

Thawing permafrost may release more CO₂ than previously thought, study suggests

September 19 2018, by Katie Willis



A permafrost thaw slump on the Peel Plateau in the Northwest Territories exposes permafrost rich in ice and sediment. As the permafrost thaws and collapses, sulfuric acid in water breaks down the exposed minerals, releasing substantial amounts of carbon dioxide. Credit: Scott Zolkos

The amount of carbon dioxide released from thawing permafrost might be greater than previously thought because of a process called mineral weathering, according to a new study by University of Alberta

ecologists.

Mineral weathering occurs when minerals previously locked up in [permafrost](#) are exposed and broken down into their chemical components by sulfuric or [carbonic acid](#) that can exist naturally in water.

Over long, geologic time scales, carbonic acid weathering is an important control on atmospheric CO₂ levels and climate, but under the right conditions, weathering by sulfuric acid can release substantial CO₂.

Ph.D. candidate Scott Zolkos and his supervisor, U of A biologist Suzanne Tank, found that these conditions are prevalent in the western Canadian Arctic.

"We found that rapidly thawing permafrost on the Peel Plateau in the Northwest Territories is greatly enhancing mineral weathering," explained Zolkos, the lead author on the study. "Because weathering is largely driven by sulfuric acid in this region, intensifying [permafrost thaw](#) could be an additional source of CO₂ to the atmosphere."

The researchers worked with scientists from the Northwest Territories Geoscience Office to examine long-term records of river chemistry from the Peel River.

They found that weathering driven by [sulfuric acid](#) has intensified with regional permafrost thaw in recent decades, and likely increased the amount of CO₂ released into the surrounding water and air.

"Any additional warming in the Arctic, which is warming at twice the rate of the rest of the planet, promotes more permafrost thaw and thus poses substantial challenges to Arctic and global ecosystems," said Zolkos.

Yet, the effects from this mineral [weathering](#) on climate warming remain largely unexplored—a problem Zolkos and Tank said they hope to address.

The research—the first to document the potential for substantial contributions of CO₂ from thawing permafrost to the atmosphere through [mineral weathering](#)—was published in a paper titled "Mineral Weathering and the Permafrost Carbon-Climate Feedback," in *Geophysical Research Letters*.

More information: Scott Zolkos et al. Mineral Weathering and the Permafrost Carbon-Climate Feedback, *Geophysical Research Letters* (2018). [DOI: 10.1029/2018GL078748](https://doi.org/10.1029/2018GL078748)

Provided by University of Alberta

Citation: Thawing permafrost may release more CO₂ than previously thought, study suggests (2018, September 19) retrieved 20 March 2024 from <https://phys.org/news/2018-09-permafrost-co2-previously-thought.html>

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