

Atmospheric Mercury in the Great Lakes Region



Issue 1, Winter 1996

The University of Michigan, Ann Arbor, Michigan

Air Quality Laboratory Begins Regional Study

The University of Michigan Air Quality Laboratory (UMAQL) has initiated a two-year study of atmospheric mercury in the Great Lakes region. The Great Lakes Atmospheric Mercury Assessment Project (GLAMAP) is jointly sponsored by the Great Lakes Protection Fund and the US EPA National Environmental Research Laboratory (NERL).

Project Goals

The UMAQL has two primary objectives for GLAMAP:

(1) to establish a regional monitoring program for investigating the transport of and determining the source areas for atmospheric mercury in the Great Lakes region,

(2) to facilitate cooperation among Great Lakes agencies and research groups to maintain this monitoring program.

GLAMAP began in July 1994, with a workshop on atmospheric mercury where Great Lakes agencies and research groups worked to-

gether to finalize the plans for the monitoring network. Installation of the sampling equipment at the monitoring sites began in November 1994 with the last site operational in May 1995.

Monitoring Network

The atmospheric mercury monitoring network currently includes more than ten sites located throughout the

Great Lakes region, with most of the states and provinces that border the Great Lakes participating.

Measurements of particle- and gas-phase mercury in ambient air are obtained on a routine basis concurrently at each of the sites (24-hour samples every 6th day). Total particulate samples are also collected on the same schedule for trace metal measurements.

Measurement	Method Description*
Particle-phase Mercury	Open-face Teflon filter pack with glass fiber filter Extracted in 10% HNO ₃ with microwave digestion Analyzed by cold-vapor atomic fluorescence spectroscopy (CVAFS)
Gas-phase Mercury	Gold-coated glass bead traps Analyzed by CVAFS
Particulate Trace Metals	Open-face Teflon filter pack with Teflon filter Analyzed by XRF at US EPA-NERL

*UMAQL methods to be published in US-EPA Compendium of Methods for Toxic Inorganic Pollutants, 1996.

Great Lakes Agencies Meet at UMAQL Workshop

Representatives from federal, state and provincial agencies for the Great Lakes region met with scientists studying atmospheric mercury at a workshop held at the University of Michigan on July 7th and 8th, 1994. The goals of this workshop were to:

- **finalize the monitoring program** to assess atmospheric mercury levels in the Great Lakes re-

gion (i.e. sampling site locations),

- **provide an overview** of state-of-the-art mercury sampling and analysis techniques and ongoing mercury measurements in the region,

- **describe the plan** for determining the major source areas for atmospheric mercury in the Great Lakes region,

- **identify common goals** with

other programs and potential for collaboration.

The UMAQL sponsored the workshop to promote cooperation among the Great Lakes agencies that would be needed to establish the regional monitoring network. Involving these groups in the design of the monitoring activities proved to be an important step in generating support for the project.

Atmospheric Mercury in the Great Lakes Region will be published over the next two years to disseminate the key findings of the project. This first issue focuses on progress to date including the workshop in July 1994, descriptions of the monitoring locations, and the various agencies involved. Preliminary summaries of data available to date are also presented.

Future Issues

Plans for future issues include an analysis of the spatial and seasonal variation of atmospheric mercury concentrations in the Great Lakes region using the first year of results, followed by an assessment of the regional transport and source areas for the atmospheric mercury.

Send comments or requests for copies of the newsletter to:

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Monitoring Sites Established

The UMAQL has established more than ten sites for the GLAMAP monitoring network. These include the five Integrated Atmospheric Deposition Network (IADN) master sites along the Great Lakes shores. The other sampling locations were chosen by the workshop participants to complete the spatial coverage of the Great Lakes region. Selected sites were required to be in rural or remote areas in order to investigate the regional transport of atmospheric mercury. The locations of the GLAMAP sites within the Great Lakes region are displayed in *Figure 1*.

Site Installations

UMAQL staff began installation of the sampling equipment and operator training for GLAMAP in November 1994. The sampling equipment includes a fiberglass box mounted to the top of a three meter pole. Inlets to the sample filter packs protrude from the bottom of the box during sampling. Hard-walled polyethylene tubing connects the sampling box to the pump unit, which consists of three separate pumps and an internal heater. The unit is enclosed in an insulated wooden box for protection during harsh winter conditions encountered at several of the sites.

After the equipment was installed and tested, site operators were trained in the proper techniques for handling and collecting

atmospheric mercury samples. Many of the operators had collected samples for other research projects and already had experience with standard operating procedures for air pollution studies.



Point Petre, Ontario

Atmospheric mercury monitoring was established at this Canadian IADN site in November 1994 with the support of AES/CARE. **Darrel Smith** collects the samples at this site on the northeast shore of Lake Ontario near Picton, Ontario.



Point Petre, Ontario

Acknowledgments

Because of the regional nature of this study, cooperation from many Great Lakes federal, state and provincial agencies was needed to get the atmospheric mercury monitoring program underway. We would like to acknowledge the efforts of several people whose assistance with coordinating the funding for site operations and help with the site installations was essential:

Gary Evans, Project Manager, US EPA-NERL; **Jackie Bode** of the US EPA Great Lakes National Program Office (GLNPO) for the United States IADN sites; **Frank Fraude** and **Jim Owens** of the Atmospheric Environment Service/Center for Atmospheric Research Experiments (AES/CARE) in Canada for the two Canadian IADN sites; **Rick Strassman** of the Minnesota Pollution Control Agency; **Phil Downey** of the Ohio EPA; **Doug Knauer**, **Mark Allen** and **Bruce Rodger** of the Wisconsin DNR; **Marty Auer** and **James Pauer** at Michigan Technological University; **Kim Irvine** at Buffalo State College; **Clyde Sweet** and **Donald Dolske** at Illinois State Water Survey; **Steve Yancho** and **Tom Van Zoeren** at Sleeping Bear Dunes National Lakeshore.

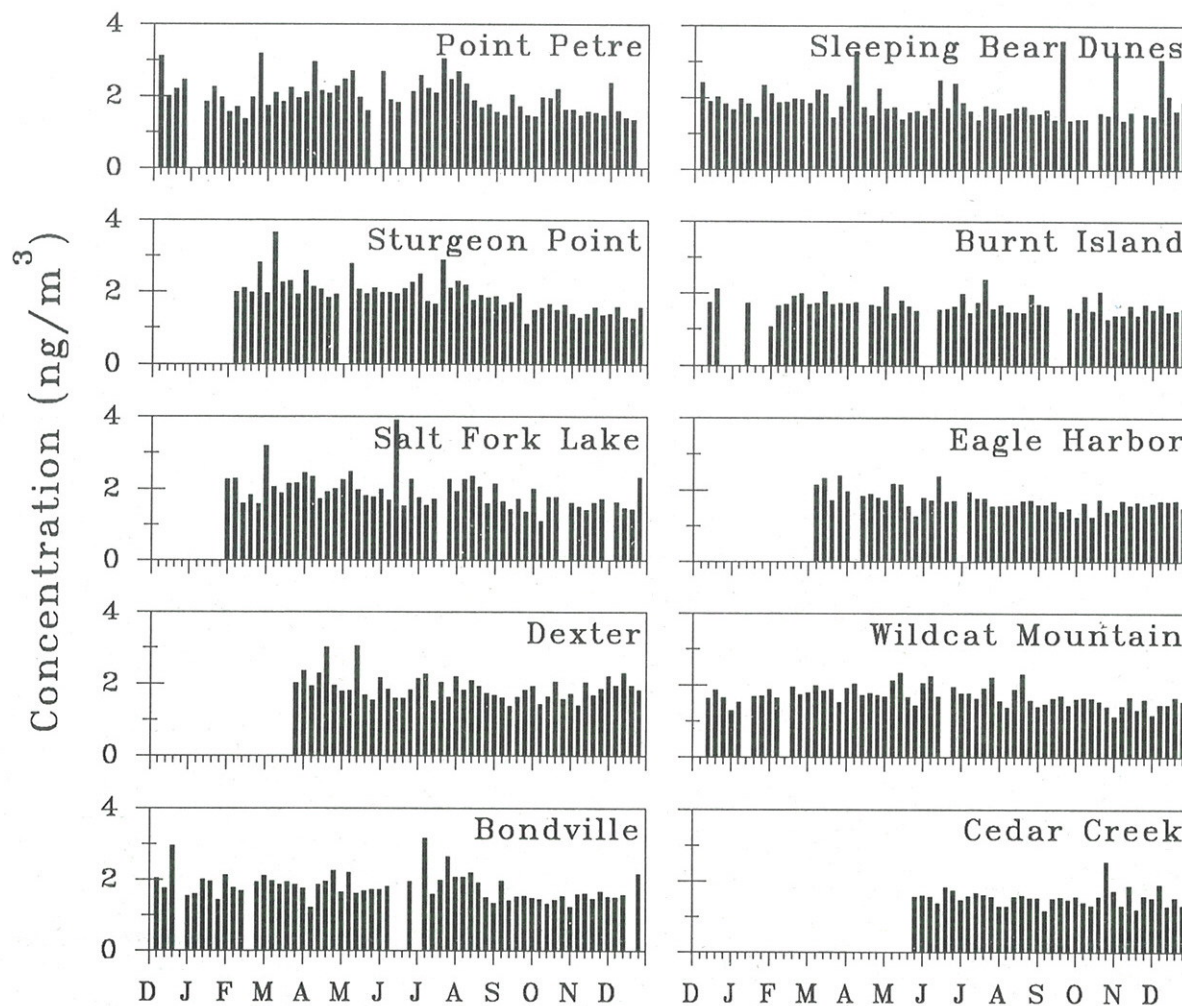


Figure 3. Vapor-Phase Mercury Concentrations (ng/m³)
December 1994 - December 1995

Preliminary Results

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tions by site through December 1995 ranged from 1.6 ng/m³ at Cedar Creek, Minnesota to 2.0 ng/m³ at Point Petre, Ontario (Figure 2). It should be noted that for a few of the sites the average concentrations are calculated with less than 10 months of data (Cedar Creek, Dexter, Eagle Harbor).

Sites located within the eastern and southern Great Lakes region tend to have higher average concentrations than sites in the western and northern parts of the region. When an entire year of con-

current measurements is available for all the sites it will be determined whether the average vapor-phase mercury concentrations are statistically different across the Great Lakes region.

Variability in vapor-phase mercury levels at each of the monitoring locations is more pronounced at the eastern and southern Great Lakes sites where the maximum concentrations were above 3.0 ng/m³ (Figure 3). Sites in the northern and western areas of the Great Lakes region tend to have stable vapor-phase mercury

concentrations less than 2 ng/m³. It should be noted that the concentrations displayed in Figure 3 are for 24 hour samples collected on an every sixth day schedule.

Particle-phase Mercury

Samples analyzed to date for GLAMAP indicate particle-phase mercury concentrations range over two orders of magnitude (1 to 100 pg/m³). A similar trend is evident for particle-phase mercury, with the eastern Great Lakes sites having

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Inside...

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Great Lakes Agencies Meet
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Preliminary Results

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higher concentrations than the western and northern sites, although only a few months of samples have been analyzed to date. Analysis of the sample filters is currently ongoing at UMAQL. These results will be presented in a future issue of this newsletter.

Particulate Metals

Total particulate sample filters will be analyzed using x-ray fluorescence (XRF) at the US EPA-NERL. Concentrations of many elements including trace metals will be obtained from this analysis. Source signatures can be identified using these trace metal levels which may provide information on the relative contribution of different source types to atmospheric mercury levels in the Great Lakes region. Results of this analysis will also be published in a future issue of the newsletter.

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WORLD WIDE WEB!!**

**UMAQL will soon be on the
University of Michigan School
of Public Health homepage:**

<http://www.sph.umich.edu>

Academic Programs:
Environmental and Industrial
Health

*On UMAQL homepage:
GLAMAP Network*