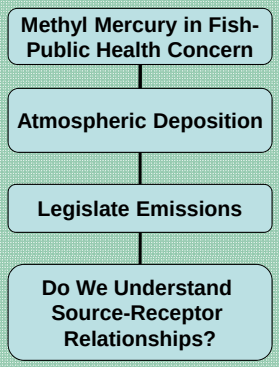
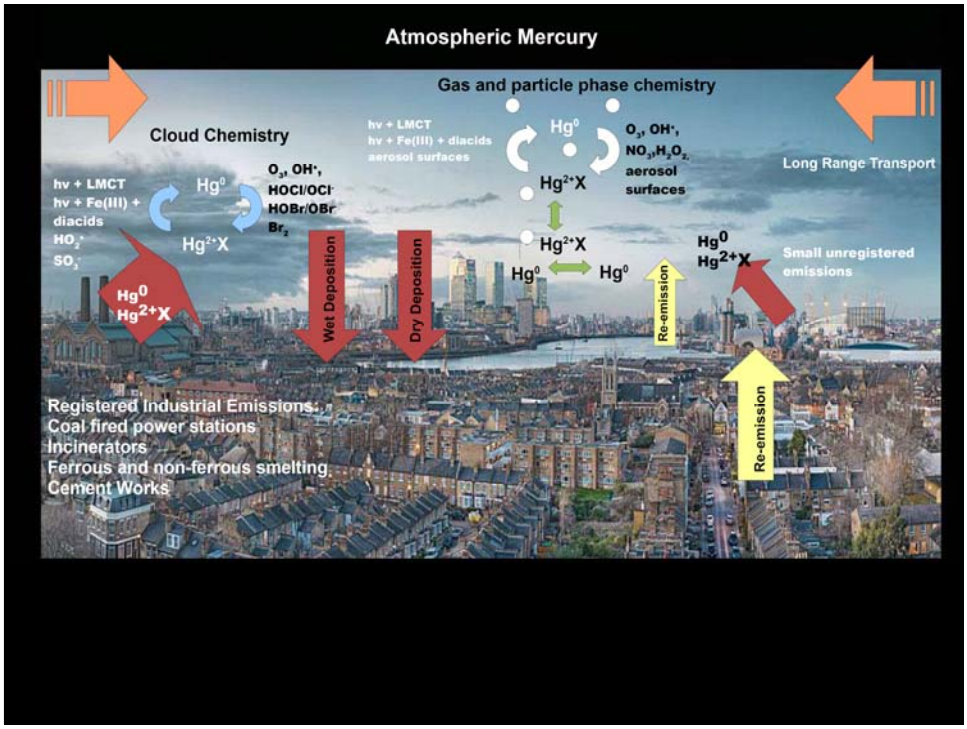
# Source Apportionment Tools for Speciated Atmospheric Mercury in Urban Centers and Rural Locations.

Andrew P. Rutter, James J. Schauer

*Environmental Chemistry and Technology Program, University of Wisconsin- Madison*

## Motivations

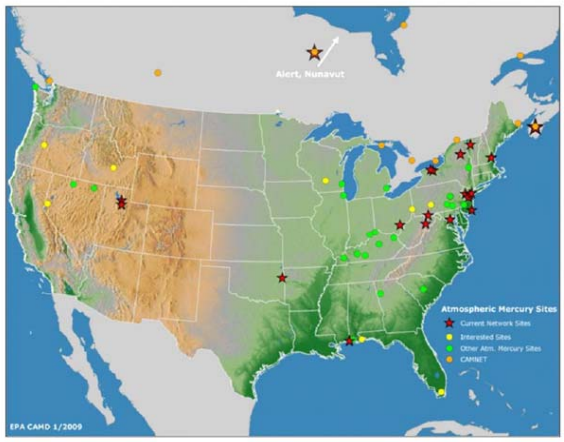





## Do local point sources of reactive mercury impact locations nearby?

- 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

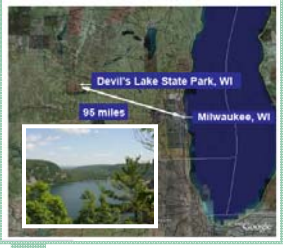
* Gabriel, et al., 2005; Lynam and Keeler, 2005 & 2006; Yatavelli, et al., 2006; Poissant et al., 2004




| Site | Contacts(s) |
|---|---|
| Underhill, VT (at VT99) | Eric Miller, ERG |
| Beltsville, MD (at MD99) | Winston Luke/David Schmeltz, NOAA ARL/EPA CAMD |
| Canaan Valley Institute, WV | Steve Brooks/Rick Artz, NOAA ARL |
| Grand Bay National Estuarine Research Reserve, MS | Winston Luke/Steve Brooks/Rick Artz, NOAA ARL |
| West Florida | Eric Edgerton/ARA, Inc |
| Piney Reservoir, MD | Mark Castro, University of Maryland, Frostburg |
| Nova Scotia, Canada | Rob Tordon, Environment Canada |
| Steubenville, OH | Jerry Keeler/Matt Landis, University of Michigan/EPA ORD |
| Ohio University; Athens, OH | Kevin Crist/Gary Conley |

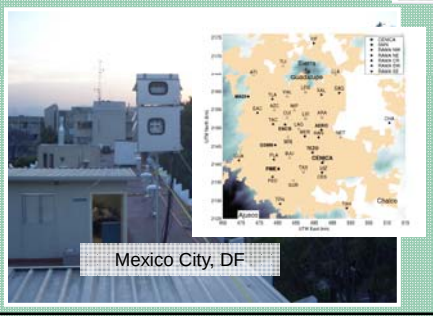
# Measurement Locations

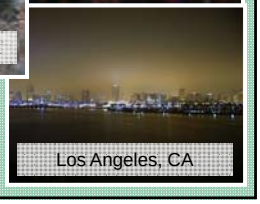
- Tekran AMA located at
  - **Devil's Lake** April 2003- March 2004
  - **Milwaukee** May 2004- June 2005
  - **Mexico City**, DF, March 2006
  - **St Louis, MO** (Oct-Dec 2002, Dec-Mar 2003-04)
  - **Los Angeles, CA** (Aug 2005 & 2006)
  - **Yellowstone National Park**, WY (Summer 2004)







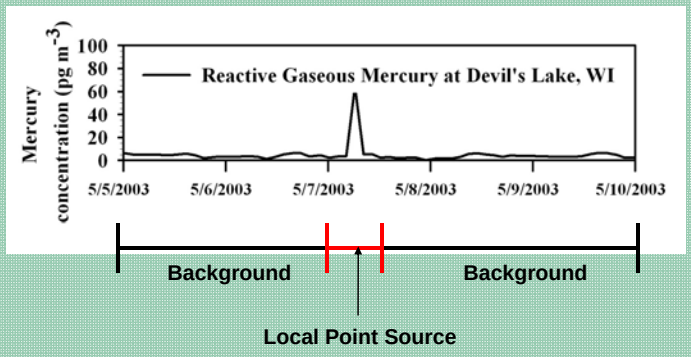


# Definition of Local Point Source Impacts

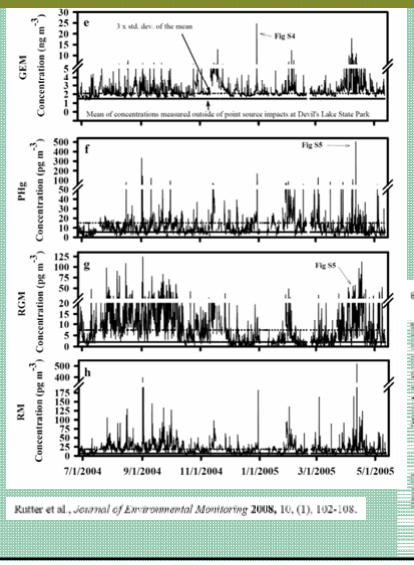
- Impacts from local point sources defined as a short lived increases in concentration

**Devil's Lake State Park, WI**



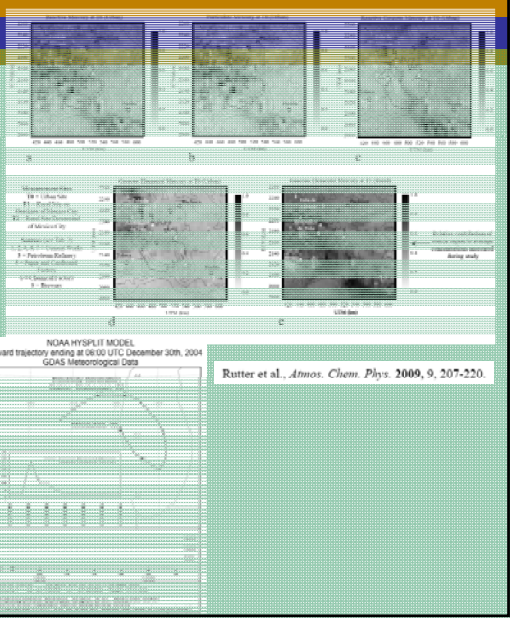

# Local Sources Can Be Important

Milwaukee, WI



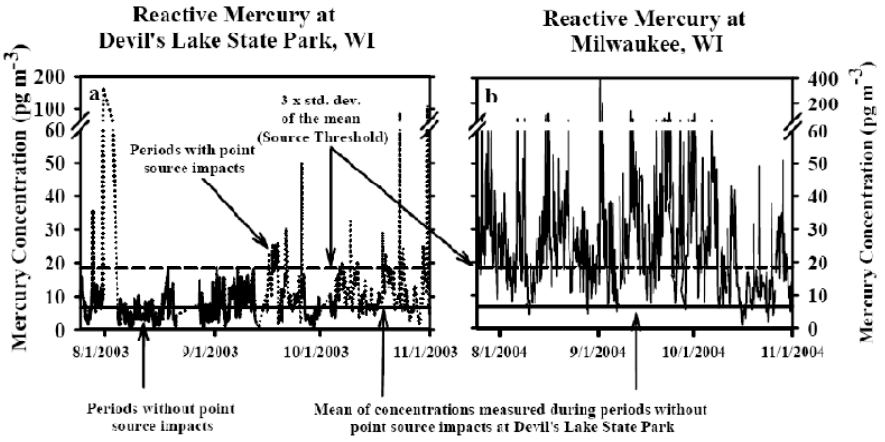

Rutter et al., *Journal of Environmental Monitoring* **2008**, 10, (1), 102-108.

Mexico City

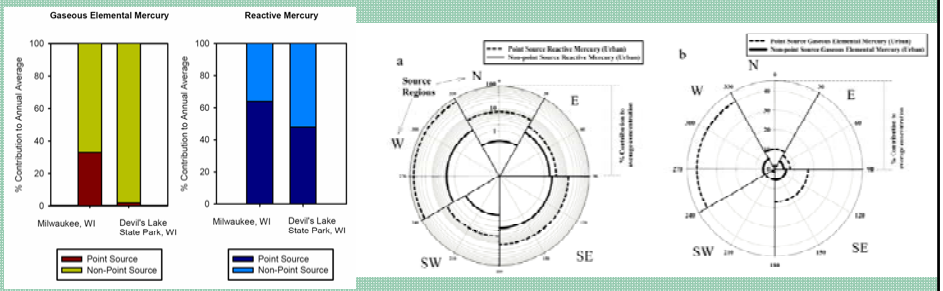



Rutter et al., *Atmos. Chem. Phys.* **2009**, 9, 207-220.

# Source Apportionment




# Source Apportionment

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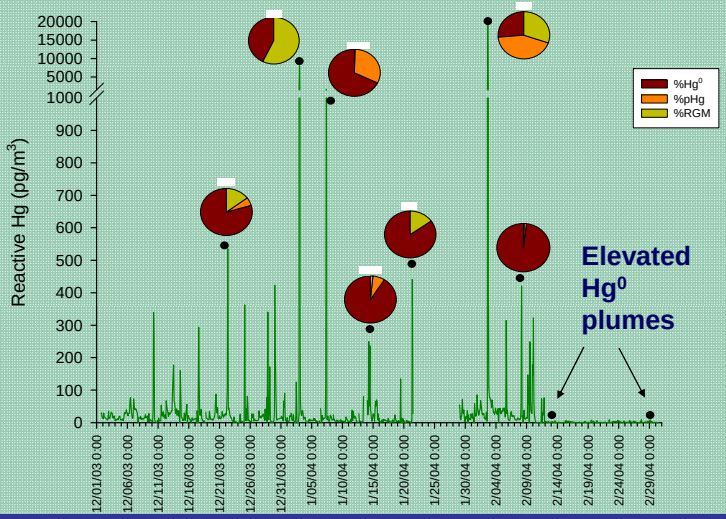
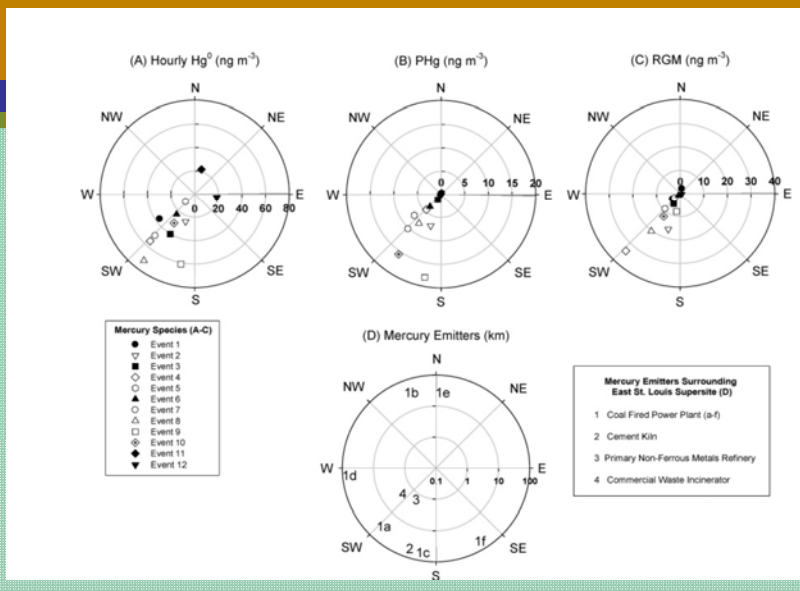
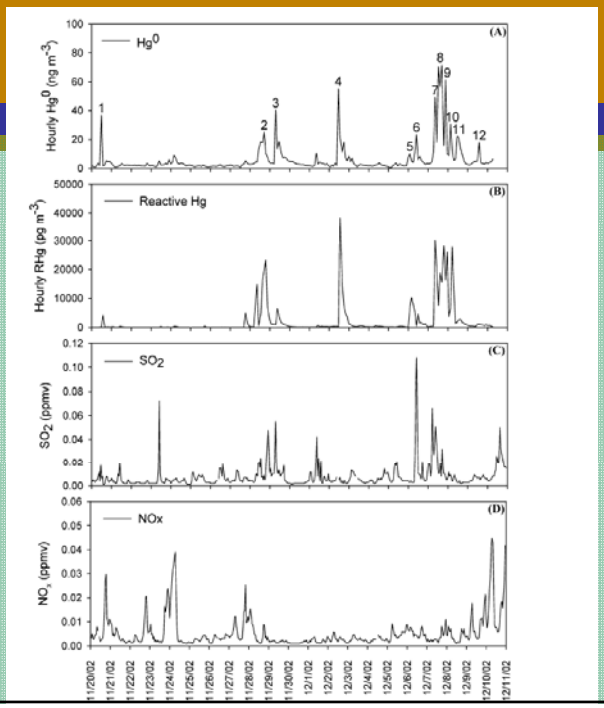
## Speciation of Atmospheric Mercury

## Varied Greatly Between Plumes in St Louis

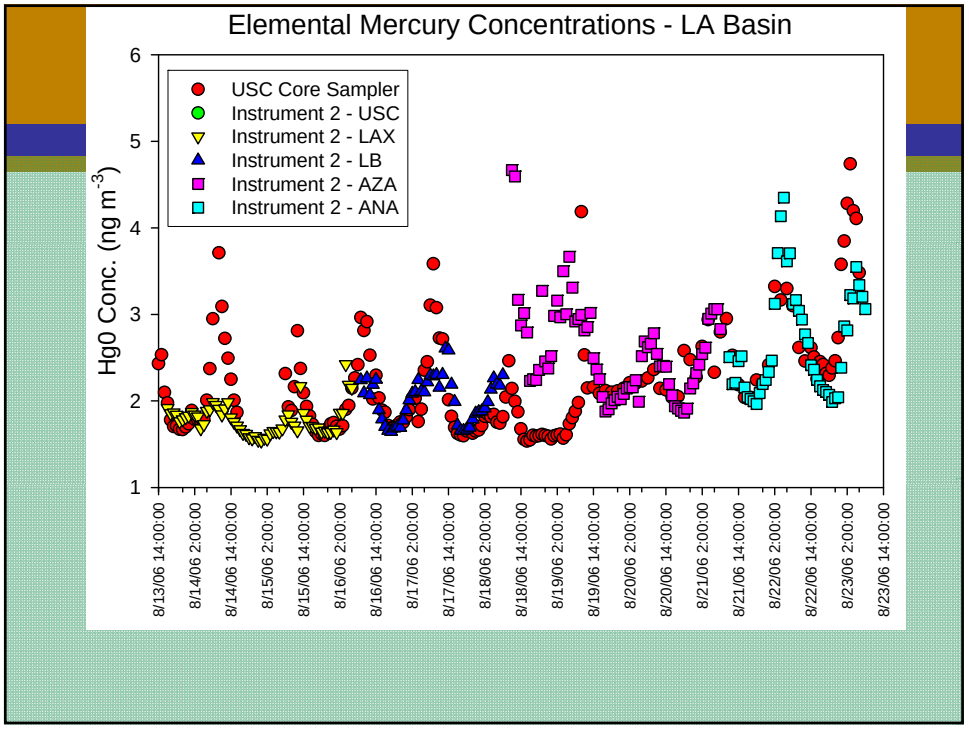


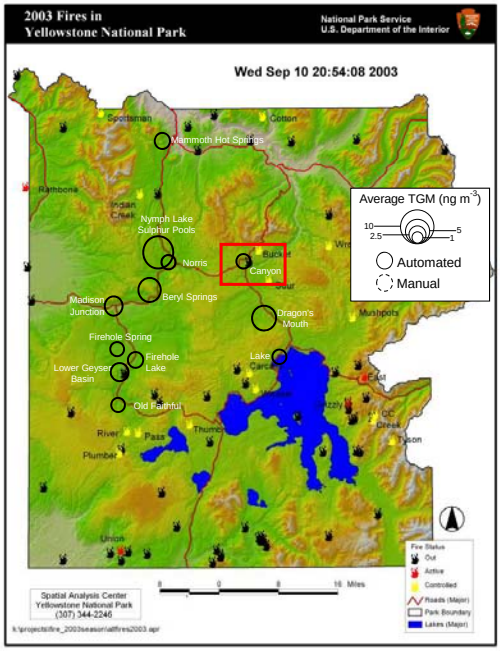






# Los Angeles, CA


**http://www.epa.gov/air/data/**




**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/m$^3$**

**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 $SO_2$) 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/pdf/MercuryPreliminaryFinding200803.pdf
http://dnr.wi.gov/news/mediakits/mk_mercury.asp

# 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