

Atmospheric Mercury in Vermont and New England: Measurement of deposition, surface exchanges and assimilation in terrestrial ecosystems

Final Project Report – Introduction – 1/16/2009

Investigators and Institutions:

Principal Investigator Melody Brown Burkins, PhD
The Rubenstein School of Environment and Natural Resources
University of Vermont
Burlington, Vermont 05405
Voice: 802-656-2982; email: melody.burkins@uvm.edu

Co-Principal Investigator Eric K. Miller, PhD
Ecosystems Research Group, Ltd. (ERG)
Aldrich House, 16 Beaver Meadow Road
Norwich, Vermont 05055
Voice: 802-291-0831; email: ekmiller@ecosystems-research.com

Co-Principal Investigator Gerald J. Keeler, PhD
University of Michigan
109 Observatory Street
Ann Arbor, Michigan 48109
Voice: 734-936-1836; email:

Project Overview

The primary objectives of this project were to 1) continue year-round monitoring of mercury wet-deposition in the Lake Champlain Basin; 2) establish measurements of speciated (GEM, RGM, HGP) ambient atmospheric mercury; 3) conduct measurements of surface-atmosphere exchanges of gaseous elemental mercury (GEM) over a New England forest; and 4) evaluate possible pathways for assimilation of atmospheric mercury into the biota of terrestrial ecosystems of the region.

The project was designed as part of an integrated program of research and monitoring of atmospheric deposition in the Lake Champlain Basin coordinated with NOAA, the Lake Champlain Research Consortium, The Vermont Agency of Natural Resources, and the Vermont Monitoring Cooperative. The project investigators participated in several major regional mercury research initiatives providing a connection between mercury research at Underhill, VT and regional efforts. The characterization and analysis of mercury deposition, surface exchanges, and assimilation in terrestrial ecosystems provided by this study has provided critical understanding of potential mercury response to regional and national reductions in atmospheric mercury emissions. The observational results and analysis provided by this study have applicability to regional assessments of mercury deposition, ecosystem mercury retention and the extent to which atmospherically deposited mercury is transferred to high trophic-level organisms in terrestrial environments.

Project Description

1. Background

Atmospheric mercury research began at Proctor Maple Research Center in Underhill, Vermont in 1992. Sponsored by EPA and NOAA, in collaboration with the University of Vermont and University of Michigan, the station embarked on an event-based sampling program for mercury in precipitation, aerosol particles and mercury vapor. Collecting rain and snowfall storm by storm, rather than the more common weekly sampling, allowed the investigators to relate the mercury concentration patterns in individual storms to specific air mass trajectories. In this way, geographic sources of atmospheric mercury emissions were more easily isolated. Underhill has the longest continuous running event-based mercury wet-deposition station *in the world*. This project provided a crucial comparison and critical evaluation of the 3 major types of mercury wet-deposition collectors used in regional and national wet-deposition networks. This comparison and analysis provided the information needed to transition the long-term mercury observations at Underhill using the University of Michigan MICB collector to the national Mercury Deposition Network monitoring protocol and collector. Inclusion of the Underhill site in the national network was an important step needed to provide national representation and evaluation of mercury risks to Vermont and Northern New England.

Vermont has also been a locus for pioneering research on the fate and transport of mercury in terrestrial and aquatic environments. Because of its quality high temporal-resolution data and its location in the Lake Champlain basin, estimates of atmospheric mercury deposition derived from the measurements at Underhill have been and continue to be used by scientists investigating mercury in terrestrial and aquatic environments. These programs have fostered a community of researchers including atmospheric scientists,

This consortium of researchers identified critical areas requiring research in order to
a

