

Global warming in the Canadian Arctic

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Ph.D. student Karita Negandhi and professor Isabelle Laurion from INRS'Eau Terre Environnement Research Centre, in collaboration with other Canadian, U.S., and French researchers, have been studying methane emissions produced by thawing permafrost in the Canadian Arctic. These emissions are greatly underestimated in current climate models. Their findings, published in the journal *PLOS ONE*, illustrate the importance of taking into account greenhouse gases emitted by small thaw ponds, as they could have a significant impact on climate.

"We discovered that although the small shallow ponds we studied represent only 44% of the water-covered surface in a Bylot Island valley, they generate 83% of its [methane emissions](#)," notes water sciences doctoral student Karita Negandhi.

The researchers compared ponds of different shapes and sizes, and studied their physicochemical properties and microbial ecology. To analyze the samples taken on Bylot Island in Nunavut's Sirmilik National Park, they used various methods, including radiocarbon dating, as well as new-generation molecular tools to study the sediment and water microbial communities involved in carbon transformation processes.

The isotopic signatures of the methane emitted by these small ponds indicate that this [greenhouse gas](#) comes partly from old carbon reserves that have been sequestered in the [permafrost](#) for millennia. As the permafrost thaws, organic matter is becoming more abundant, promoting the proliferation of aquatic microbes such as methanogenic Archaea, which use various sources of carbon, then release it into the atmosphere

in the form of methane and CO₂. Consequently, longer summers could lead to an increase in these emissions.

These small thaw ponds have been studied very little up until now, primarily because of their remote location and the attendant logistical constraints. However in the context of global warming, they are worth examining more closely, as they could have an increasingly significant incidence on the transfer of [greenhouse gases](#) into the atmosphere in the future.

More information: The article entitled "Small thaw ponds: an unaccounted source of methane in the Canadian High Arctic" appeared in *PLOS ONE* on November 13, 2013.

Provided by INRS

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