Mercury and ozone depletion events in the Arctic linked to sea-ice dynamics
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Moore said, "that it actually pulls down mercury from a higher layer of the atmosphere to near the surface."

Scientists have long known that complex chemical reactions involving sunlight deposit mercury out of the air to the surface, but these processes normally stop once the mercury near ground level is completely removed. The newly discovered mixing induced by sea ice leads forces down additional mercury to restart and sustain these reactions.

Moore and his colleagues, including researchers from NASA's Jet Propulsion Laboratory in Pasadena, Calif., measured increased concentrations of mercury near ground level after leads opened near Barrow, Alaska, in 2012 during the NASA-led Bromine, Ozone, and Mercury Experiment (BROMEX) field project. They also used images from the Moderate Resolution Imaging Spectroradiometer instrument on NASA's Terra satellite to observe sea ice and a National Oceanic and Atmospheric Administration model of air transport to gain insight into what was upwind of their mercury measurements.

This site on the frozen Arctic Ocean was visited twice daily and all data was retrieved. Credit: Alexandra Steffen

"The atmospheric mixing created when thinner, seasonal sea ice opens to form leads is so strong."
Obrist, also a research professor at DRI and co-leader of the Institute's Environmental Mercury Laboratory, said, "the 'aha' moment came when we combined satellite data with the air transport model and surface measurements. We considered a variety of chemical processes and sources to explain the increased levels of mercury we observed, until we finally realized it was this pumping process."

The authors estimate the mercury pumping occurs about a quarter-mile (400 meters) above the Arctic surface, the height where visible roiling clouds spewing out of sea ice leads extend.

Moore said while the initial findings support needed actions to curb mercury pollution across the globe, future research will be needed to establish the degree to which changes in sea ice dynamics across the Arctic alter ozone chemistry and impact mercury deposition throughout the sensitive region.

More information: Nature paper: dx.doi.org/10.1038/nature12924
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