Understanding sources of fine particulate matter (PM$_{2.5}$) is important for Federal Clean Air Act § 179b demonstrations, exceptional event demonstrations, and other high-priority policy objectives.

In this work, we investigated the sources of fine particulate matter (PM$_{2.5}$) pollution in urban areas of Texas. Using air quality site data spanning 2015-2021, obtained from the Texas Commission on Environmental Quality (TCEQ), we:

- Developed methods to rapidly flag and evaluate sudden increases in hourly PM$_{2.5}$ measurements.
- Used positive matrix factorization (PMF) for a selection of sites to determine relative source contributions to total PM$_{2.5}$.
- Investigated the impact of biomass burning smoke and mineral dust on days that exceed the 24-hour NAAQS threshold of 35 μg/m$^3$.

II. PM$_{2.5}$ Anomaly Flagging and Investigation

### PM$_{2.5}$ Anomalies

- We flag anomalies in PM$_{2.5}$ on days that exceed the 24-hour NAAQS threshold of 35 μg/m$^3$.
- Anomalies that occurred at several monitors were flagged as regional (-2) or multiregional (-3) events, while anomalies at isolated monitors were flagged as local (-1) events (Fig. 3a).

#### PMF Anomaly Case Study at two DFW Sites (2018-2021)

- We further focused our analysis on the maximum concentration as with all other regions, lower air temperatures are typically associated with higher PM$_{2.5}$ concentrations (especially local and regional anomalies).
- As with all other regions, lower air temperatures are typically associated with higher PM$_{2.5}$ concentrations (especially local and regional anomalies).
- This suggests contributions from winter heating sources.

### Contributions to Total PM$_{2.5}$: PMF Case Study at two DFW Sites (2018-2021)

- Local
- Regional
- Local and regional
- Local, regional, and regional
- Local, regional, and regional

#### BPA

- Local Anomaly: 2015-10-17: 355 μg/m$^3$
- Regional Anomaly: 2016-04-14: 719 μg/m$^3$
- Multiregional Anomaly: 2015-01-01: 254,828 μg/m$^3$

#### ELP

- Local Anomaly: 2016-04-14: 719 μg/m$^3$
- Regional Anomaly: 2015-01-01: 254,828 μg/m$^3$

#### ARR, CC, HGB, SAN

- Local Anomaly: 2015-01-01: 254,828 μg/m$^3$

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