

Warming of 2 C would release billions of tons of soil carbon

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Global warming of 2°C would lead to about 230 billion tons of carbon being released from the world's soil, new research suggests.

Global soils contain two to three times more carbon than the atmosphere, and higher temperatures speed up decomposition—reducing the amount of time carbon spends in the soil (known as "soil carbon turnover").

The new international research study, led by the University of Exeter, reveals the sensitivity of soil carbon turnover to global warming and subsequently halves uncertainty about this in future climate change projections.

The estimated 230 billion tons of carbon released at 2°C warming (above pre-industrial levels) is more than four times the [total emissions](#) from China, and more than double the emissions from the U.S., over the last 100 years.

"Our study rules out the most extreme projections—but nonetheless suggests substantial soil carbon losses due to climate change at only 2°C warming, and this doesn't even include losses of deeper permafrost carbon," said co-author Dr. Sarah Chadburn, of the University of Exeter.

This effect is a so-called "[positive feedback](#)"—when climate change causes knock-on effects that contribute to further climate change.

The response of soil carbon to climate change is the greatest area of uncertainty in understanding the [carbon cycle](#) in climate change projections.

To address this, the researchers used a new combination of observational data and Earth System Models—which simulate the climate and carbon cycle and subsequently make climate change predictions.

"We investigated how soil carbon is related to temperature in different locations on Earth to work out its sensitivity to global warming," said lead author Rebecca Varney, of the University of Exeter.

State-of-the-art models suggest an uncertainty of about 120 billion tons of carbon at 2°C global mean warming.

The study reduces this uncertainty to about 50 billion tons of carbon.

Co-author Professor Peter Cox, of Exeter's Global Systems Institute, said: "We have reduced the uncertainty in this [climate change](#) response, which is vital to calculating an accurate global carbon budget and successfully meeting Paris Agreement targets."

The study, published in *Nature Communications*, is entitled: "A spatial emergent constraint on the sensitivity of [soil carbon](#) turnover to [global warming](#)."

More information: "A spatial emergent constraint on the sensitivity of soil carbon turnover to global warming," *Nature Communications* (2020). DOI: [10.1038/s41467-020-19208-8](https://doi.org/10.1038/s41467-020-19208-8)

Provided by University of Exeter

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