

Integrating Satellite and Ground Data for PM_{2.5} Exposure and Health Impact Assessment



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HAQAST5

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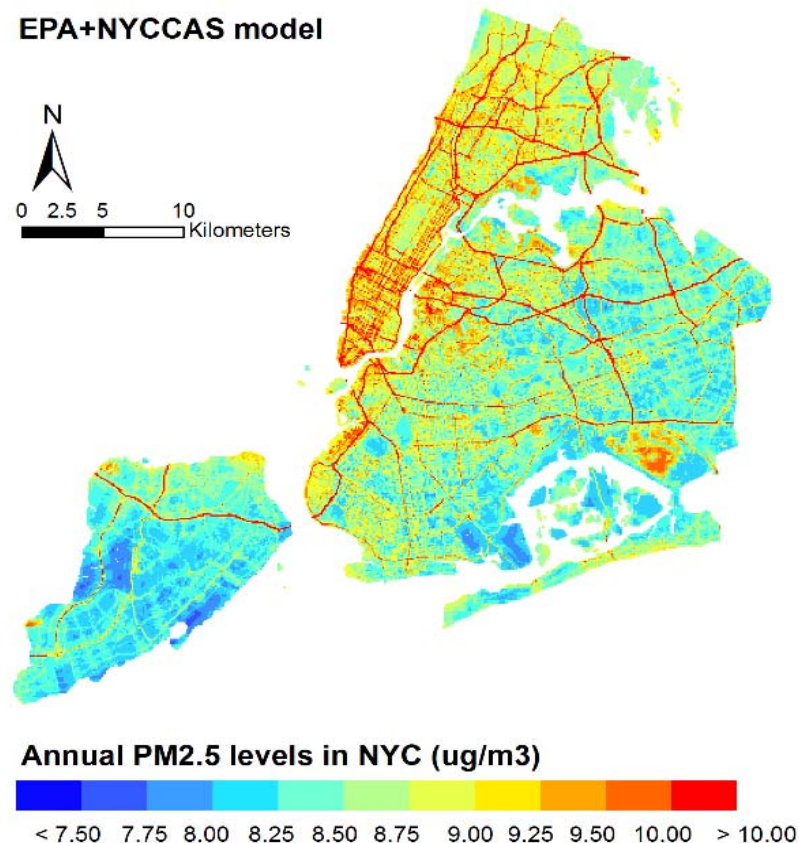
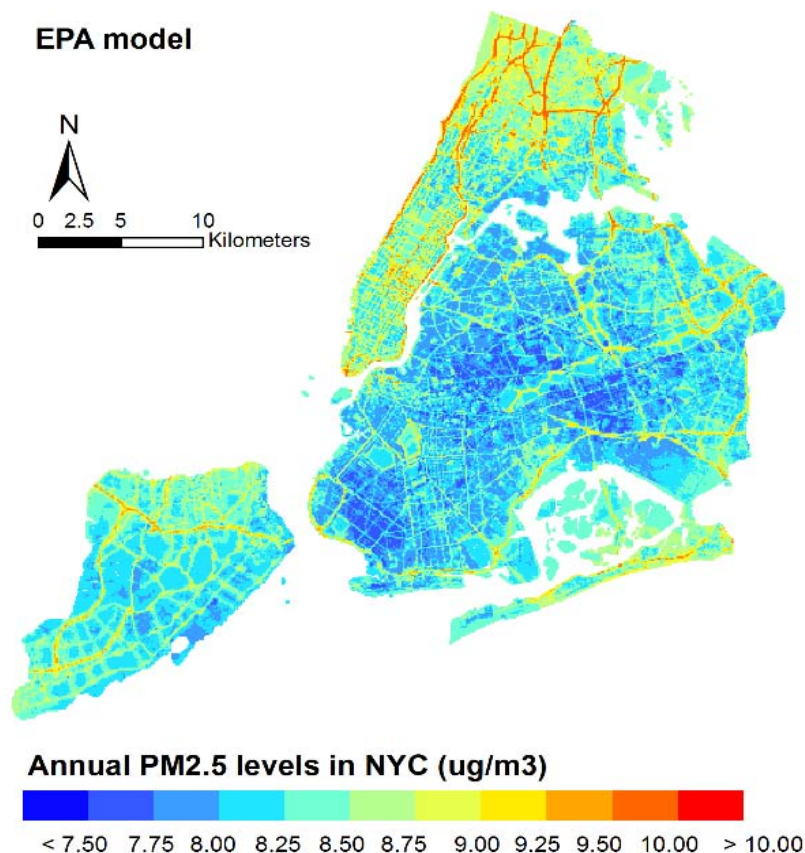
Core and TT Project Updates

- 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

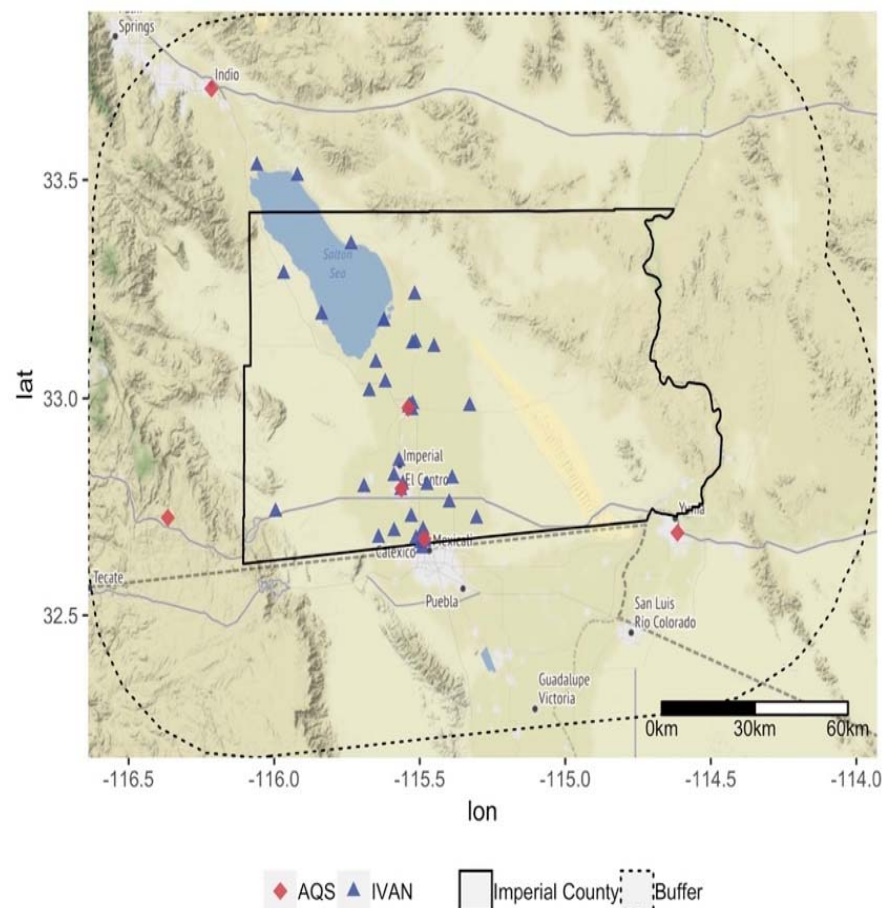
- Objectives
 - ❑ Estimate daily PM_{2.5} concentrations by combining NASA satellite data, regulatory and non-regulatory measurements
 - ❑ Evaluate the impact of integrating low-cost measurements into satellite-based models

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

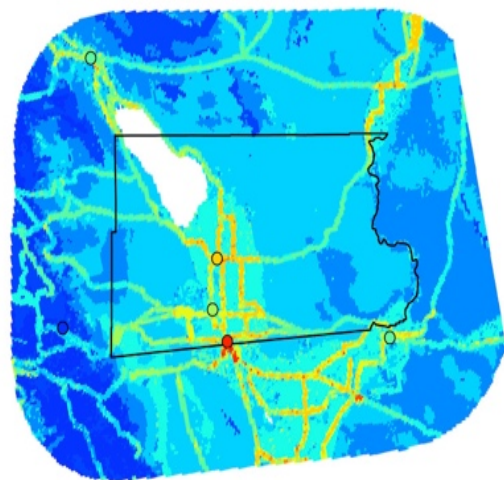
6 AQStations and 39 IVAN monitors

Comparison of 1 km resolution predicted PM_{2.5} Surface in Imperial Valley

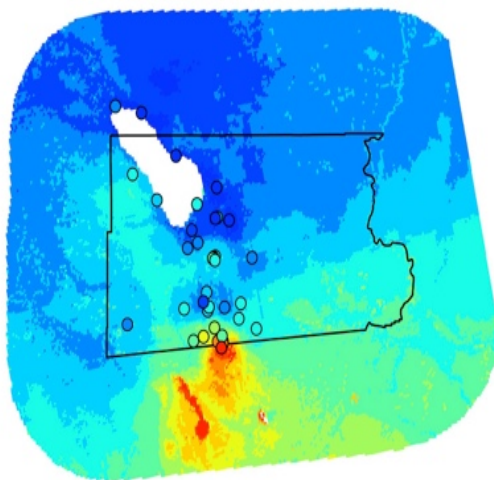


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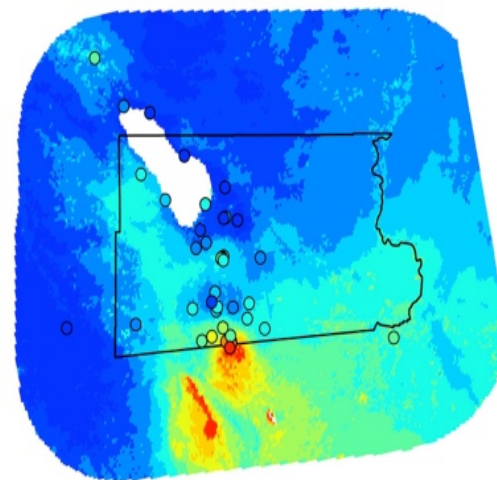
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(a) AQS-Only Model



(b) IVAN-Only Model



(c) AQS/IVAN Model

μg/m³



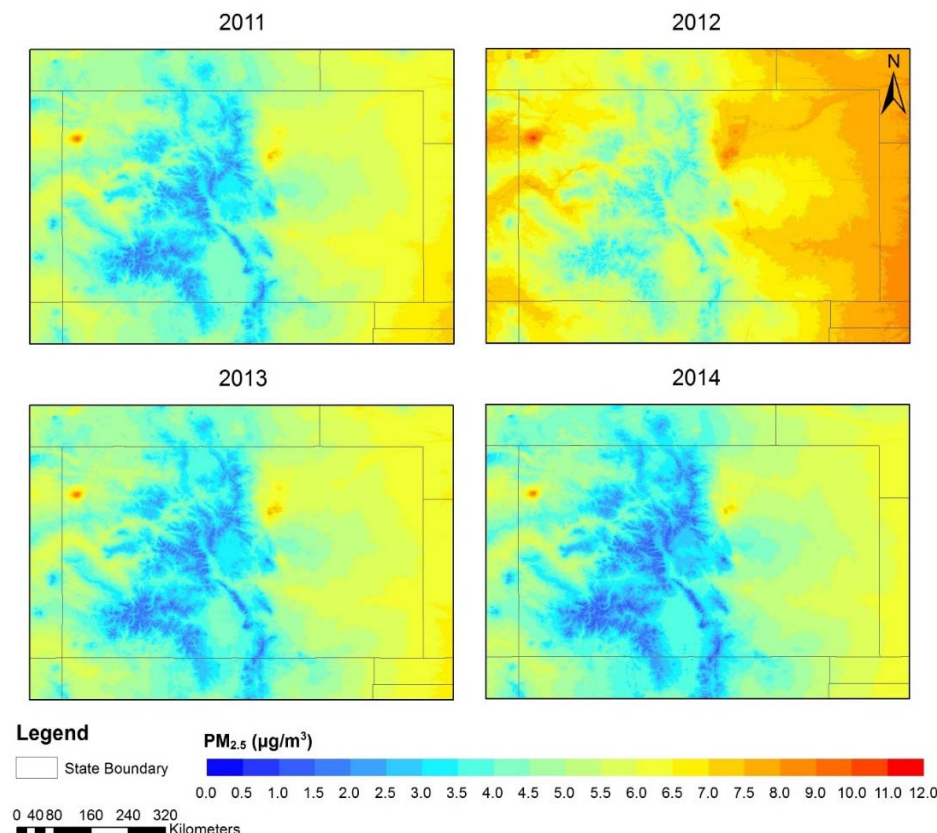
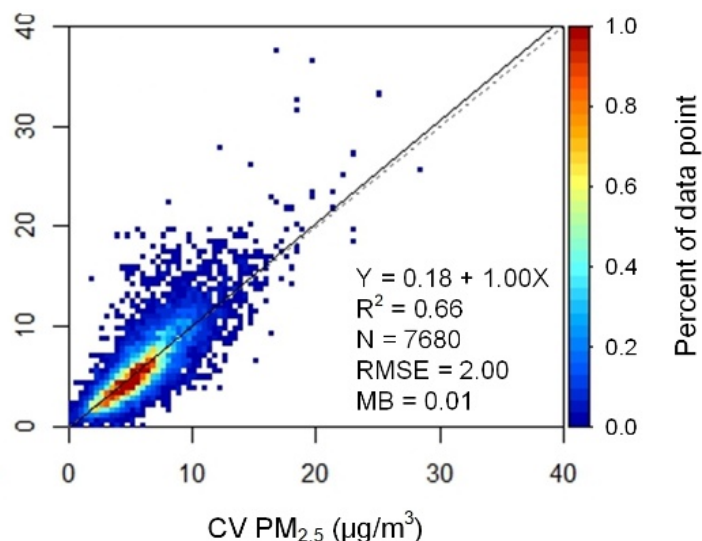
AQS-only results suggested roads as the major source of PM_{2.5}

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



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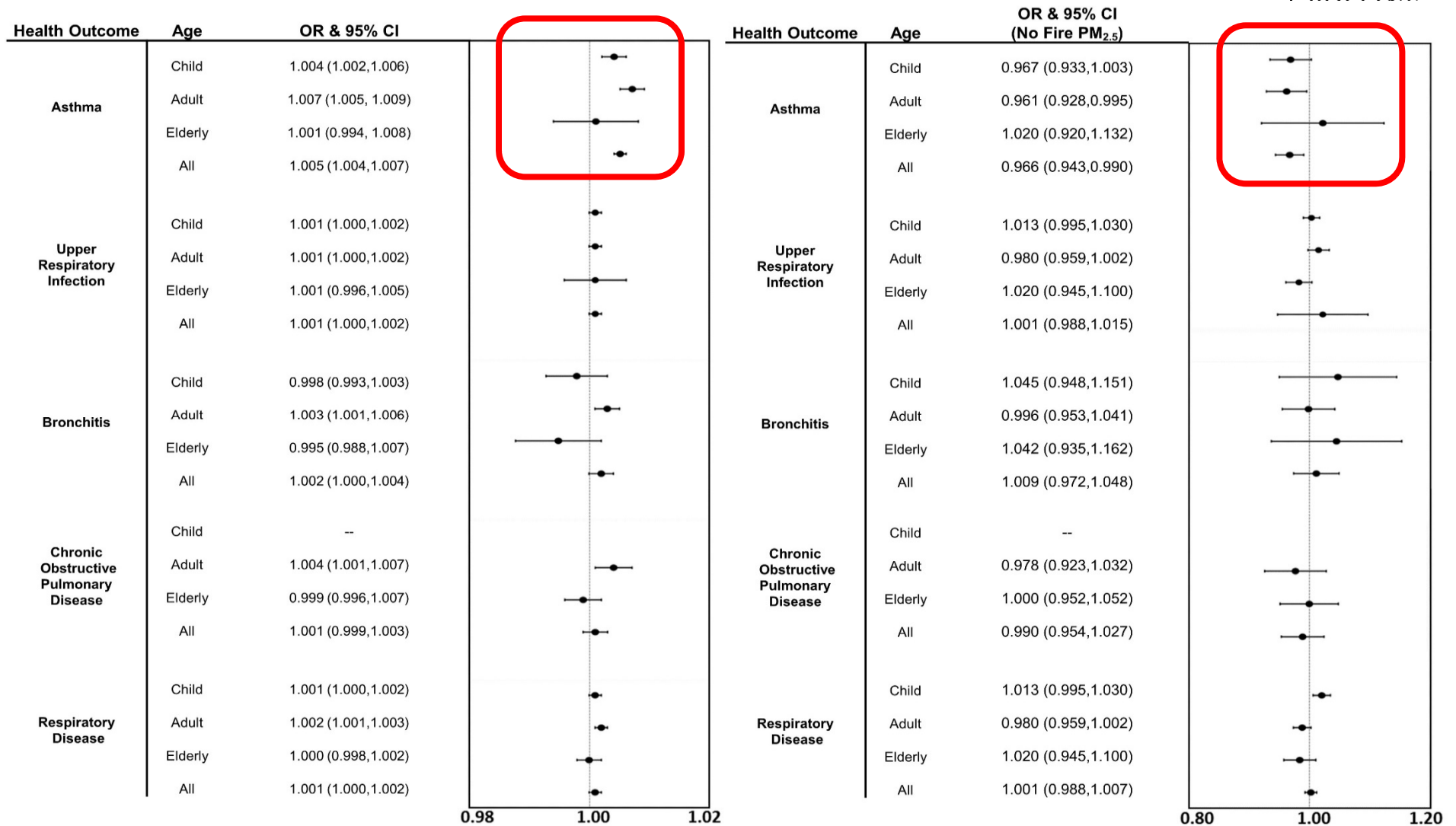
A conditional logistic model for fire smoke PM_{2.5} controlling for temperature, time trend, and non-fire PM_{2.5} (manuscript in prep, don't cite or quote)

$$\begin{aligned} \text{logit } P(X) &= \beta(\text{fire}_{3\text{day}} \text{ PM}_{2.5}) + \beta(\text{non-fire}_{3\text{day}} \text{ PM}_{2.5}) \\ &+ \beta(\text{temp}_{3\text{day}} \text{ PM}_{2.5}) + \text{ns}(\text{doy}) \end{aligned}$$

Age stratified results per IQR of exposure



BIRMINGHAM



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)