Integrating Satellite and Ground Data for PM$_{2.5}$ Exposure and Health Impact Assessment

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Core and TT Project Updates

- Evaluation of low-cost sensors
  - Neighborhood-scale PM$_{2.5}$ machine learning model in NYC – manuscript submitted
  - 1 km resolution PM$_{2.5}$ machine learning model in Imperial Valley, California – manuscript in preparation

- Epidemiologic study of wildfire smoke in Colorado – manuscript in preparation

- 1 km resolution PM$_{2.5}$ statistical model in Southern California – manuscript in preparation
Evaluation of Low-Cost Sensors

- Objectives
  - Estimate daily PM$_{2.5}$ concentrations by combining NASA satellite data, regulatory and non-regulatory measurements
  - Evaluate the impact of integrating low-cost measurements into satellite-based models
100-m resolution predicted PM$_{2.5}$ Surface in New York City

In suburban areas, forests and parks, two models are comparable. Along major roads and in densely populated neighborhoods, EPA+NYCCAS model is 15% higher. Health burden due to PM$_{2.5}$ pollution in the city may have been underestimated. (manuscript under review, don’t cite or quote)
Contribution of Low-Cost Sensors to Predicted PM$_{2.5}$ Levels in Imperial Valley, CA

IVAN (Identifying Violations Affecting Neighborhoods) Imperial is one of the largest community-based air monitoring networks in the US

6 AQS stations and 39 IVAN monitors
Comparison of 1 km resolution predicted PM$_{2.5}$ Surface in Imperial Valley

AQS-only results suggested roads as the major source of PM$_{2.5}$

IVAN-only and combined results suggested multiple sources including (1) dusts from the west shore of the Sultan Sea (off-road recreational driving) and Laguna Salada (dust storms) in Mexico, (2) transport from Mexicali, and (3) traffic and other local sources (manuscript under review, don’t cite or quote)
Epidemiologic study of wildfire smoke in Colorado

A conditional logistic model for fire smoke PM$_{2.5}$ controlling for temperature, time trend, and non-fire PM$_{2.5}$ (manuscript in prep, don’t cite or quote)

$$\logit P(X) = \beta(fire_{3day} PM2.5) + \beta(non - fire_{3day} PM2.5) + \beta(temp_{3day} PM2.5) + ns(doy)$$
Several respiratory outcomes exhibited associations with wildfire PM$_{2.5}$ after controlling for ambient PM$_{2.5}$ (manuscript in prep, don’t cite or quote)