Air pollutions control policies effective in improving downwind air quality

December 9 2015

Emissions controls on coal-fired power plants are making a difference in reducing exposure of mercury to people. Credit: University of Maryland Center for Environmental Science/Cheryl Nemazie

Emissions controls on coal-fired power plants are making a difference in reducing exposure of mercury to people, especially in the western Maryland community. A study of air quality from the University of Maryland Center for Environmental Science found that levels of mercury in the air from power plant emissions dropped more than half over a 10-year period, coinciding with stricter pollution controls.

"I was surprised when I first saw it," said the study's author Mark Castro, associate professor with the University of Maryland Center for Environmental Science's Appalachian Laboratory in Frostburg. "We've been measuring mercury for years. To see such a dramatic drop was exciting."

From 2006 to 2014, researchers monitored the atmospheric concentrations of mercury at a relatively pristine location in western Maryland that was also downwind from several power plants in Ohio, Pennsylvania, and West Virginia. The annual average concentrations of mercury declined by up to 75% and were strongly correlated with the power plant emissions from the upwind states.

Mercury is a serious threat to human health throughout the world. Many people, particularly pregnant women and their fetuses, and young children, are highly susceptible to the neurological effects. Important sources of mercury in the United States have been power plants and waste incinerators. Some regions in the U.S., particularly those downwind of large sources of mercury, receive 60-80% of their atmospheric mercury deposition from these man-made sources.

In 2005, the EPA issued the Clean Air Mercury Rule (CAMR) to reduce mercury emissions from power plants, and in 2011, the EPA issued the Mercury and Air Toxic Standards (MATS) to reduce mercury emissions by 90% upon full compliance in April 2016. (Note: Recently, the US Supreme Court ruled that MATS needs to be reexamined by the D.C.

Circuit Court.)

Maryland, with one of the most aggressive power plant control programs in the nation, has in place regulations such as the Healthy Air Act that require significant reductions in mercury from coal burning power plants. The Healthy Air Act required an 80 percent reduction in mercury in 2010 and a 90 percent reduction by 2013.

The purpose of the study was to determine if power plant emission reductions have affected the atmospheric concentrations of mercury entering western Maryland before being transported to population centers further east by prevailing westerly winds. Measurements were made that the Piney Reservoir Air Monitoring Station in Garrett County, Maryland, a spot surrounded by forest and farm land, where winds arrive commonly from the west and northwest.

"Our site is located downwind from three states that are top mercury emitters," said Castro. "We are in a hot spot to be impacted by regional emissions. If those emissions change, we are in a good spot to see it."

Models predicted that power plant emissions from the state of Ohio, Pennsylvania, and West Virginia contributed up to 50% of the mercury that was deposited in Maryland from these states. The reductions in emissions could be seen in the frequency and maximum concentrations of the short-term episodic events of emissions, and the annual average concentrations.

There was a statistically significant decrease in the annual average concentrations from 2006 to 2013 and a strong correlation with annual power plant mercury emissions from the upwind states of Ohio, Pennsylvania and West Virginia. This was a relatively large reduction and strongly suggested the emissions reduction strategies of CAIR and MATS were very effective at reducing the concentration of mercury in

western Maryland. Full compliance with MATS, which includes a 90% reduction in power plant mercury emissions, is expected to lower concentrations even further.

The paper, "Effectiveness of Emission Controls to Reduce the Atmospheric Concentration of Mercury," was published by Mark Castro of the University of Maryland Center for Environmental Science's Appalachian Laboratory and John Sherwell of the Maryland Department of Natural Resources' Power Plant Research Program. It was published in *Environmental Science & Technology*.

More information: *Environmental Science & Technology*, pubs.acs.org/doi/abs/10.1021/acs.est.5b03576

Provided by University of Maryland Center for Environmental Science