Source Apportionment Tools for Speciated Atmospheric Mercury in Urban Centers and Rural Locations.

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Motivations

- Methyl Mercury in Fish - Public Health Concern
- Atmospheric Deposition
-立法Emissions
- Do We Understand Source-Receptor Relationships?
Do local point sources of reactive mercury impact locations nearby?

- Studies* show that local RM and GEM sources impact atmospheric concentrations in nearby downwind locations
- Must take into account susceptibility of watershed to Hg methylation
- Develop methods that could be used by State Officials (i.e. WI DNR Air Management)
- NADP Atmospheric Mercury Initiative

* Gabriel, et al., 2005; Lynam and Keeler, 2005 & 2006; Yatavelli, et al., 2006; Poissant et al., 2004
Measurement Locations

- Tekran AMA located at
  - Devil’s Lake April 2003–March 2004
  - Milwaukee May 2004–June 2005
  - Mexico City, DF, March 2006
  - St Louis, MO (Oct-Dec 2002, Dec-Mar 2003-04)
  - Los Angeles, CA (Aug 2005 & 2006)
  - Yellowstone National Park, WY (Summer 2004)
Definition of Local Point Source Impacts

- Impacts from local point sources defined as a short lived increases in concentration

Devil's Lake State Park, WI

Background

Mercury concentration (μg m⁻²)

Local Point Source

Local Sources Can Be Important

Milwaukee, WI

Mexico City

Source Apportionment

Reactive Mercury at Devil's Lake State Park, WI

- Mercury Concentration (pg m⁻³)
- Periods without point source impacts
- Mean of concentrations measured during period without point source impacts at Devil's Lake State Park

Reactive Mercury at Milwaukee, WI

Source Apportionment

Gasoline Elemental Mercury

- Mercury Concentration (pg m⁻³)
- % Contribution to average

Reactone Mercury

- Mercury Concentration (pg m⁻³)
- % Contribution to average


Speciation of Atmospheric Mercury Varied Greatly Between Plumes in St Louis

Elevated Hg⁰ plumes
Elemental Mercury Concentrations - LA Basin

Measured gaseous Hg (TGM) at various sites using a mobile Tekran unit

TGM at various sites differed from global background concentrations

The maximum TGM concentrations was 9 ng/m³

PHg from fires outside Park
Atmospheric Study Conclusions

- “Local” point sources of mercury in the US are important to State Air Sheds.
- Estimates of source apportionment between “local” and “distant” sources relatively straightforward.
- Emission Inventories can be examined with CFA.
- Mobile monitoring of GEM for source identification.
- Speciation of mercury in plumes varies between locations / emitting processes/ time.

Questions and Comments...
Regulation

- Wisconsin Mercury Rule
  - Adopted by Natural Resources Board June 2008
  - Legislative Review began August 2008
  - Went into effect November 2008
  - 90% reduction by 2015 for Coal Fired Power Plants over 150MW
  - Plants under 150MW subject to BACT
  - New Plants subject to 98% reduction as of December 2008
  - Multi-pollutant option (i.e. control of NOx and SO2) gives 6 additional years.
  - Similarities and differences to parallel rules in Michigan, Illinois, and Minnesota.
    - [http://dnr.wi.gov/air/toxics/mercury/rule.htm](http://dnr.wi.gov/air/toxics/mercury/rule.htm)

LA Basin Atmospheric Hg

- Summer 2005
  - Measured Elemental, RGM, and particulate Mercury in Riverside for one Month
  - Elevated Elemental and Reactive Mercury
  - Observed Mercury Plumes

- Summer 2006
  - Investigated sources of elemental mercury
  - Core sites at USC and Anaheim
  - Movable and Mobile Sites