

Researchers find Greenland glacial meltwaters rich in mercury

May 24 2021



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New research shows that concentrations of the toxic element mercury in rivers and fjords connected to the Greenland Ice Sheet are comparable to rivers in industrial China, an unexpected finding that is raising questions about the effects of glacial melting in an area that is a major exporter of

seafood.

"There are surprisingly high levels of [mercury](#) in the glacier meltwaters we sampled in southwest Greenland," said Jon Hawkings, a postdoctoral researcher at Florida State University and the German Research Centre for Geosciences. "And that's leading us to look now at a whole host of other questions such as how that mercury could potentially get into the [food chain](#)."

The study was published today in *Nature Geoscience*.

The international study began as a collaboration between Hawkings and glaciologist Jemma Wadham, a professor at the University of Bristol's Cabot Institute for the Environment.

Initially, researchers sampled waters from three different rivers and two fjords next to the [ice sheet](#) to gain a better understanding of meltwater water quality from the glacier and how nutrients in these meltwaters may sustain coastal ecosystems.

One of the elements they measured for was the potentially toxic element mercury, but they had no expectation that they would find such high concentrations in the water there.

Typical dissolved mercury content in rivers are about 1—10 ng L⁻¹ (the equivalent of a salt grain-sized amount of mercury in an Olympic swimming pool of water). In the glacier meltwater rivers sampled in Greenland, scientists found dissolved mercury levels in excess of 150 ng L⁻¹, far higher than an average river. Particulate mercury carried by glacial flour (the sediment that makes glacial rivers look milky) was found in very high concentrations of more than 2000 ng L⁻¹.

With any unusual finding, the results raise more questions than answers.

Researchers are unclear if the mercury levels will dissipate farther away from the ice sheet and whether this "glacier" derived mercury is making its way into the aquatic food web, where it can often concentrate further.

"We didn't expect there would be anywhere near that amount of mercury in the glacial water there," said Associate Professor of Earth, Ocean and Atmospheric Science Rob Spencer. "Naturally, we have hypotheses as to what is leading to these high mercury concentrations, but these findings have raised a whole host of questions that we don't have the answers to yet."

Fishing is Greenland's primary industry with the country being a major exporter of cold-water shrimp, halibut and cod.

"We've learned from many years of fieldwork at these sites in Western Greenland that glaciers export nutrients to the ocean, but the discovery that they may also carry potential toxins unveils a concerning dimension to how glaciers influence water quality and downstream communities, which may alter in a warming world and highlights the need for further investigation," Wadham said.

The finding underscores the complicated reality of rapidly melting ice sheets across the globe. About 10 percent of the Earth's land surface is covered by glaciers, and these environments are undergoing rapid change as a result of rising temperatures. Scientists worldwide are working to understand how warming temperatures—and thus more rapidly melting glaciers—will affect geochemical processes critical to life on Earth.

"For decades, scientists perceived glaciers as frozen blocks of [water](#) that had limited relevance to the Earth's geochemical and biological processes," Spencer said. "But we've shown over the past several years that line of thinking isn't true. This study continues to highlight that these ice sheets are rich with elements of relevance to life."

Hawkings also said it was worth noting that this source of mercury is very likely coming from the Earth itself, as opposed to a fossil fuel combustion or other industrial source. That may matter in how scientists and policymakers think about the management of mercury pollution in the future.

"All the efforts to manage mercury thus far have come from the idea that the increasing concentrations we have been seeing across the Earth system come primarily from direct anthropogenic activity, like industry," Hawkings said. "But mercury coming from climatically sensitive environments like [glaciers](#) could be a source that is much more difficult to manage."

More information: Large subglacial source of mercury from the southwestern margin of the Greenland Ice Sheet, *Nature Geoscience* (2021). [DOI: 10.1038/s41561-021-00753-w](https://doi.org/10.1038/s41561-021-00753-w)

Provided by Florida State University

Citation: Researchers find Greenland glacial meltwaters rich in mercury (2021, May 24) retrieved 24 April 2024 from <https://phys.org/news/2021-05-greenland-glacial-meltwaters-rich-mercury.html>

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