

Piney Reservoir Back Trajectory Analysis

Version 1 – April 4, 2009

■ NOTE – THE GRAPHICS IN THIS NARRATIVE ARE “LOW QUALITY”. HIGHER QUALITY (HIGHER RESOLUTION) VERSIONS OF ALL OF THESE GRAPHICS -- PLUS MANY OTHERS -- ARE INCLUDED IN THE ACCOMPANYING POWERPOINT SLIDE COLLECTION . THE GRAPHICS HERE HAVE JUST BEEN INSERTED SO THAT THE NARRATIVE CAN REFER TO THEM...

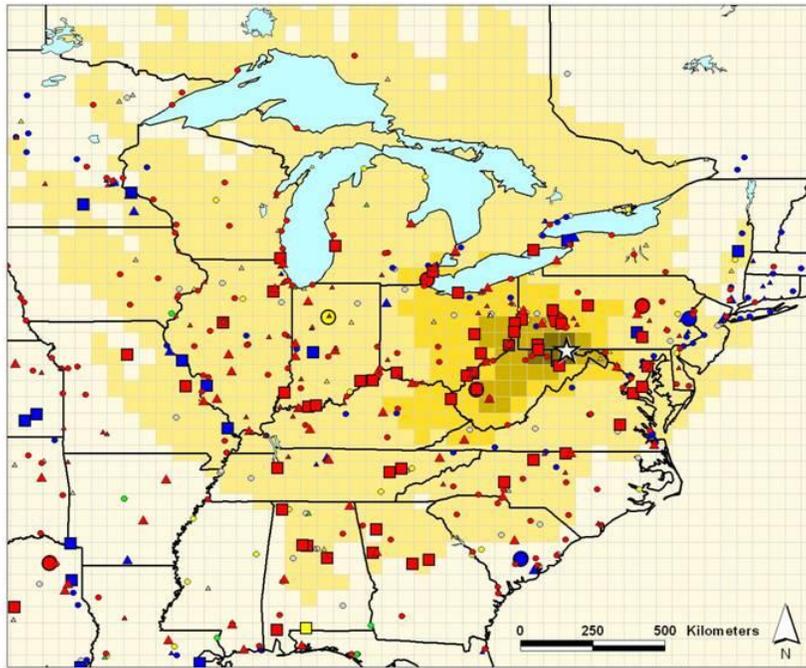
Back-trajectories were run for every hour of the year using the HYSPLIT model (version 4.9). An inherent uncertainty in back-trajectory analysis is the selection of starting height. A common choice is to use ½ of the planetary boundary layer (PBL) height, and this approach was followed for the first iteration in this analysis. Each back-trajectory was estimated for 96 hours using the NOAA EDAS meteorological data, a gridded dataset archived at 40km spatial resolution and 3 hour temporal resolution by the NOAA Air Resources Laboratory. It is understood that this meteorological data set is somewhat coarse, and that the back-trajectories estimated from the Piney Reservoir site are therefore somewhat uncertain.

A convenient way to summarize large groups of trajectories is to define a spatial grid and then calculate the fraction of the trajectories that pass through each grid square. The HYSPLIT modeling system's trajectory frequency programs were used to create such summary spatial distributions. Analyses were done using a 1°x1° grid, a 0.5°x0.5° grid, and 0.25°x0.25° grid, and a 0.1°x0.1° grid. In this narrative, selected results from the 0.5°x0.5° and 0.1°x0.1° grids will be shown, but, results are available for the other grids as well.

The overall distribution of trajectory grid frequencies for the entire year is shown in the figures below. These figures show the percentage of 8760 96-hr back-trajectories that were run starting in each hour of the year that pass through each given grid square.

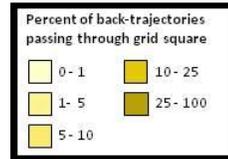
Also shown in these trajectory frequency distribution figures are the estimated emissions of mercury for 2002, based on data from the U.S. EPA National Emissions Inventory and Environment Canada. Depending on the figure, emissions of reactive gaseous mercury (RGM), particulate mercury (HgP), elemental mercury (Hg0) or total mercury (Hg) are shown.

Spatial distribution of hourly trajectory endpoint frequencies
 Entire year, Starting Height = 1/2 Planetary Boundary Layer
 with estimated 2002 emissions of reactive gaseous mercury



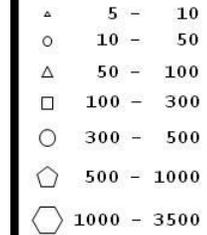
0.5 degree lat/long grid

☆ Piney Measurement Site



Air Emissions

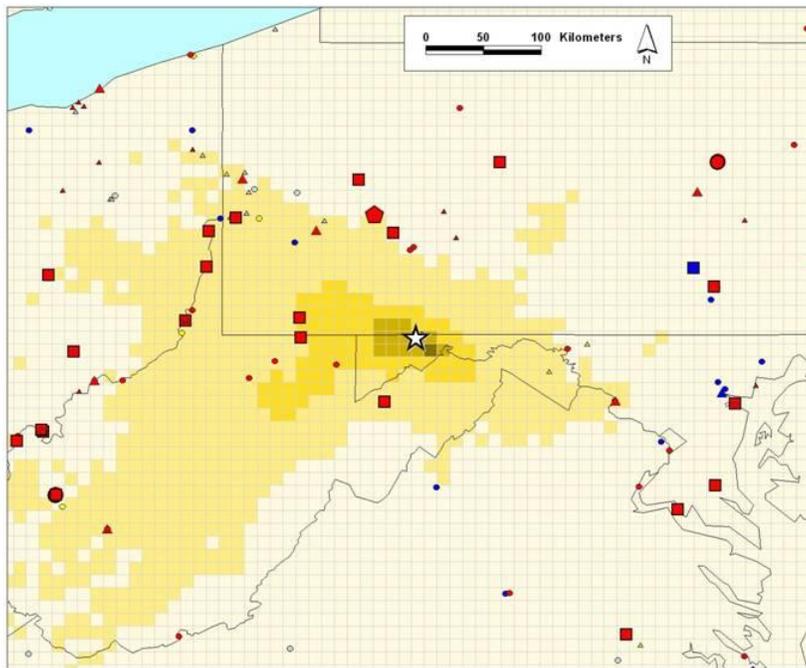
size/shape of symbol denotes amount of mercury emitted (kg/yr)



color of symbol denotes type of mercury source

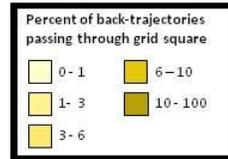


Spatial distribution of hourly trajectory endpoint frequencies
 Entire year, Starting Height = 1/2 Planetary Boundary Layer
 with estimated 2002 emissions of reactive gaseous mercury



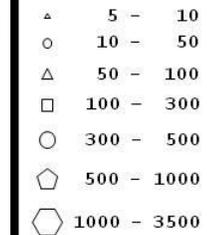
0.1 degree lat/long regional grid

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Air Emissions

size/shape of symbol denotes amount of mercury emitted (kg/yr)

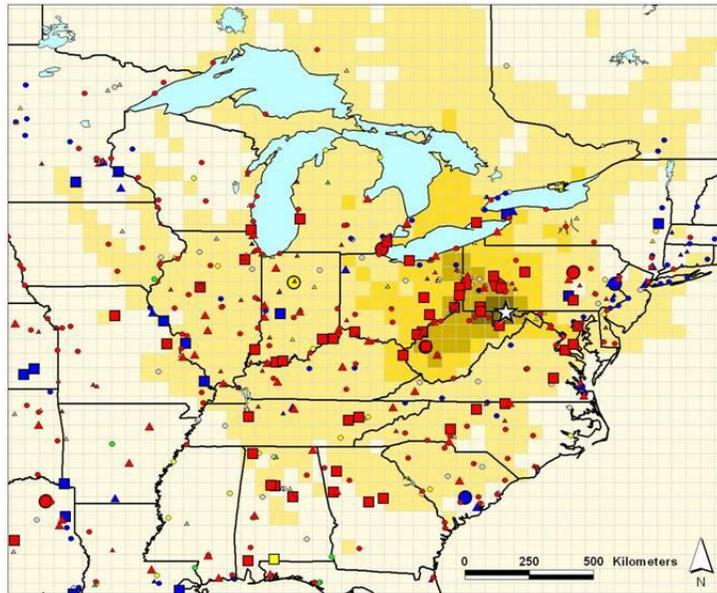


color of symbol denotes type of mercury source



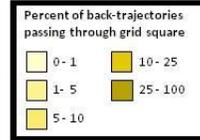
Overall seasonal distributions are shown for the 0.5°x0.5° grid below.

Spatial distribution of hourly trajectory endpoint frequencies
 Spring, Starting Height = ½ Planetary Boundary Layer
 with estimated 2002 emissions of reactive gaseous mercury



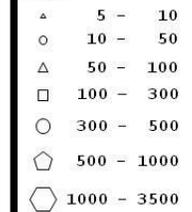
0.5 degree lat/long grid

☆ Piney Measurement Site



Air Emissions

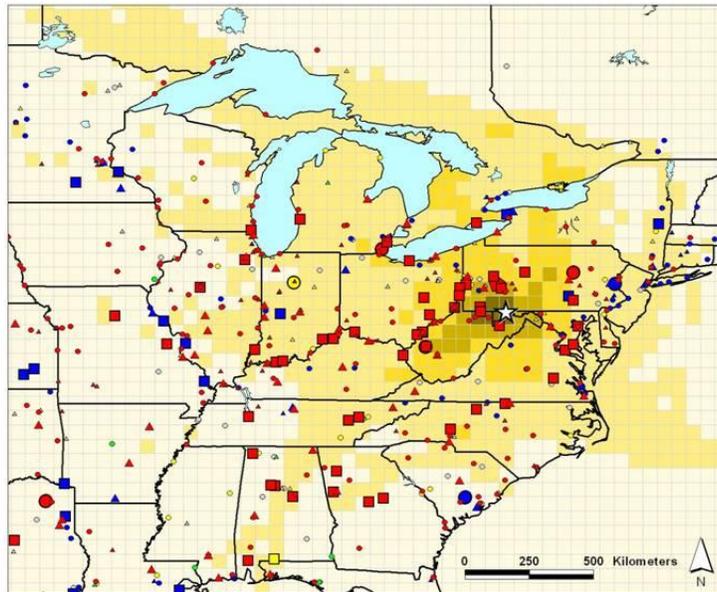
size/shape of symbol denotes amount of mercury emitted (kg/yr)



color of symbol denotes type of mercury source

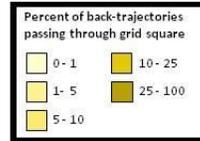


Spatial distribution of hourly trajectory endpoint frequencies
 Summer, Starting Height = ½ Planetary Boundary Layer
 with estimated 2002 emissions of reactive gaseous mercury



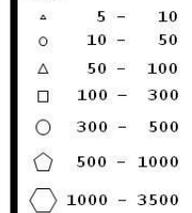
0.5 degree lat/long grid

☆ Piney Measurement Site



Air Emissions

size/shape of symbol denotes amount of mercury emitted (kg/yr)

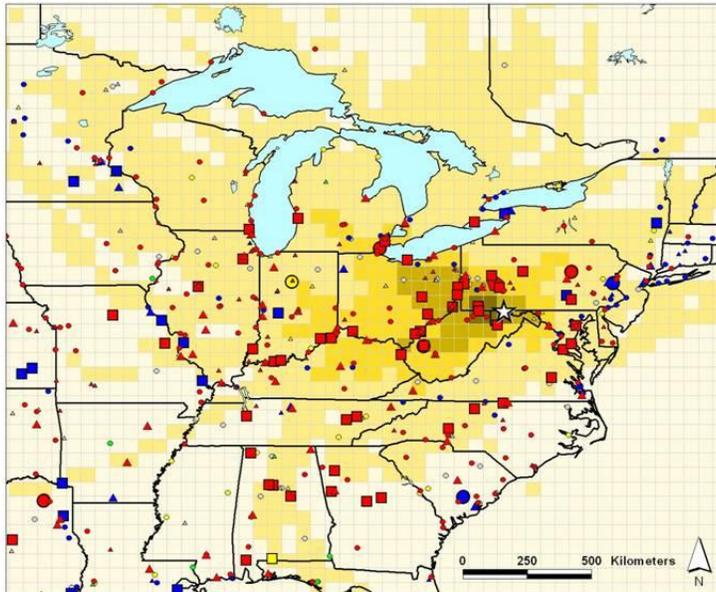


color of symbol denotes type of mercury source

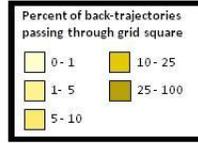


Spatial distribution of hourly trajectory endpoint frequencies
 Fall, Starting Height = 1/2 Planetary Boundary Layer
 with estimated 2002 emissions of reactive gaseous mercury

☆ Piney Measurement Site

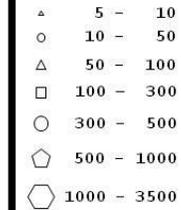


0.5 degree lat/long grid



Air Emissions

size/shape of symbol denotes amount of mercury emitted (kg/yr)

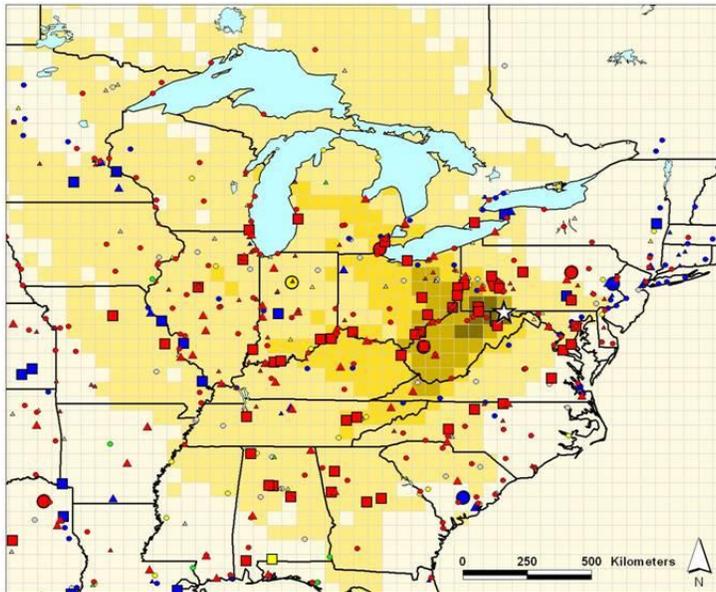


color of symbol denotes type of mercury source

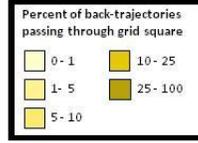


Spatial distribution of hourly trajectory endpoint frequencies
 Winter, Starting Height = 1/2 Planetary Boundary Layer
 with estimated 2002 emissions of reactive gaseous mercury

☆ Piney Measurement Site

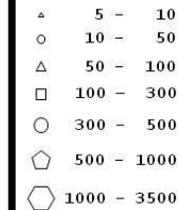


0.5 degree lat/long grid



Air Emissions

size/shape of symbol denotes amount of mercury emitted (kg/yr)



color of symbol denotes type of mercury source



