

THE CIX: Toronto Halogens, Emissions, Contaminants, and Inorganics eXperiment



Cora Young
York University

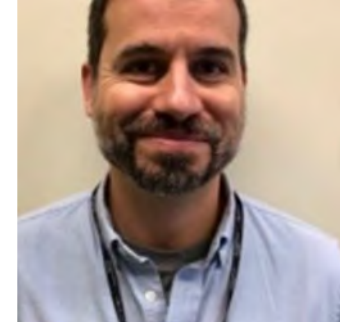
THE CIX Participants



Jen Murphy
University of
Toronto



Pete Edwards
University of
York



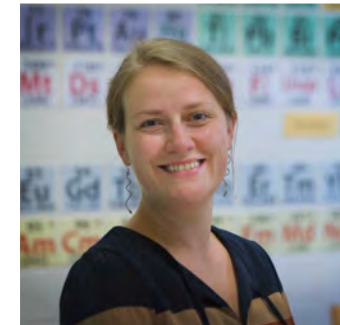
John Liggio
Environment and Climate Change Canada



Rob McLaren
York
University



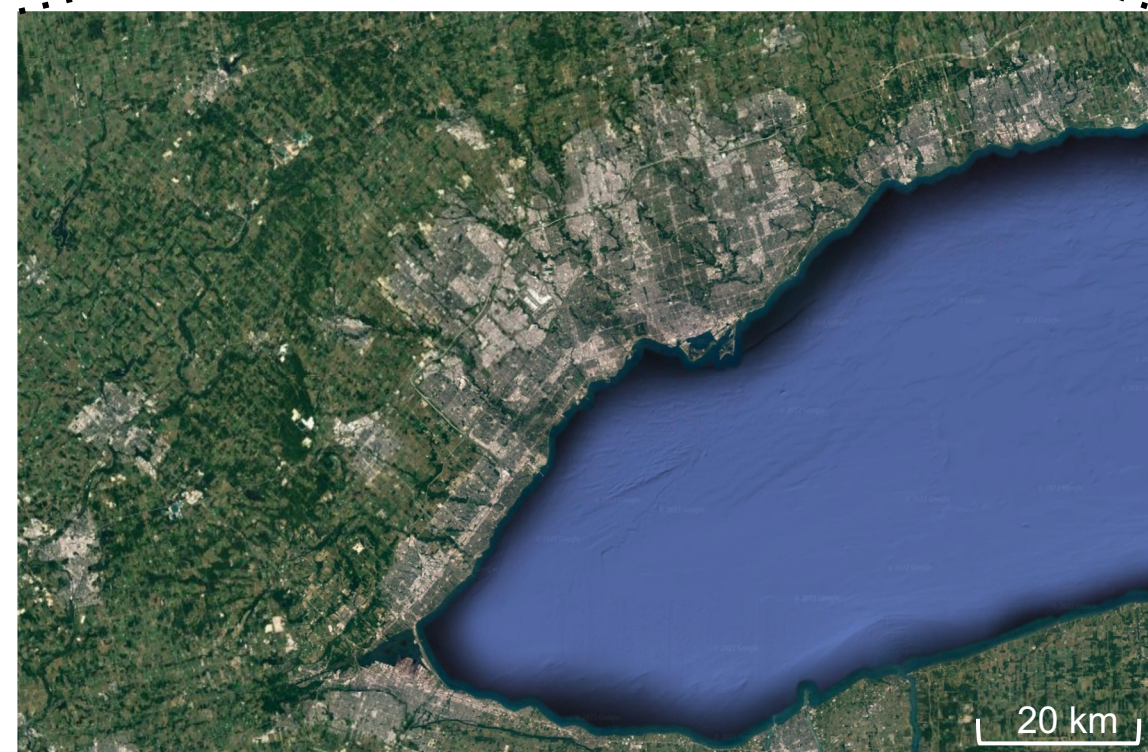
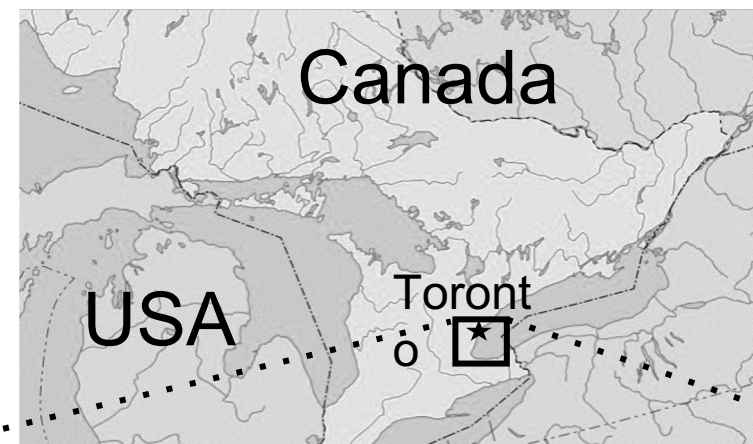
**Trevor
VandenBoer**
York University



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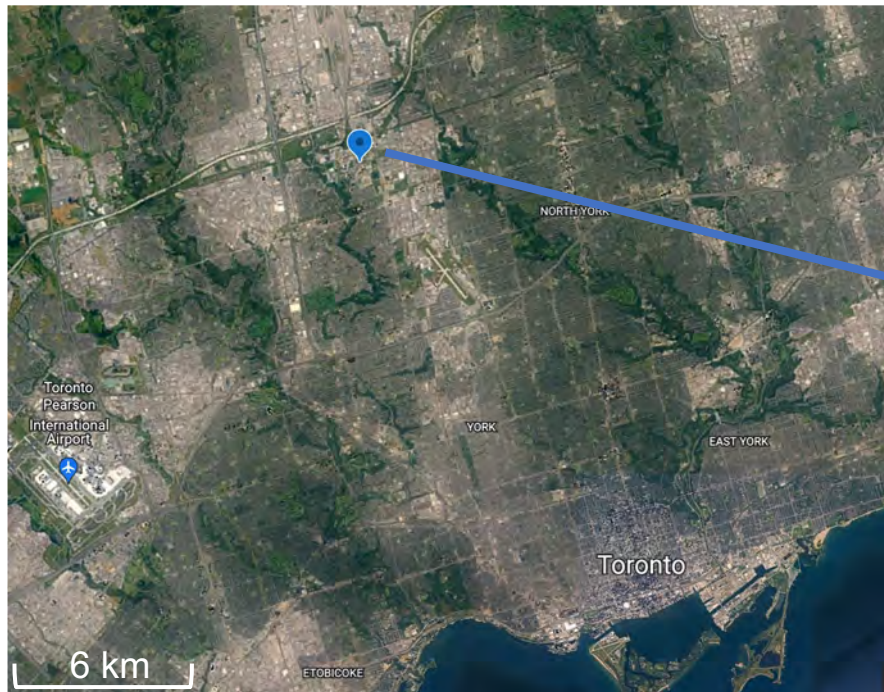
Toronto

- Largest continental city included in AEROMMA.
 - **City** population over 7M.
 - **Regional** population approaching 10 M.
- (One of) the fastest growing cities in North America.
- Measured precursors to ground-level ozone have been reduced in Toronto over past decades.
- Exceedances of the 8-hour ozone Canadian Ambient Air Quality Standard are still common.



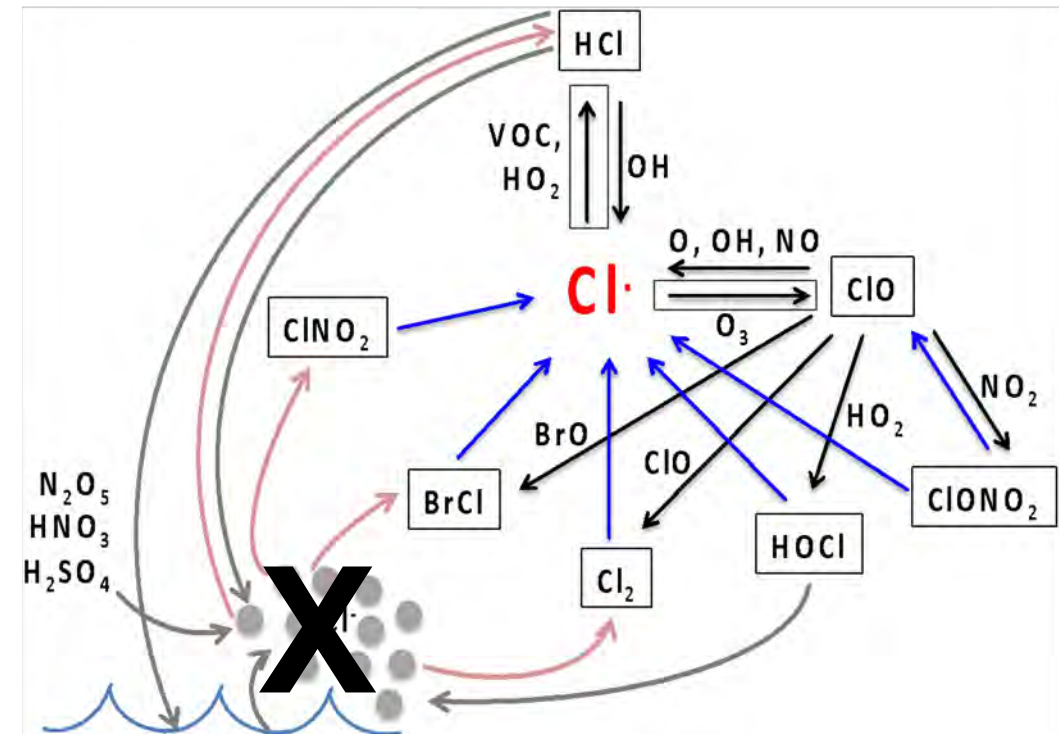
Toronto

- THE CIX site is located in an urban/suburban transition zone.
 - Not impacted by any large local sources (i.e. >500 m from any major roads).
 - ~20 km north of downtown Toronto and Lake Ontario (~2-3 hours transport time from downtown)
 - Typically not impacted by lake breeze fronts until late afternoon during summer.



Halogens

- Our team will be exploring reactive chlorine chemistry in Toronto.
 - Chlorine cycling in mid-continental regions are poorly understood.
 - We have previously observed HCl and pCl⁻ in summertime Toronto.
- We will explore direct sources and processes.
- We will also undertake an HCl instrument intercomparison.
- Measurements will be discussed in instrument presentation later today.



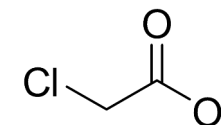
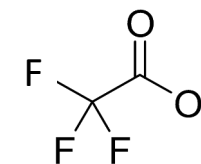
Emissions

- We will have a suite of measurements that will allow us to determine emissions and quantities of several pollutants and greenhouse gases:
 - Meteorology and irradiance
 - SMPS (2 nm – 1 μm particles)
 - OPS (0.3 – 10 μm particles)
 - O_3
 - NO_x
 - TN_r (total reactive N; will be described in instrument talk)
 - QCL (N_2O , CO_2 , CO)
 - *Probably but not yet officially confirmed*: CRDS (CH_4 , CO_2 , CO)

Contaminants

- Our team will be measuring several organic contaminants from two classes:

1. Numerous poly- and perfluoroalkyl substances (PFAS)
2. Haloacetic acids



- We will capture atmospheric deposition, as well as in situ gas and particle phase composition:

- i. Automated precipitation samplers + offline analysis
- ii. ToF-CIMS (acetate)
- iii. Ambient ion monitor-ion chromatography-mass spectrometry (AIM-IC-MS)



Contaminants

- We have observed higher-than-expected levels of gaseous PFAS in Toronto.
- This will be the most comprehensive set of atmospheric PFAS measurements to date.

Inorganics

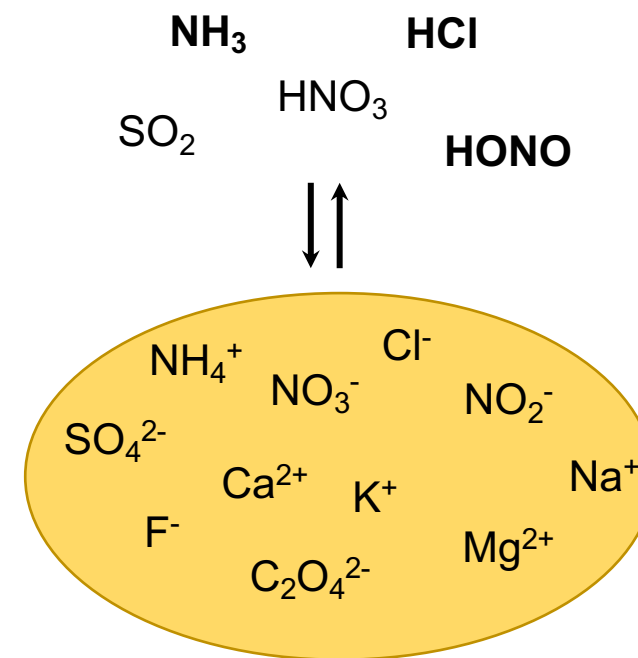
- Our team will be exploring gas-particle partitioning with a suite of gas and particle measurements.

Particle:

- **AIM-IC-MS**: hourly online measurements of PM_{2.5} water-soluble ionizable composition
- **nano-MOUDI**: daily offline measurements of 12 size fractions from 10 nm – 10 μm

Gas:

- **AIM-IC-MS**: hourly online measurements of water-soluble ionizable gases
- **QCL**: high time resolution NH₃
- **TILDAS/CRDS**: high time resolution HCl
- **ToF CIMS (acetate)**: high time resolution HONO



Thank you!

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