

Global warming makes tropical soils leak carbon dioxide

August 12 2020, by Marlowe Hood



"Carbon held in tropical soils are more sensitive to warming than previously recognized," says Andrew Nottingham, a researcher at the University of Edinburgh

Tropical forest soil warmed in experiments to levels consistent with end-

of-century temperature projections released 55 percent more CO₂ than control plots, exposing a previously underestimated source of greenhouse gas emissions, researchers reported Wednesday.

Before humanity began loading the atmosphere with [carbon pollution](#) by burning fossil fuels, the input and outflow of CO₂ into soil—one key element in Earth's complex [carbon](#) cycle—remained roughly in balance.

Gases emitted by deadwood and decaying leaves, in other words, were canceled out by microorganisms that feed on such matter.

But [climate change](#) has begun to upset that balance, according to a new study, published in *Nature*.

"Carbon held in tropical soils is more sensitive to warming than previously recognized," lead author Andrew Nottingham, a researcher at the University of Edinburgh's School of Geosciences, told AFP.

"Even a small increase in respiration from tropical [forest](#) soils could have a large effect on atmospheric CO₂ concentrations, with consequences for [global climate](#)."

The quantity of carbon cycling each year through soils worldwide is up to 10 times greater than human-generated greenhouse gas emissions.

Just a one-percent imbalance—with more carbon going out than in—"would equal about ten percent of global anthropogenic (manmade) carbon emissions," noted Eric Davidson, a researcher at the University of Maryland Center for Environmental Science.

Earth's average surface temperature has risen just over one degree Celsius (1C) above preindustrial levels, enough to boost the severity of droughts, heatwaves and superstorms made more destructive by rising

seas.

But the increase in temperatures over land alone—excluding oceans, which cover 70 percent of the planet—has been nearly 2C, or double the global average.

Carbon 'sink' to 'source'

In the experiments, Nottingham and colleagues placed heating rods in a one-hectare plot of undisturbed primary forest on Barro Colorado Island, Panama.



Up to now, tree cover and the ocean have together consistently absorbed about half of the excess carbon emissions from human activity

They warmed the soil to a depth of just over one meter (three feet) by 4C over a period of two years.

Soil temperature is usually about a degree warmer than air temperature.

While such experiments have been conducted in higher latitude forests, none had been carried out up to now in the tropics.

Climate models seeking to take into account the potential carbon leakage from [soil](#) due to rising temperatures have relied on theoretical calculations that underestimate outputs compared to the field tests reported in *Nature*.

Extrapolating from the new findings, the study estimates that if all the world's tropical soils warmed by 4C for a two-year period some time before 2100, it would release 65 billion tons of carbon—equivalent to about 240 billion tons of CO₂—into the atmosphere.

"That is more than six times the current annual emissions from human-related sources," Nottingham said.

"This could be an underestimation, because we might see large continued loss beyond the two years in our experiment."

Nor are deeper stores of carbon—below two meters—taken into account, he added.

No sweeping conclusions can be drawn on the basis of a single experiment, the researchers caution.

"But the study adds to recently accumulating evidence that tropical

forests are unlikely to continue indefinitely to be carbon sinks as the world warms," said Davidson, who was not among the study's authors.

Up to now, [tree cover](#) and the ocean have together consistently absorbed about half of the excess carbon emissions from human activity, but there are signs that some forests may be experiencing CO₂ fatigue.

Stored CO₂ is also released when trees are cut down.

Last year, a football pitch of primary, old-growth trees was destroyed every six seconds, about 38,000 square kilometers (14,500 square miles) in all, according to Global Forest Watch.

More information: Nottingham, A.T., Meir, P., Velasquez, E. et al. Soil carbon loss by experimental warming in a tropical forest. *Nature* 584, 234–237 (2020). doi.org/10.1038/s41586-020-2566-4 , www.nature.com/articles/s41586-020-2566-4

© 2020 AFP

Citation: Global warming makes tropical soils leak carbon dioxide (2020, August 12) retrieved 14 July 2024 from <https://phys.org/news/2020-08-global-tropical-soils-leak-carbon.html>

This document is subject to copyright. Apart from any fair dealing for the purpose of private study or research, no part may be reproduced without the written permission. The content is provided for information purposes only.