Team develops more accurate model of climate change's effect on soil

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Scientists from UC Irvine and the National Center for Atmospheric Research have developed a new computer model to measure global warming's effect on soil worldwide that accounts for how bacteria and fungi in soil control carbon.

They found that soil outcomes based on their microbial model were more reliable than those forecast by traditional models. Study results appear online in *Nature Climate Change*.

While standard models project modest carbon losses with global warming, the microbial models generate two novel scenarios: One is that soil around the world will accumulate carbon if microbial growth declines with higher temperatures. The second assumes that microbial growth increases with global warming, resulting in large soil carbon losses, meaning much more carbon will be released into the atmosphere.

"The microbial soil model is extremely important to understanding the balance of carbon in the soil versus the atmosphere and how carbon mass in soil is affected by these bacteria and fungi," said the study's senior author, Steven Allison, an associate professor of ecology & evolutionary biology and Earth system science at UC Irvine. "Our hope is that this new soil model will be applied to the global Earth system models to better predict overall climate change."

The researchers also discovered that in cases of increased carbon input to soil (such as carbon dioxide or nutrient fertilization), microbes

actually released the added carbon to the atmosphere, while traditional models indicate storage of the additional carbon. This, they said, is further evidence that the Earth system models should incorporate microbial impact on soil to more accurately project climate change ramifications.

"In our microbial model, we directly simulate how the activity of organisms like bacteria and fungi control the storage and losses of soil carbon," said Will Wieder, a postdoctoral scientist with the National Center for Atmospheric Research in Boulder, Colo. "Now that we can more accurately measure what happens to soil as temperatures increase, we hope to study the potential effects of soil carbon fluctuations within a changing environment."

Provided by University of California, Irvine

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