Wetlands are bad and good news for Arctic warming: study

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(PhysOrg.com) -- Seasonal wetlands in Arctic regions will initially persist longer due to global warming but then shrink as temperatures rise further, according to new study into how climate change will progress this century.

The study, published in the journal *Nature Geoscience*, holds both good and bad news for concerns over global warming because such wetlands produce substantial amounts of methane, which is far more potent than carbon dioxide as a greenhouse gas.

It suggests that the future global production of methane from high-latitude wetlands will have a complicated signal over the next century, with decreasing overall wetland extent counteracting a greater number of wet days in remaining wetlands.

"It suggests a more complex picture of the role played by these high-latitude wetlands than we previously thought," says Dr Katrin Meissner, an author of the study and a senior lecturer Future Fellow in the UNSW Climate Change Research Centre. The study was led by Christopher Avis, along with Professor Andrew Weaver, of the University of Victoria, Canada.

"Wetlands play an important role in the carbon cycle through carbon uptake and storage in vegetation and soil and through carbon dioxide and methane release from bacterial decomposition of organic matter," Dr Meissner says.

"This study is the first to examine the global carbon-climate feedback related to high-latitude wetlands in a warming world. Over 50% of wetlands are located in high northern latitudes, so we really need to know how they will change in extent in the near future.

"These wetlands sit perched on the frozen tundra beneath them, a bit like a bathtub. At first, an increase in length of the thaw season leads to an increase in the number of days of the year conductive to wetland formation.

"That's important to know for climate change predictions because the Earth's poles are expected to warm faster than equatorial regions and because wetlands produce methane and they produce more of it as they get warmer - so bigger, warmer wetlands means more methane. That would tend to accelerate the overall global warming trend.

"As things get warmer still, the tundra melts even more and allows water from the wetlands to drain into the soil, so they shrink in area – in effect, it pulls the plug on the bath. If so, methane emissions would fall but more carbon dioxide would be released in the process. It's a very complex process and very difficult to make accurate predictions about the net effect of all this in the near future."

The model simulations were based on four emission scenarios, the most severe leading to a 40% loss of permanently frozen ground – permafrost - in the tundra by the end of this century.

Actual observations have already linked permafrost degradation to changes in Arctic lakes: from 1973 to 2004, the abundance of lakes increased in continuous permafrost zones, but decreased in other zones.

Dr Meissner cautioned that the model used for the study was relatively simple. But its findings would prompt climate researchers to investigate

the issue more closely in the hope of making more accurate predictions.

Provided by University of New South Wales