

The HEI Air Quality Database and the Relationships of Indoor, Outdoor, and Personal Air (RIOPA) Database: Recent Updates



Matthew Alvarado, Yaping Xiao, Ross Hoffman
Atmospheric and Environmental Research, Inc., 131 Harvard Ave., Lexington, MA, 02421-3626, USA
hei@aer.com, riopa@aer.com

1. Introduction

- AER has created two user-friendly databases that allow HEI investigators to quickly retrieve air quality and meteorological data:
 - The HEI Air Quality database (hei.aer.com) includes the US EPA's Air Quality System (AQS) particulate matter (PM_{2.5}) data, along with concentrations of several gas-phase pollutants, meteorological data, PM_{2.5} emissions data, and census population data.
 - The Relationships of Indoor, Outdoor, and Personal Air (RIOPA) Database (riopa.aer.com) provides concentration data for PAHs, chlordanes, carbonyls, PM, and other VOCs, as well as questionnaire data and other metadata for the homes included in the RIOPA study.
- All data is output as comma-separated value (.csv) files for easy importation into Excel or other plotting software (IDL, Matlab, etc.)
- This poster describes recent updates to both databases and shows some examples of how the data can be used by HEI investigators.

2. Updates to the HEI Air Quality Database (hei.aer.com)

- The HEI Air Quality Database has been updated to include the following data for 54 core sites and 234 supplemental sites for the years 2000 to 2010.

(a) EPA's AQS Particulate Matter Data

- Total PM_{2.5}
- Sulfate
- Nitrate
- Ammonium
- Organic and Elemental Carbon (OC & EC)
- Other Trace Species

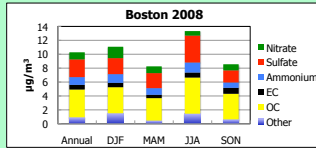


Figure 1: Annual and seasonal average PM_{2.5} amount and composition for Boston (Station ID # 250250042) in 2008. Note that sulfate and OC peak in the summer, while nitrate peaks in the winter.

(b) EPA's AQS Gaseous Data

- Species included are CO, O₃, SO₂, NO₂
- Three averages stored for each day:
 - 24 hour average
 - Maximum 8 hour average
 - Maximum 1 hour average

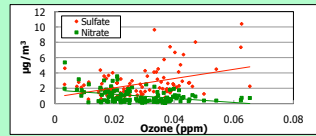


Figure 2: Sulfate and nitrate versus maximum 8 hour average ozone in Boston for 2008. Note that PM data are only available every third day. Sulfate and ozone are positively correlated, while nitrate and ozone are negatively correlated.

(c) EPA's AQS Meteorological Data

- Temperature
- Pressure
- Relative humidity
- Wind speed and direction

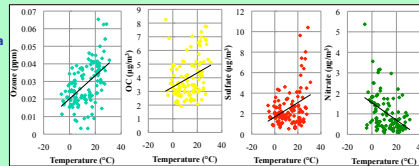


Figure 3: Ozone, OC, sulfate and nitrate versus 24 hour average temperature for Boston in 2008. Ozone, sulfate, and OC are all positively correlated with temperature, while nitrate is negatively correlated.

3. Updates to RIOPA database (riopa.aer.com)

- Google Map of each study area (Elizabeth, NJ; Houston, TX; Los Angeles County, CA) that displays the location of each census block group, significant point sources, major highways, and bodies of water. The point source data was compiled from the 1999 National Emissions Inventory of the US EPA.

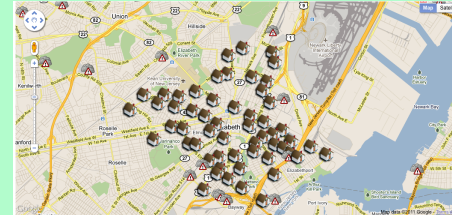


Figure 4: Map of Elizabeth, NJ study area. Houses represent the location of census block groups, while "I" signs represent point sources. Clicking on the icons in the map gives additional information.

New meta data, including:

- The latitude, longitude, and elevations of each census block group
- The population and household density for each census block group
- The percentage of land within 1 km of the census block group that is developed open space, low-, medium-, and high-intensity developed land, undeveloped land, and open water
- The seasonal average prevailing wind direction, wind speed and nighttime wind speed
- The two closest arterial highways and their Annual Average Daily Traffic (AADT)

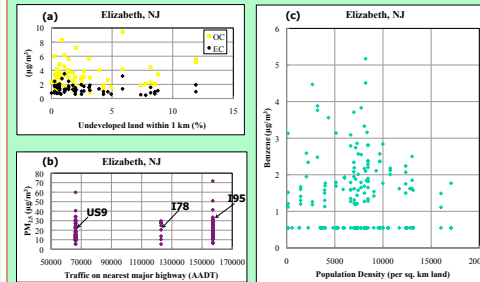


Figure 5: Plots demonstrating the use of the new RIOPA meta data for Elizabeth, NJ. (a) OC and EC concentrations versus percentage of undeveloped land within 1 km. (b) PM_{2.5} concentrations versus AADT on nearest major highway. (c) Benzene concentrations versus population density.

4. Summary and Conclusions

- AER has added a substantial amount of new data to the HEI Air Quality Database and the RIOPA measurement database.
- This data is freely available to all HEI investigators and collaborators.
- We've presented a few quick examples of the use of the data.
 - Sulfate, OC, and O₃ in Boston all increased with daily average temperature in 2008, while nitrate decreased.
 - There is no obvious correlation between (a) OC and EC with the percentage of undeveloped land within 1 km, (b) PM_{2.5} and traffic on the nearest major highway, or (c) benzene and population density in the RIOPA data for Elizabeth, NJ.
- We welcome your feedback on these databases! Please send any questions, comments, or requests to hei@aer.com or riopa@aer.com.