PHYS.ORG

Current view of soil-climate interaction too simplistic, warn scientists

October 5 2011

(PhysOrg.com) -- Assumptions over the rate at which soil bacteria will break down carbon in the face of global warming must be re-addressed, according to some of the world's leading experts.

In an article published in *Nature*, an international team of scientists including Newcastle University's Professor David Manning, argue our predictions of a large-scale release of carbon into the atmosphere due to rising temperatures is too one-dimensional.

They say that while temperature undoubtedly plays a role, it is often not the dominant factor and we need to find new ways of predicting how soil carbon responds to climate change.

Led by Professor Michael Schmidt at the University of Zurich, the team suggests a number of ways in which we can improve our understanding of this process – such as tracing the origin of soil compounds through microbes' metabolic pathways and gene expression.

"Soils store more carbon than the atmosphere and living plants but we still don't really know why some organic compounds persist for centuries or even thousands of years in soils, while others quickly decompose," explains Newcastle University's Professor Manning.

"Answering this question is fundamental if we are going to accurately predict the impact of climate change and understand what the trigger points are for releasing this carbon sink into the atmosphere.

"The aim of this paper is to suggest ways in which we can improve our predictions, not only of the link between soil carbon and climate change but also its link to land use and vegetation change."

What the study showed:

For many years, scientists thought that organic matter persists in soil because some of it forms very complex molecular structures that are too difficult for organisms to break down.

In their Nature review, however, Schmidt and colleagues point out how recent advances, from imaging the molecules in soils to experiments that track decomposition of specific compounds, show this view to be mistaken.

For example, the major forms of organic matter in soils are in the form of simple biomolecules, rather than large macromolecules. Charred residues from fire provide a possible exception, but even these have been shown to decompose.

The team contends that the average time carbon resides in soil is due to the interactions between organic matter and the surrounding soil ecosystem. Factors such as physical isolation and recycling or even unfavourable local temperature or moisture conditions can all play a role in reducing the probability that a given molecule will decompose.

"Understanding soil biogeochemistry is essential and underpins the basic principles of crop production, water quality, resistance to erosion and, of course, climate mitigation," explains Professor Manning.

"The persistence of organic matter in soil is due to many complex interactions of which temperature is just one contributing factor."

The team suggests these insights into the mechanisms involved in soil organic carbon stability need to be recognised to improve attempts to model this vital component of the Earth system. Such insights have implications for fundamental research, land management, and climate change prediction and mitigation.

Provided by Newcastle University

Citation: Current view of soil-climate interaction too simplistic, warn scientists (2011, October 5) retrieved 23 April 2024 from https://phys.org/news/2011-10-rethinking-soil-carbon-reservoir-global.html