Global warming threat seen in fertile soil of northeastern US forests

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Vast stores of carbon in U.S. forest soils could be released by rising global temperatures, according to a study by UC Irvine and other researchers in today's online *Proceedings of the National Academy of Sciences* in Washington, D.C.

The scientists found that heating soil in Wisconsin and North Carolina woodlands by 10 and 20 degrees increased the release of carbon dioxide by up to eight times. They showed for the first time that most carbon in topsoil is vulnerable to this warming effect.

"We found that decades-old carbon in surface soils is released to the atmosphere faster when temperatures become warmer," said lead author Francesca Hopkins, a doctoral researcher in UCI's Earth system science department. "This suggests that soils could accelerate global warming through a vicious cycle in which man-made warming releases carbon from soils to the atmosphere, which, in turn, would warm the planet more."

Soil, which takes its rich, brown color from large amounts of carbon in decaying leaves and roots, stores more than twice as much of the element as does the atmosphere, according to United Nations reports. Previously, it wasn't known whether carbon housed in soil for a decade or longer would be released faster under higher temperatures, because it's difficult to measure. The team, using carbon isotopes, discovered that older soil carbon is indeed susceptible to warming.

Forest lands, which contain about 104 billion tons of carbon reserves, have been one of the biggest unknowns in climate change predictions. Northeastern woodlands that were once farm fields are currently one of the Earth's beneficial carbon sinks, holding nearly 26 billion tons. But climate scientists worry that trees and soils could become sources of greenhouse gas emissions rather than repositories.

"Our results suggest that large stores of carbon that built up over the last century as forests recovered will erode with rising temperatures," said Susan Trumbore of the Max Planck Institute for Biogeochemistry and UCI, who led the research team, which also included Margaret Torn, head of the Climate & Carbon Sciences Program at Lawrence Berkeley National Laboratory.

Microbes in soil near tree roots, in particular, eat carbon, and it's then diffused into the air as carbon dioxide, already the largest greenhouse gas in the atmosphere.

"These are carbon dioxide sources that, in effect, we can't control," Hopkins said. "We could control how much gasoline we burn, how much coal we burn, but we don't have control over how much carbon the soil will release once this gets going."

More information:
www.pnas.org/content/early/201 …
/1120603109.abstract

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