



Identifying the impact of residential wood combustion on PM_{2.5} concentrations in Montréal

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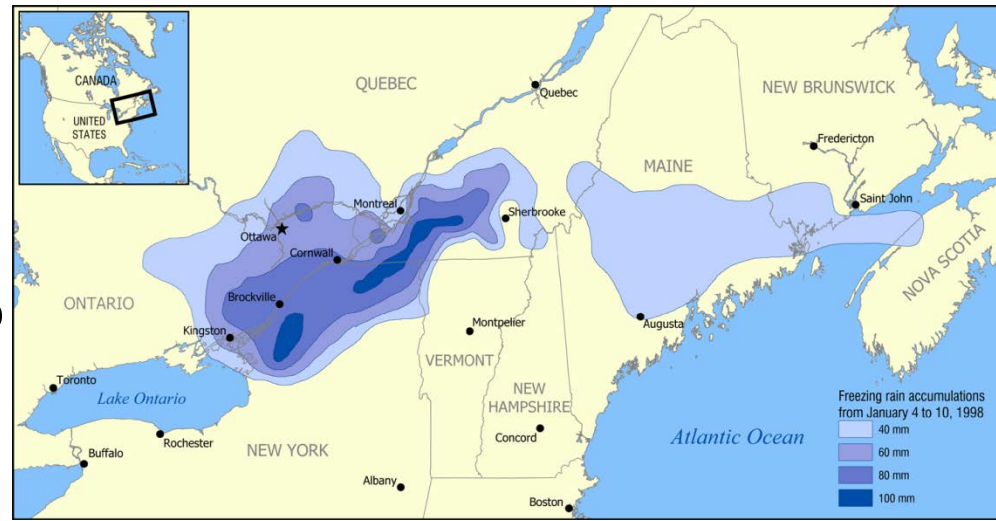
Environment and Climate Change Canada

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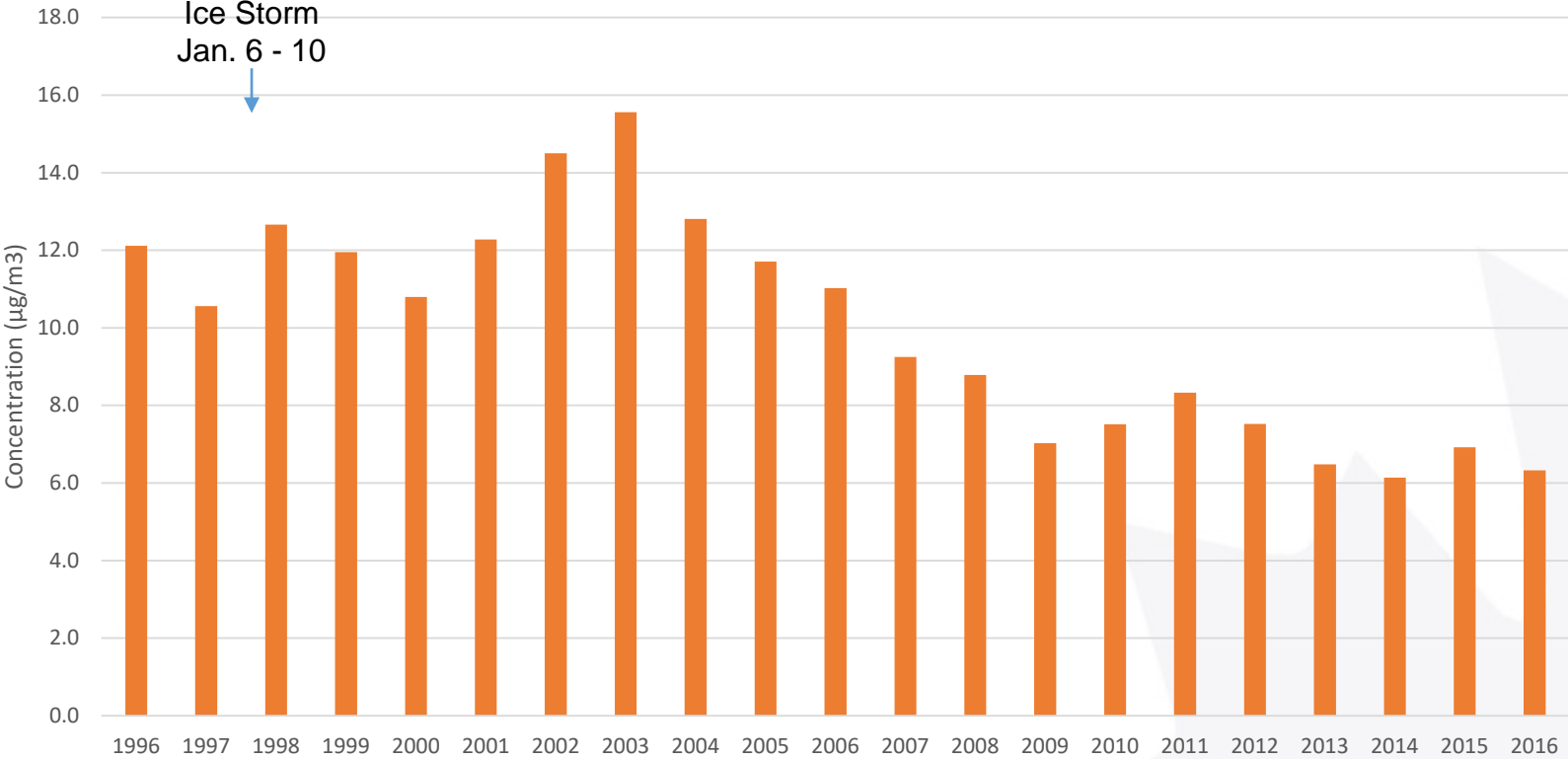
Background

- January 5 – 10, 1998, E. Ontario and S. Quebec hit by a massive ice storm
- Many areas of Montréal were without electricity (and heat) for several weeks
- In the aftermath of the storm there was a surge in woodstove sales
- Increased woodstove use led to higher wintertime $PM_{2.5}$

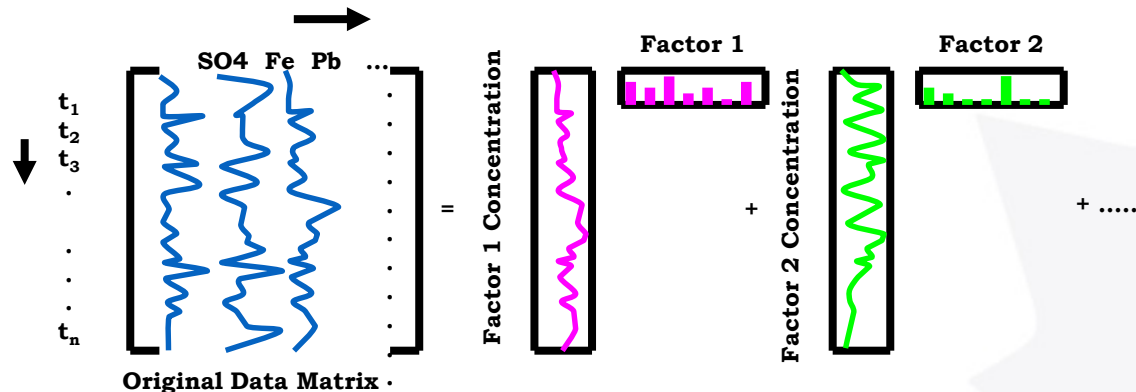
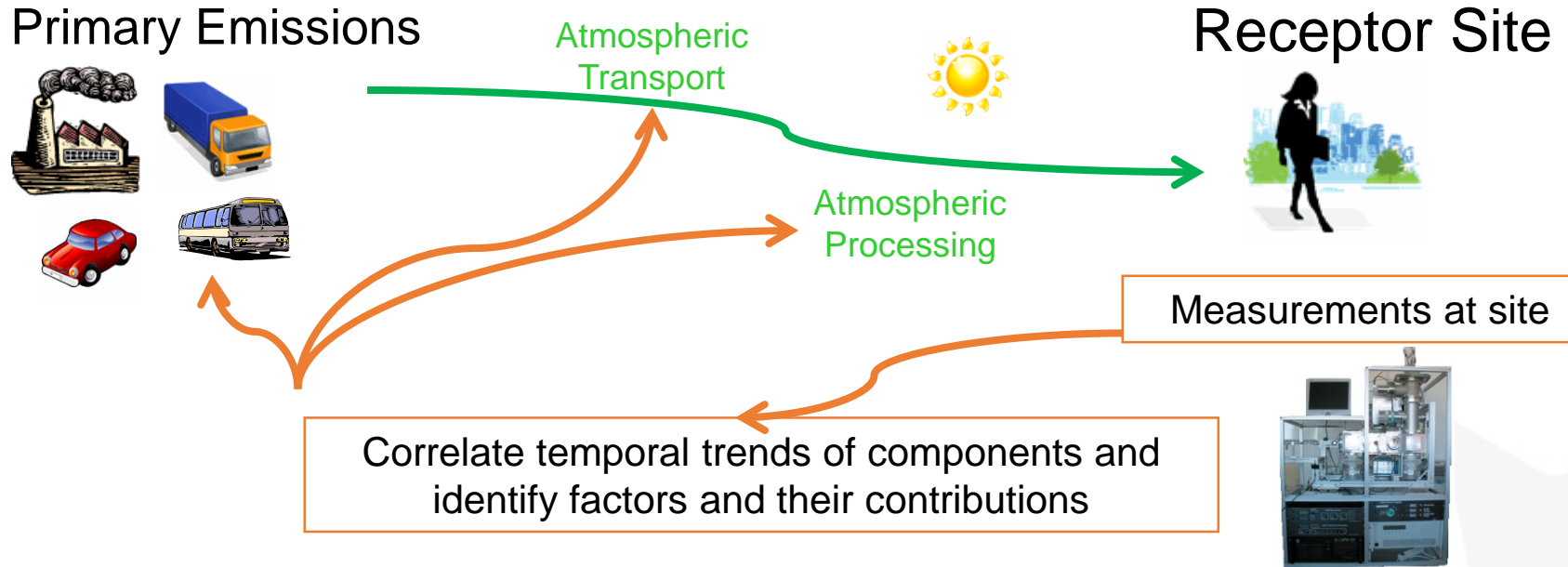


Montréal PM_{2.5} Concentration Trends – Heating Season (Nov – Mar)

Montréal Cold Season (Nov - Mar) PM_{2.5} Concentrations
1996 - 2016

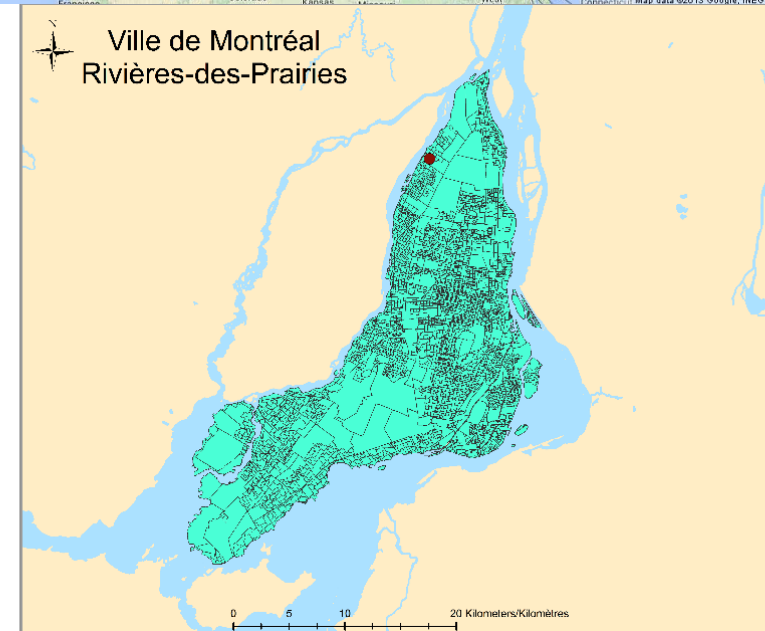
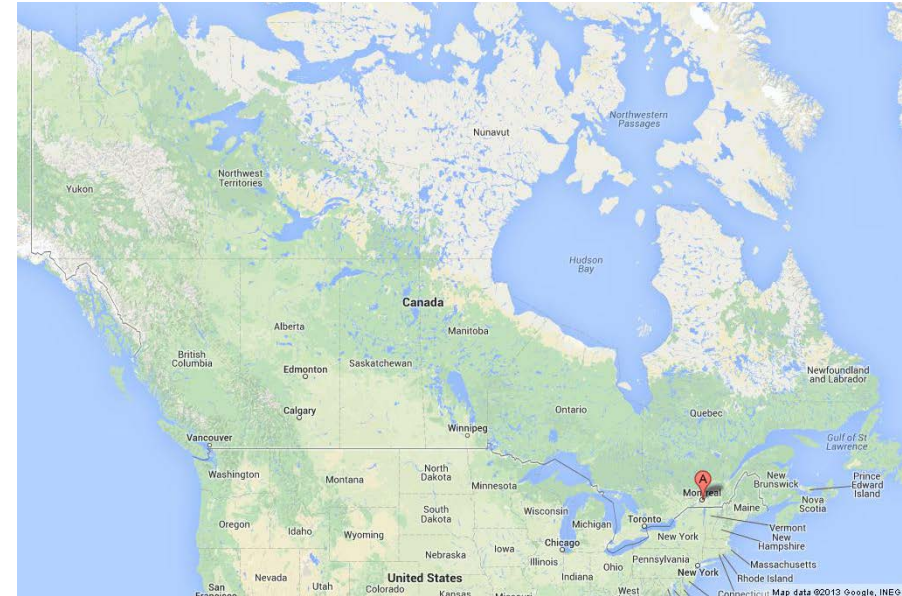


Source Identification using Receptor Modelling (Positive Matrix Factorization)

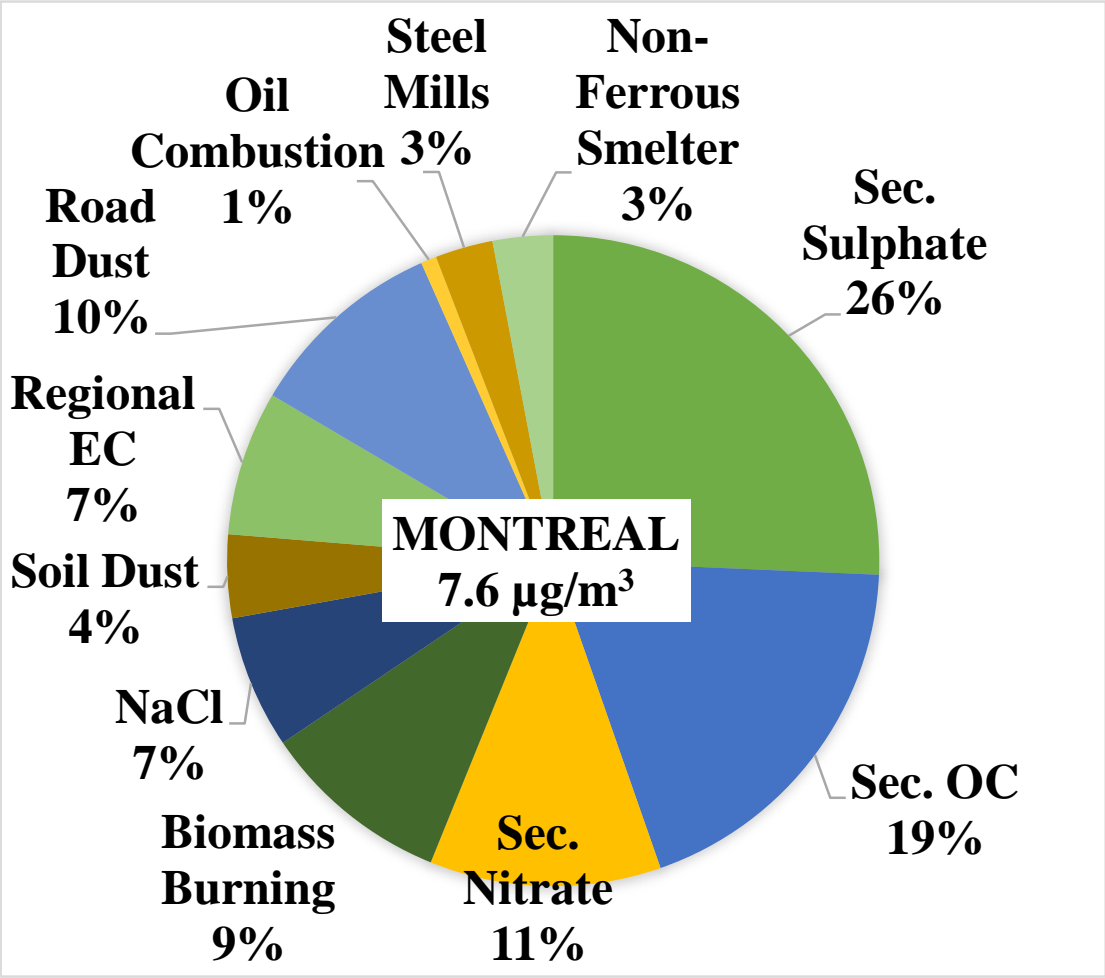


Method

- ECCC's National Air Pollution Surveillance Network PM_{2.5} Speciation Site (Rivière des Prairies)
- Suburban site (influenced by residential wood combustion)
- Applied Positive Matrix Factorization (PMF) to 24 hour filter samples from 2003-07 and 2009-14

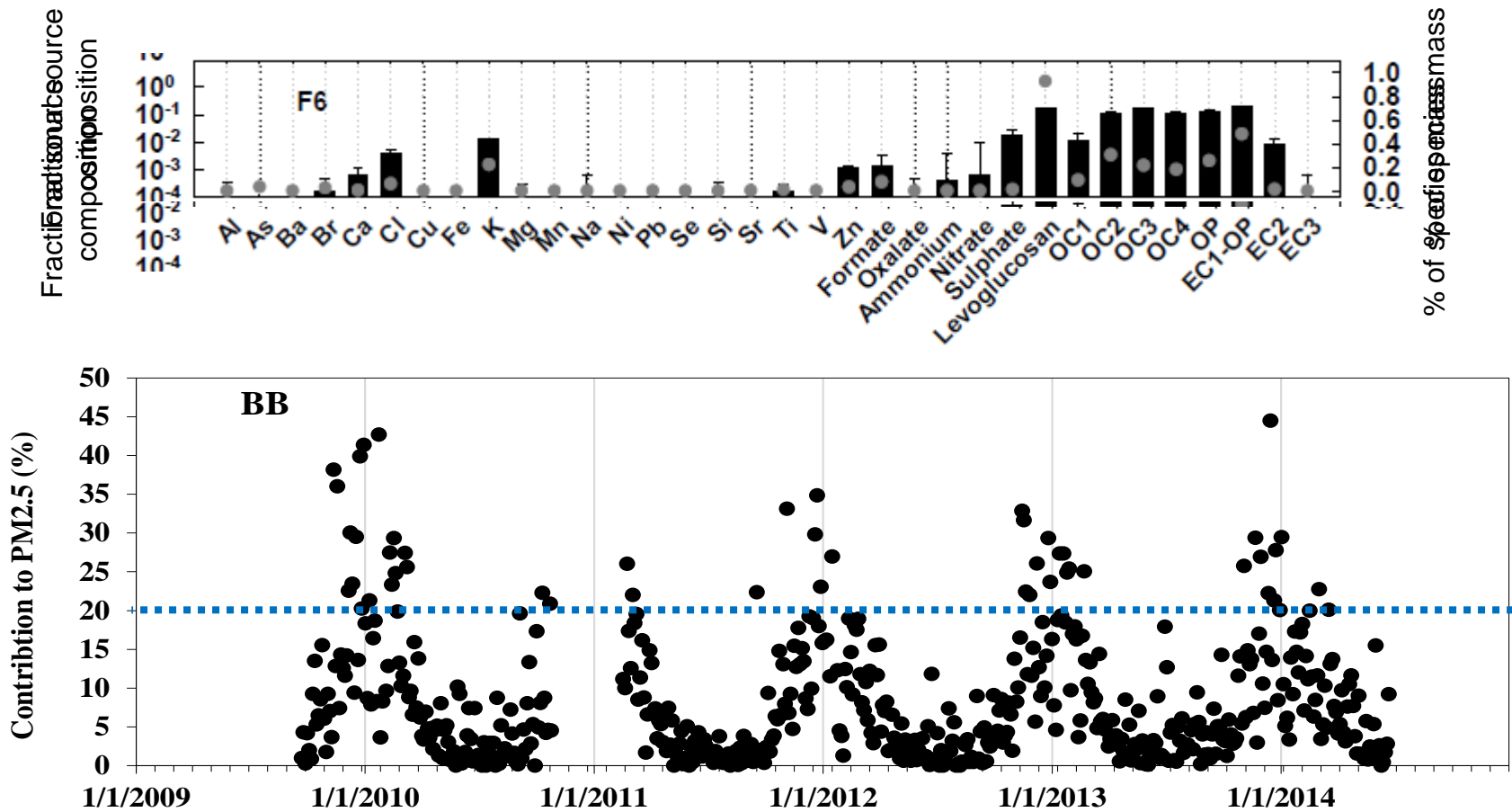


Factors Contributing to PM_{2.5} in Montréal



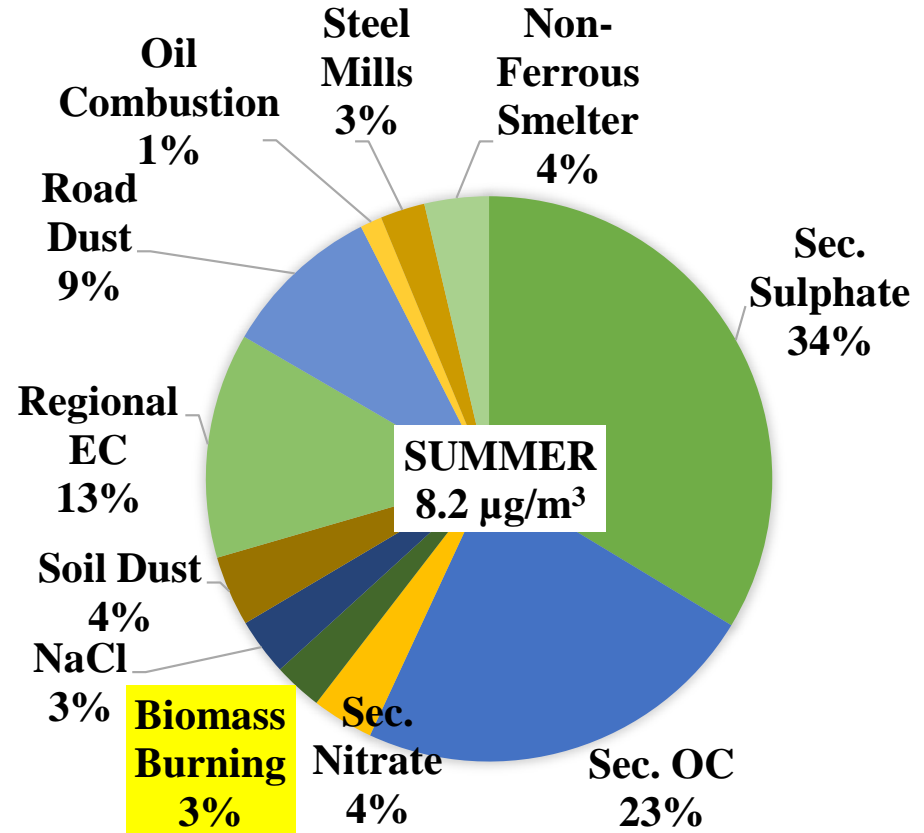
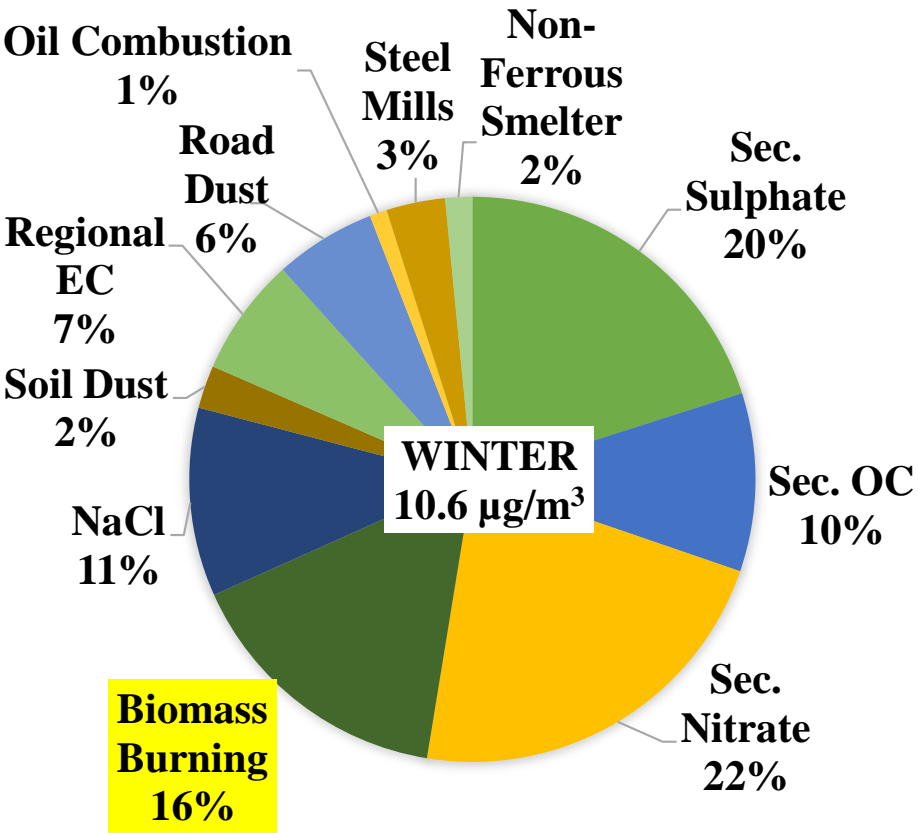
Source Apportionment for 2013

Biomass burning contributes on episodic days



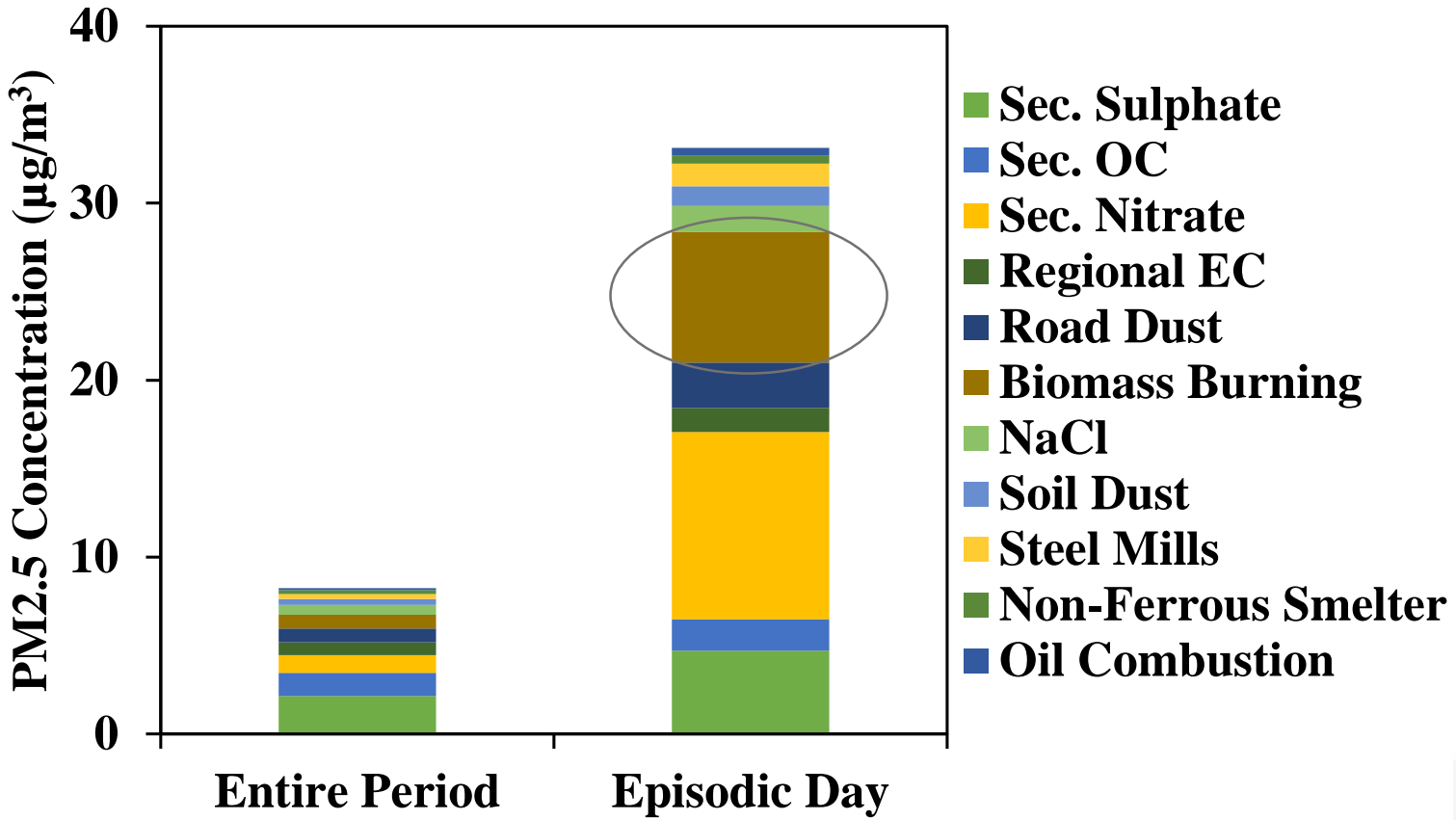
- Biomass burning often contributes > 20% of PM_{2.5} in winter
- A dominant source (10-45%) during ~80% of the PM_{2.5} episodic days (> 25 μg/m³)

Montréal: Wintertime Biomass Burning



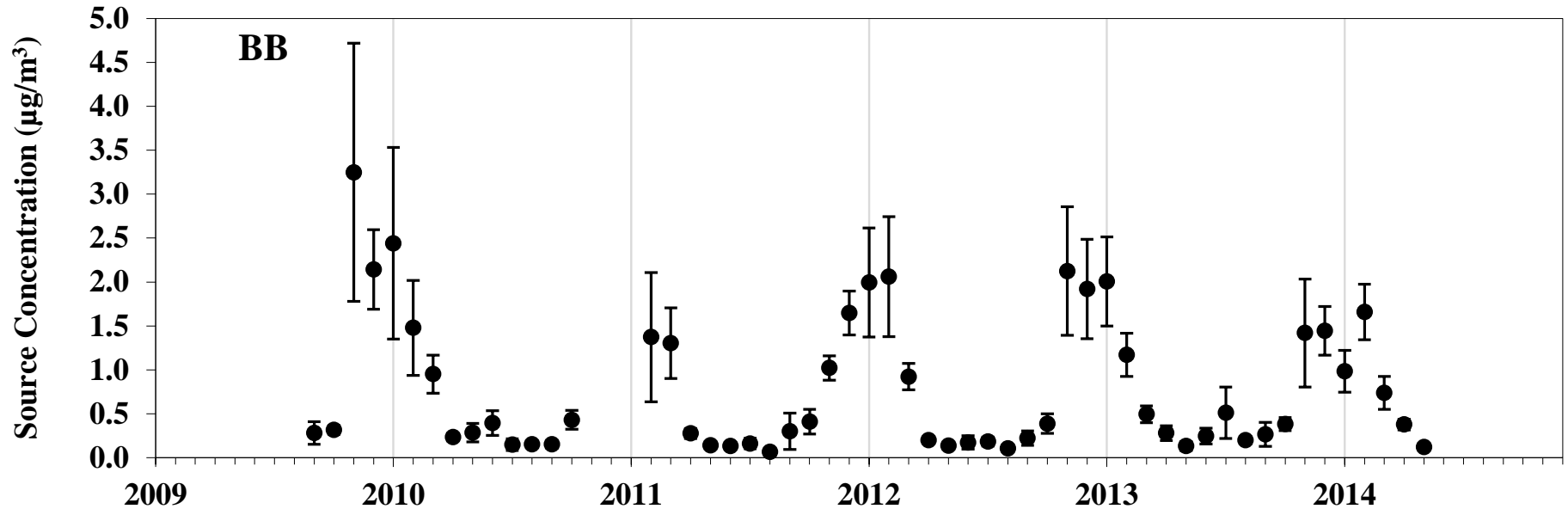
Winter BB/ Summer BB = 7.3

Montréal: Wintertime Episodic Days ($> 25\mu\text{g}/\text{m}^3$)



The contributions of Sec. Nitrate and BB increased by a factor of 10.

Wood-Burning Interventions are Improving Air Quality



Banning the new installation of wood-burning stoves or fireplaces

Woodstove Replacement Program

Winter 2009-2010: $2.1 \pm 0.9 \mu\text{g}/\text{m}^3$
Winter 2013-2014: $1.2 \pm 0.4 \mu\text{g}/\text{m}^3$
Decreased by ~ 40% since 2009-2010

Summary

- An estimated 50,000 wood-burning appliances in Montréal
- Initiatives to reduce wood burning in **Montréal** are helping to improve wintertime air quality.
- Change-out program was successful but only 2,500 appliances were removed or change
- Latest bylaw was passed by Montréal city council in 2015
- Quantifying the contribution of wood smoke to $PM_{2.5}$ levels was an important consideration in adopting the bylaw to reduce emissions.