



## Research Summary: Aviation Emissions Impact Ambient Ultrafine Particle Concentrations in the Greater Boston Area

By Anil Gurcan

### Background

Transportation emissions are one of the leading causes of air pollution and adversely affect human health. Ultrafine particles (UFP) are one of the harmful pollutants that primarily derive from fossil fuel combusted for transportation and are thus concentrated near roadways, highways and other major transportation hubs like airports. Jet aircrafts themselves emit UFPs at high rates that, like other aviation-related impacts like exposure to increased noise, can impact cities extending over large populated areas.

### What did we do?

The study continuously measured particulate number concentrations (PNCs) at three different sites within 8 miles of the Boston Logan International Airport in Chelsea, Roxbury and Boston Globe parking garage in Dorchester. PNCs increased when winds were from the direction of the airport, suggesting aviation-related emissions were the source of the increase. Researchers obtained weather data from the National Weather Service station located in the airport. Their objective was to understand the correlation between flight activity, such as landing and take offs (LTO), and PNCs. Other variables that influence PNC, like weather and traffic, were considered when looking at this correlation .

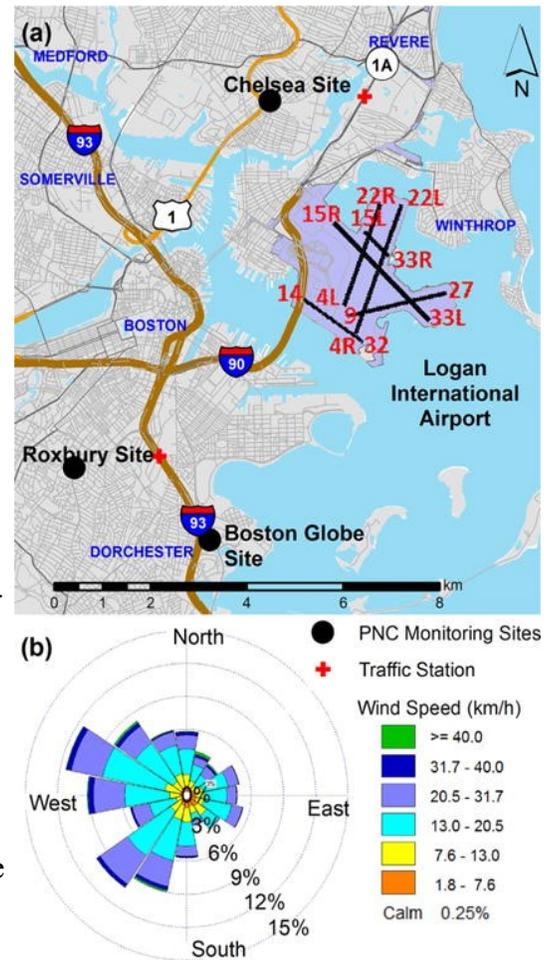


Figure 1. (a) Map showing runway configuration at Logan International Airport and locations of the three monitoring sites. Base layers for the map were obtained from mass.gov. (b) Wind rose based on 1 min data for 2014 reported by the National Weather Service automated surface station located at the airport

## What did we find?

At each site, the researchers identified wind direction sectors that were impacted by airport related emissions called impact-sectors. They found that there was a positive association with LTO and PNCs during winds that came from these impact-sectors. They also found wind speeds of impact-sector winds were positively correlated with PNCs. However, higher-speed winds from other directions resulted in lower PNCs. Higher wind speeds promote faster ground arrival of more concentrated aviation pollution. On average, there were 1.7 times more PNCs at the sites during impact-sector winds compared to during other winds. Highest PNCs were observed when winds were from the direction of the airport.

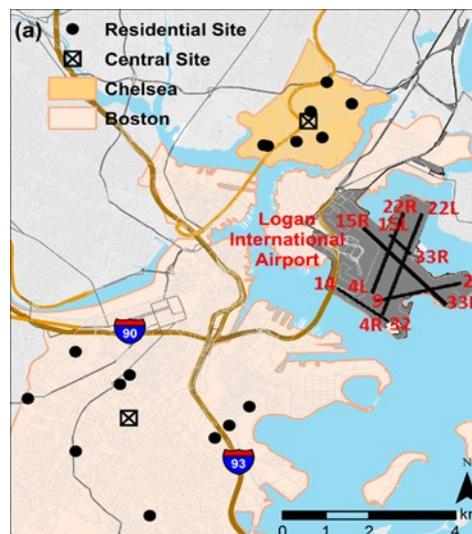


Figure 2: Map showing the locations of the central and residential monitoring sites in Chelsea and Boston.

## Why is it important?

Air pollution near highways generally impacts those who are living close to highways (within a couple hundred meters). However, pollution generated from aviation emissions can impact populations living as far as a couple hundred kilometers downwind of the airports. These findings are important because they help improve PNC exposure assessments by including aviation-related emissions.

## What can we do?

The best practices for reducing exposure to aviation-related emissions are similar to those from any other source. Indoor exposures can be reduced by improving building insulation or opening windows during periods of lower pollution. Outdoor exposures can be reduced by minimizing time spent outdoors in periods of high pollution like during impact-sector winds.

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### To learn more about this research, please refer to the following source:

<https://pubs.acs.org/doi/abs/10.1021/acs.est.6b01815>