Researchers at Utah State University Uintah Basin have designed a mercury analyzer and deployed it at the Storm Peak Laboratory in Steamboat Springs, Colo. The analyzer measures elemental and oxidized mercury in the air and it is the only instrument in the world that has been shown in real field conditions to accurately measure oxidized mercury in the atmosphere.

The analyzer was created by a team at the Bingham Research Center, led by director and research associate professor Seth Lyman, senior research scientist Huy Tran, research technician Trevor O’Neil and master’s student Tyler Elgiar. The project is being carried out in collaboration with scientists at Colorado College, the University of Colorado Boulder, and the University of Utah.

“Helping to build and design new and innovative technology has been a wonderful experience,” said Elgiar, who graduated from USU in 2020 with a bachelor’s degree in Wildlife Ecology and Management and is currently pursuing a master’s degree in Toxicology. “It means a lot to be involved in a project that has potential to have a real impact on the scientific community and world.”

The analyzer was created under a grant from the National Science Foundation that the team received in March 2020. Commercial instrumentation for measuring oxidized mercury in the atmosphere has been shown to be biased, while this new analyzer accurately measures oxidized mercury compounds generated by the team’s custom-built mercury calibrator.

“We are trying to understand what happens to mercury in the atmosphere — both physically and chemically — so we can better predict how it affects our health,” Lyman said. “Understanding how mercury behaves in the atmosphere can help governments decide how best to reduce these health risks.”

The dual-channel analyzer was deployed in field tests in February at Storm Peak, situated at the top of the Steamboat Springs Ski Resort in Colorado. The instruments will collect the first accurate long-term mercury dataset at Storm Peak. The data will allow the researchers to better understand how mercury moves through the atmosphere, how it becomes oxidized, and how mercury affects ecosystems and human health.

“It's amazing how little is actually known about atmospheric mercury,” Elgiar said. “It has been studied to a fair extent, but we still don’t know how elemental mercury is oxidized in the atmosphere. We also aren’t sure exactly what species of oxidized mercury exist and dominate in the atmosphere.”

Elgiar has loved working on the project so far and looks forward to its progression. He feels lucky to have been able to be a part of it, contributing to important research while at the USU Uintah Basin Vernal campus. For his efforts in this project as well as others, he was named the USU Uintah Basin Undergraduate Researcher of the Year.

“This opportunity has opened many new doors for me,” he said. “I never would have thought that I would be in the position I am now a few years ago. My advisor made sure I got a lot of hands-on experience with multiple aspects of the project.”

Oxidized mercury is harmful and can be naturally caused by volcanoes. Humans also produce oxidized mercury from coal-fired power plants, medical waste and other sources. While mercury in the atmosphere exists at very low levels and is not a direct air quality concern, it can be deposited to the earth’s surface as well as the ocean, where it becomes methylated by bacteria and concentrated up the food chain. High levels of mercury in fish and other foods can cause serious health issues, especially for pregnant women.

The project is in its infant stages. The next step is to continue gathering and analyzing data, which will provide the first accurate, high-resolution data set ever collected to better understand how mercury gets oxidized into the atmosphere. Understanding how mercury is oxidized will
help the project team understand where it comes from and gain insights to help reduce mercury pollution. The study will extend into 2023. Elgiar has hopes that the data will prove valuable and will create real change for the environment.

“It is wonderful to add something meaningful to the atmospheric mercury conversation,” he said.

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