PC2 ~ rain
  - PC3 ~ fire



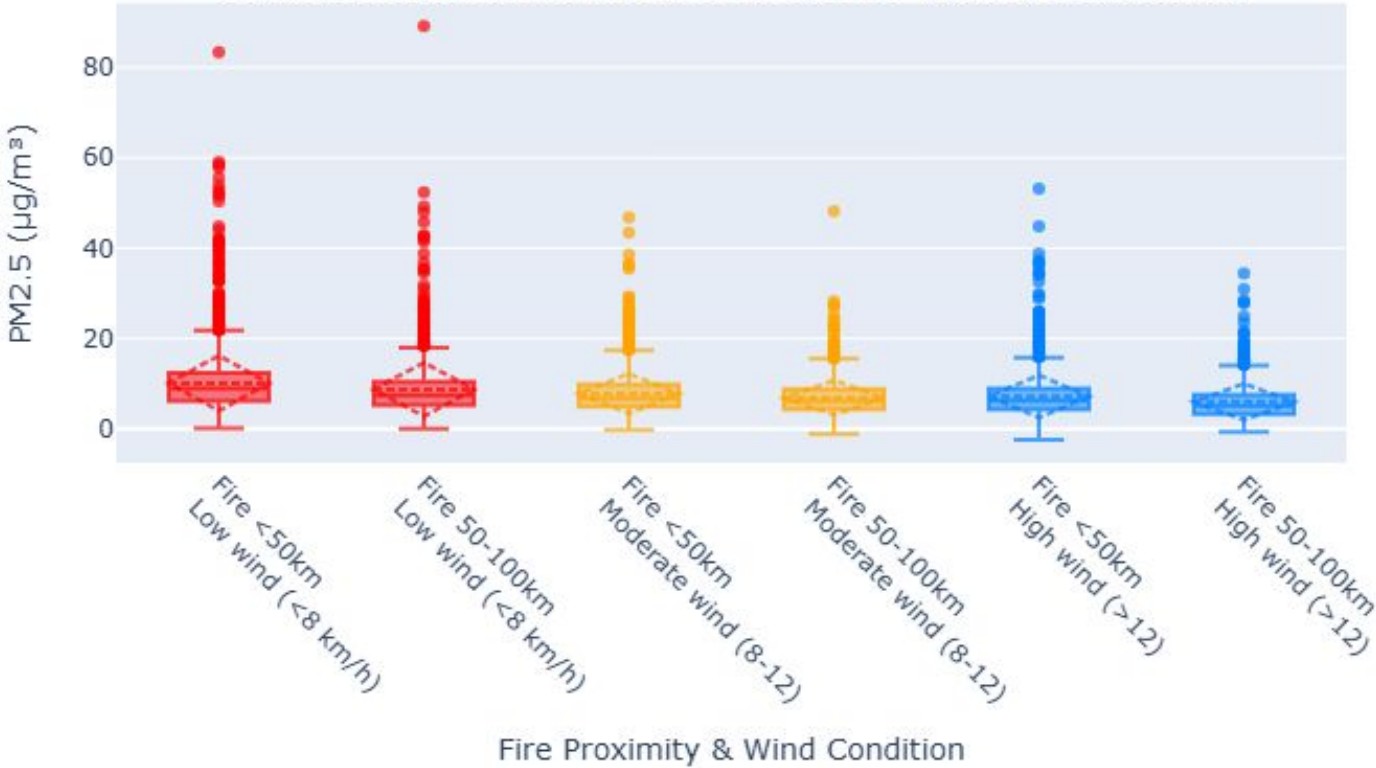


How Wind Speed Moderates Wildfire Impacts on Air Quality

Higher wind speeds (solid lines) reduce PM2.5 levels during fire events by dispersing smoke  
PM2.5 Levels by Fire Proximity and Wind Speed (7-day rolling average)



Wind Speed Moderation Effect on Fire-Air Quality Relationship

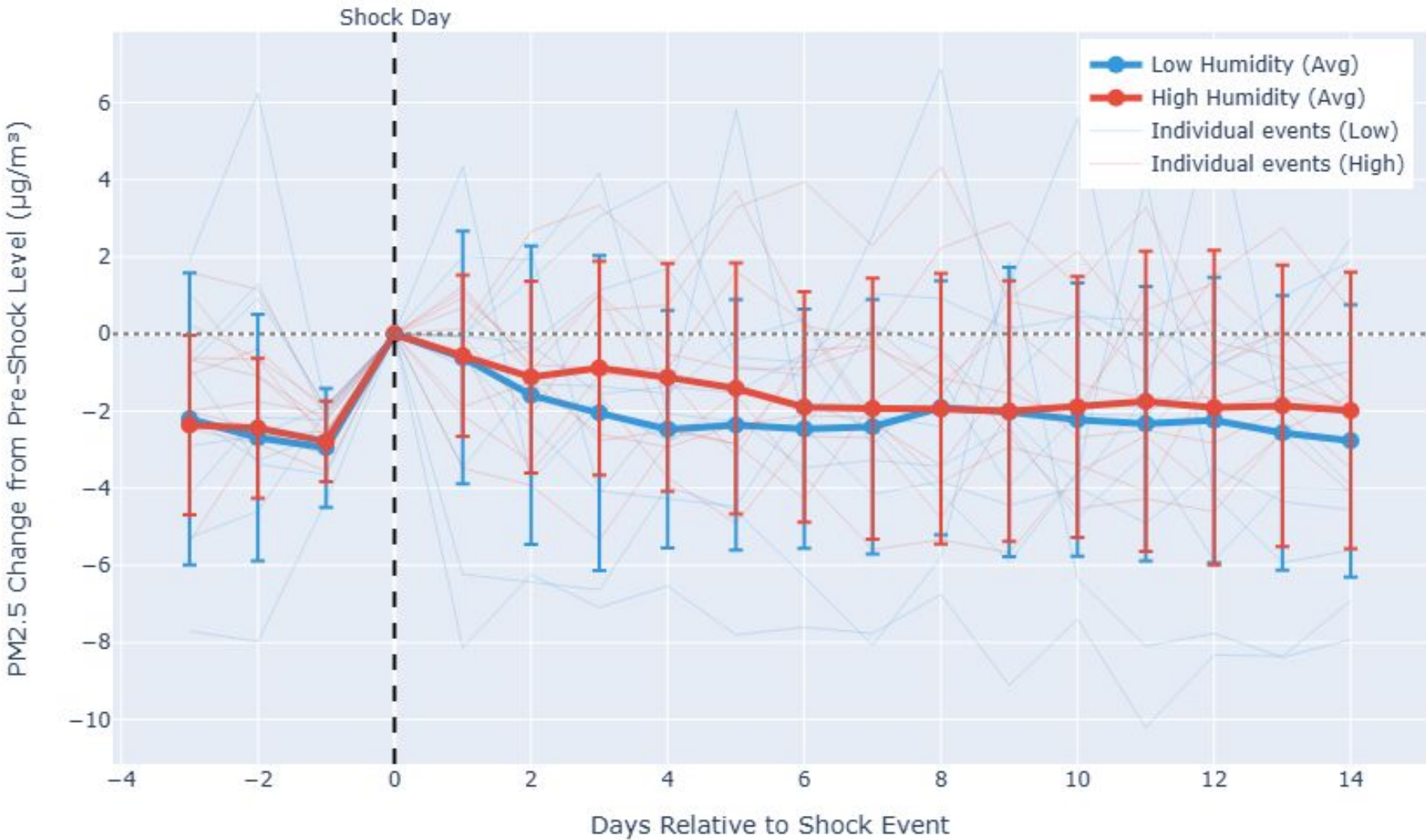


# Time Series Analysis

High wind speeds 👍

Low humidity 👍

PM2.5 Response to Shock Events: Evidence of Slower Dissipation





# Conclusions for Stakeholders

- **Environment:** Encourage action by policymakers and individuals
  - **Public health:** Issue air quality warnings and mind humid conditions
  - **Policy Planning:** Anticipate air quality impacts in advance
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- **Prediction challenges despite multi-model approach**
  - **However, successful capture of trends and conditions**
  - **Actionable insights for protecting environmental and public health**