Boreal peatlands not a global warming time bomb

June 10 2015

To some scientists studying climate change, boreal peatlands are considered a potential ticking time bomb. With huge stores of carbon in peat, the fear is that rising global temperatures could cause the release of massive amounts of CO2 from the peatlands into the atmosphere—essentially creating a greenhouse gas feedback loop.

A new study by researchers at the University of South Carolina and University of California Los Angeles challenges that notion, and demonstrates that the effect of temperature increases on peat storage could be minor.

Funded by the National Science Foundation (NSF) and published in *Global Biogeochemical Cycles*, the study instead points to the length of time peat is exposed to oxygen as a much more important factor in how it releases carbon into the atmosphere.

The researchers used the biochemical composition of a peat core collected from the James Bay Lowland in Canada to assess the historical relationship between climate and the extent of peat decomposition. The core is a record of peat accumulation over the last 7,500 years and contains two intervals (the Medieval Climate Anomaly and the Holocene Thermal Maximum) when temperatures were about 2°C warmer than normal, providing a natural analogue for modern warming.

However, peat formed during these warm intervals was not extensively decomposed compared to peat formed during cooler periods. Instead,

the most extensive decomposition coincided with drier conditions and longer oxygen exposure time during peat formation. This indicates oxygen exposure time was the primary control on peat decomposition, while temperature was of secondary importance. This was supported by comparing the extent of decomposition along a climate transect in the West Siberian Lowland, Russia. Cores from the northern end of the transect, which experienced longer oxygen exposure times, were more decomposed than cores from the south, which formed under warmer temperatures.

The low apparent sensitivity of peat decomposition to warming has important implications for the future of the peatlands, as warming is unlikely to result in widespread carbon loss. Instead, the lengthening growing season is expected to stimulate plant growth, which combined with unchanging decomposition could increase the rate of carbon sequestration.

Ron Benner, director of the Marine Science Program at the University of South Carolina and one of the study's authors, says the findings are important in understanding how the earth's changing climate will affect peatlands.

"It is too early to declare peatlands and their massive carbon stocks are secure. Changing precipitation patterns could cause drier conditions, increasing oxygen exposure time and promoting decomposition," Benner said.

"Thawing permafrost in arctic peatlands could also trigger the loss of previously inaccessible carbon. In addition, increasing atmospheric nitrogen pollution can allow rapidly decomposing vascular plants to outcompete the more recalcitrant Sphagnum (peat moss). However, the results of the study indicate the direct effect of increasing temperatures on decomposition will be relatively minor."

More information: *Global Biogeochemical Cycles*, agupubs.onlinelibrary.wiley.co … 002/(ISSN)1944-9224/

Provided by University of South Carolina