

Abstracts

Thursday, May 1

Session M4: Mercury in Air, Water, and Fish Tissue

3:30 – 5:00 pm | Room 237

The Atmospheric Mercury Network: Measurement of Atmospheric Mercury Fractions across North America

David Gay¹, David Schmeltz², Eric Prestbo³, Mark Olson¹, Timothy Sharac² and Robert Tordon⁴

¹University of Illinois, Urbana Champaign, Ill., ²US Environmental Protection Agency, Washington, D.C., ³Tekran Research and Development, Seattle, Wash., ⁴Environment Canada, Dartmouth, N.S., Canada

Abstract

The National Atmospheric Deposition Program (NADP) has developed and is currently operating a collaborative network of atmospheric mercury (Hg) monitoring sites based in North America – the Atmospheric Mercury Network (AMNet).

The goal of this network is to develop a robust database of Hg fraction measurements to improve model development, assess policies and programs, and improve estimates of mercury dry deposition. Many different agencies and groups support the network, including federal, state, tribal, and international governments, academic institutions, and private companies. Network sites measure concentrations of atmospheric Hg fractions using automated, continuous mercury speciation systems. The procedures that NADP developed for field operations, data management, and quality assurance ensure that the network makes scientifically valid and consistent measurements.

AMNet reports concentrations of hourly gaseous elemental mercury (GEM), two-hour gaseous oxidized mercury (GOM), and two-hour particulate-bound mercury less than 2.5 microns in size (PBM2.5). As of January 2013, over 600,000 valid observations are available from 30 stations. All data and methods are publically available through an online database on the NADP website (<http://nadp.sws.uiuc.edu/amn/>). The data available from this network will allow for in-depth analysis and modeling studies for the mercury community, which also could have important policy implications for future mercury regulation.

For this talk, we will present an overview of the network, review the quality assurance aspects of the data review, and provide initial observations of individual sites and over space.

Future network directions are to foster new network partnerships and continue to collect, quality assure, and post data, including dry deposition estimates to compliment currently available wet deposition measurements.

The Great Lakes Atmospheric Mercury Monitoring Network

Martin Risch¹, Donna Kenski² and David Gay³

¹US Geological Survey, Indianapolis, Ind., ²Lake Michigan Air Directors Consortium, Rosemont, Ill., ³Illinois State Water Survey, Champaign, Ill.

Abstract

As many as 51 mercury (Hg) wet-deposition-monitoring sites from 4 networks were operated in 8 USA states and Ontario in the Great Lakes Region from 1996-2010. By 2013, 20 of those sites were no longer in operation and approximately half the geographic area of the Region was represented by a single Hg-monitoring site. In response, a Great Lakes Atmospheric Mercury Monitoring (GLAMM) network has been developed as a framework for regional collaboration in Hg-deposition monitoring. The purpose of the GLAMM network is to detect changes in regional atmospheric Hg deposition related to changes in Hg emissions.

The development and funding of this network is a successful example of federal, state, and regional partnerships. A majority of the active and historic Hg-monitoring sites in the Great Lakes Region are part of the National Atmospheric Deposition Program (NADP) Mercury Deposition Network (MDN) and the GLAMM network will be part of the MDN. Sites in the MDN have comparable data because of uniform equipment and procedures and a central laboratory.

An important component in the development of the GLAMM was an optimized design for a regional network. This design was based on a relatively complex evaluation that determined a representative and approximately uniform geographic distribution of Hg-monitoring sites for the Region. In the past, each state or other funding entity determined the location of Hg-monitoring sites for their own purposes.

Implementation of the network design offers improved monitoring coverage and increased efficiency in monitoring operations. A regional planning agency will use federal funding to start or re-start a total of 9 Hg-monitoring sites in the network to fill gaps in the geographic distribution of sites in 4 states. Four states and Ontario will continue to support operation of 12 MDN sites that were still active in 2013. The network design evaluation criteria can be used by states to identify monitoring sites that are important for understanding regional trends and spatial patterns in Hg deposition. In addition, Hg-monitoring sites in the GLAMM are co-located with NADP acid-rain monitoring and Hg-in-air monitoring sites to increase efficiency in monitoring operations and to add opportunities for data comparison.

Results of EPA's Assessment of Fish Tissue from U.S. Rivers for Mercury and Legacy Organic Compounds with implications for Aquatic Life and Human Health

John Wathen¹, Leanne Stahl¹, James Lazorchak², Angela Batt², Blaine Snyder³ and Harry McCarty⁴

¹US Environmental Protection Agency, Washington, D.C., ²US Environmental Protection Agency, Cincinnati, Oh., ³Tetra Tech, Inc., Owings Mills, Md., ⁴CSC, Alexandria, Va.

Abstract

Mercury and persistent halogenated organic compounds occur in fish tissue in U.S. lakes, rivers, and streams. Mercury, PCBs, and DDT occurring in fish tissue are the leading cause of fish consumption advisories. In a continuing effort to characterize the extent of contamination in the Nation's waters, EPA's Office of Water and Office of Research and Development collaborated to conduct the first statistically based survey of persistent and bio-accumulative contaminants in fish from U.S. rivers. This national fish survey was conducted June through October in 2008 and 2009 within EPA's National Rivers and Streams Assessment (NRSA), a probability-based survey designed to assess the condition of the Nation's streams and rivers. Field teams applied consistent methods nationwide to collect samples of fish species of sizes consumed by humans at 541 randomly selected river locations (\geq 5th order) in the lower 48 states during June through October. They collected one composite fish sample consisting of five similarly sized adult fish of the same species at every sampling location. Largemouth and smallmouth bass were the primary species collected for the study, accounting for 34% and 24% of all fish composites, respectively. Homogenate samples were analyzed for Hg by AA and a suite of ~50 organo-halogen compounds including PCBs (21 congeners), PBDEs (8 congeners), Chlordane, and DDT compounds and degradation products, and other pesticides, (Aldrin, Dieldrin, Mirex, and Endosulfan) by GC-ECD. Samples were collected from both non-urban (379 sites) and urban locations (162 sites). All samples contained Mercury above the quantitation level, and study data indicate that PCBs, PBDEs, Chlordane, and DDT compounds occur at quantifiable levels in almost every fish sample collected for the study. Ongoing analysis of the data from this study will apply both human health and aquatic life thresholds to fish tissue concentrations of Mercury and these four organo-halogen contaminant groups from both urban and non-urban sites. In addition, we are examining the percentages of co-occurrence of Mercury and these four compound groups at concentrations above the respective contaminant group medians.

Mercury Monitoring and Assessment in the Ohio River

Jason Heath, Eben Hobbins and Jeff Thomas

Ohio River Valley Water Sanitation Commission, Cincinnati, Oh.

Abstract

Control of mercury in the Ohio River has become a highly controversial issue in the Ohio Valley. The Ohio River Valley Water Sanitation Commission (ORSANCO) is an interstate agency for water pollution control which sets water quality standards for the Ohio River. The discharge of mercury is regulated with a total mercury water quality criterion of 0.012 µg/L and a fish tissue methyl mercury criterion of 0.3 mg/Kg. In addition, elimination of mixing zones for bioaccumulative chemicals of concern (including mercury) is set to take effect in the near future which would require discharges to meet the 0.012 µg/L total mercury criterion end-of-pipe. In addition, the US EPA has dropped the 0.012 µg/L criterion from their national recommended criteria list. ORSANCO's criterion is listed as "not to be exceeded", while it was established to protect against undesirable bioaccumulation in fish tissue which occurs over a much longer timeframe.

Questions to be addressed in this paper, through monitoring efforts, include: Is the "not to be exceeded" total mercury criterion of 0.012 µg/L the correct criterion to protect against methyl mercury bioaccumulation in fish? How should methyl mercury fish tissue data and total mercury water quality data be used to determine if the Ohio River is impaired for mercury?

Results will be presented of a special one-year monitoring study to compare total mercury in the water column to methyl mercury in fish tissue. Evaluation of the total mercury water quality criterion based on the study will be presented. The commission collects a substantial amount of water samples for total mercury and fish tissue samples from multiple species for methyl mercury for its 305(b) assessment of the Ohio River. These data frequently give conflicting indications of impairment. The challenges and resolution associated with such conflicting data will be discussed in depth.

The Ohio River borders six states and three US EPA regions. The Commission itself is comprised of three Commissioners from each state appointed by the governor and three federal Commissioners appointed by the President. All technical work is coordinated through state/federal workgroups.