**1. Title**  
Analyzing Houston Air Quality: Time Series Trends in Aerosol Optical Properties and VOCs

**2. Research Question(s)**

* How do AAE and SAE vary over July in Houston, and what do they indicate about aerosol sources?
* What is the relationship between formaldehyde and VOC concentrations, and how does this link to secondary organic aerosol formation?
* Are there significant pollution events during this period, and what are their potential causes?

**3. Objective(s)**

* Develop a time series analysis workflow to explore air quality trends in Houston using aerosol optical properties (AAE, SAE) and gas-phase pollutants (VOCs, formaldehyde).
* Identify key pollution events and possible source contributions.
* Provide a reproducible R script for researchers to analyze similar datasets.

**4. Approach**  
This analysis will use Python (or R) for time series data processing, visualization, and correlation analysis.

* **Data Handling:** Load and clean the dataset, handle missing values.
* **Exploratory Analysis:** Generate summary statistics, visualize trends over time.
* **Correlation Analysis:** Investigate relationships between AAE, SAE, VOCs, and formaldehyde.
* **Event Detection:** Identify peak pollution episodes and compare with meteorological conditions (if available).
* **Code Documentation:** Provide step-by-step comments and explanations in the script.  
  The final tutorial will be hosted on GitHub with detailed documentation and examples.

**5. Selected References**

* [Reference 1] (Peer-reviewed paper on AAE, SAE as pollution indicators)
* [Reference 2] (Study on VOCs and formaldehyde in urban air)
* [Reference 3] (Time series analysis in environmental chemistry)
* R Core Team. 2024. R: A Language and Environment for Statistical Computing. <https://www.r-project.org/>