Study finds that soil carbon may not be as stable as previously thought

April 16 2015

Researchers have combined measurements of plant production, bacterial and fungal carbon decomposition, and soil carbon stocks to study the effects of rising carbon dioxide on long-term carbon storage in soils. Credit: Wikimedia Commons, AnRo0002

Increased plant growth caused by rising atmospheric carbon dioxide is associated with higher rates of carbon dioxide release from soil. If rising carbon dioxide enhances soil carbon storage at all, the effect will be small. Soil carbon may not be as stable as previously thought, and soil microbes exert more direct control on carbon buildup than global climate models represent.

This study provides insight into the mechanisms determining long-term soil carbon storage, knowledge that can be used to improve climate model representations of the global carbon cycle.

Carbon dioxide, the major cause of global warming, is released to the atmosphere when oil, coal, and gasoline are burned. Soils contain the largest pool of terrestrial organic carbon, helping counteract rising carbon dioxide levels and thus potentially playing a key role in modulating climate change. Carbon accumulates in soil through many years of plant photosynthesis and is lost from soil as microscopic organisms, mostly bacteria and fungi, decompose soil carbon, converting it back to carbon dioxide and releasing it to the atmosphere. The balance of these two processes and the future of the soil carbon sink are uncertain.

How much will soil organic carbon persist, and how much of this carbon will soil microorganisms convert back to carbon dioxide? By comparing data from experiments around the world with models of the soil carbon cycle, researchers have tested how soil carbon release by microbes responds to rising carbon dioxide. They found that higher levels of atmospheric carbon dioxide increase both carbon's input and release from the soil. Thus, soil carbon may not be as stable as previously considered, and soil microbes have more direct control on carbon storage than is represented in today's global climate models.

More information: "Faster decomposition under increased

atmospheric CO2 limits soil carbon storage." *Science* 344 (6183), 508–509 (2014). DOI: 10.1126/science.1249534