Mercury Deposition Network (MDN) – National Status and Trends

Mark Nilles (USGS), Amy Ludtke (USGS), Eric Prestbo (Frontier Geosciences, Inc.), David Gay (Illinois State Water Survey)

Mercury Deposition Network (MDN) Database Objectives

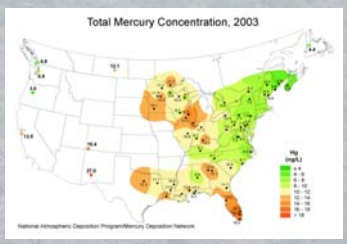
- Quantify geographic distribution of mercury deposition
- Monitor seasonal and long term trends in mercury deposition
- Provide better understanding of relation between mercury emissions and deposition
- Acquire data for model development
- Record baseline data to gauge effectiveness of future controls

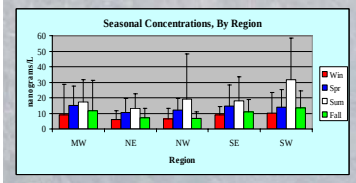
MDN monitoring includes:

- Dual orifice precipitation sampler
- Recording rain gage
- Consistent sampling protocols
- Central laboratory
- Data availability on the Internet
- Internal and external QA/QC

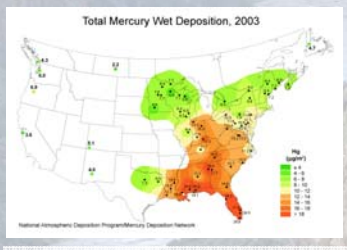
- MDN is one of 3 networks managed by the National Atmospheric Deposition Program (NADP)
- MDN monitors for total mercury at nearly 100 sites and methyl-mercury at about 20 sites in the U.S. and Canada
- Weekly composite samples are analyzed by cold vapor atomic fluorescence
- NADP is a cooperative effort, supported by federal, state, private, academic, and tribal entities
- Median total mercury for all sites = 10 ng/L

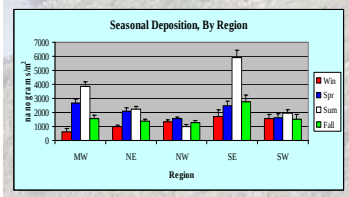
Seasonal and Regional Mercury Concentration and Deposition





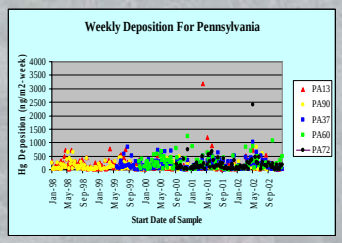
- Highest total mercury concentration in Southeast, Upper Midwest, and Southwest U.S.
- Higher mercury concentration during warmer months

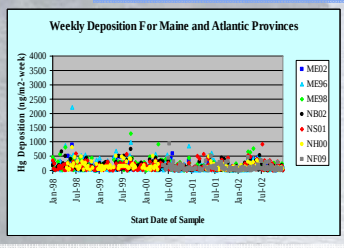


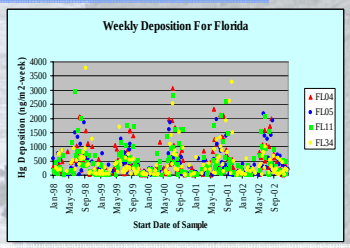


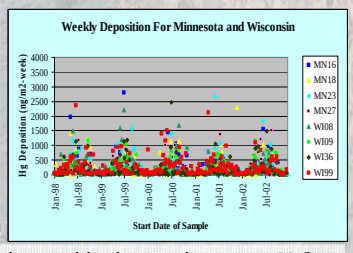
- Highest deposition in southeastern U.S.
- Higher mercury deposition during warmer months

Mercury Deposition Comparison for MDN Sites









Upper midwestern and southeastern sites show stronger seasonal dependence for mercury deposition than sites located in the northeastern U.S.

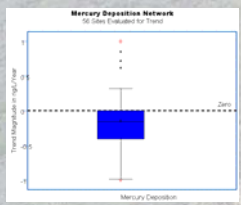
Concentration Trends (1996 – 2003)

Number of Sites Evaluated	56
Median trends of 53 sites[a]	-0.17 ng/L/yr
Number of sites with positive slope[b]	13
Number of sites with negative slope[b]	41
Number of sites with zero slope[b]	2
Number of sites with significant positive trend slope at α=.05[b]	2
Number of sites with significant negative trend slope at α=.05[b]	9

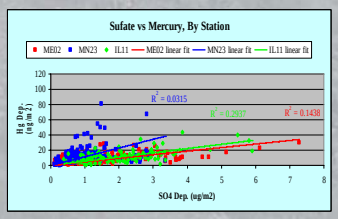
[a] – calculated using the following: [(sen slope estimator * years of record)/average concentration in first 3 years of analysis]
[b] – determined using the seasonal Mann-Kendall test

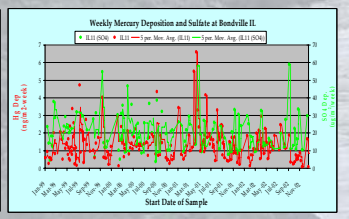
Deposition Trends (1996 – 2003)

- Wet mercury deposition increased from 1996 to 2003 at southwestern and upper midwestern sites, and decreased at eastern sites
- Mercury deposition decreased at a majority of sites between 1996 and 2003



Weekly mercury and sulfate deposition at MDN sites





Sulfate deposition appears to be weakly correlated with mercury deposition at the studied sites.

Future Directions for MDN

- Expand network coverage, especially in the Western U.S.
- Enhance data and graphical products
- Develop and deploy a next generation wet-deposition sampler
- For collection of mercury and additional trace metals

Visit: http://nadp.sws.uiuc.edu/mdn/ or Google: Mercury Deposition Network