Peatland carbon storage is stabilized against catastrophic release of carbon

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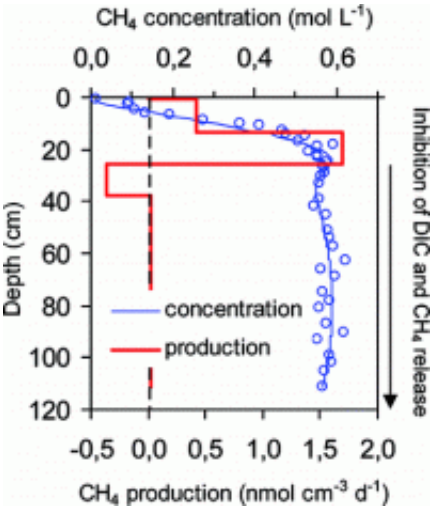

Concerns that global warming may have a domino effect —unleashing 600 billion tons of carbon in vast expanses of peat in the Northern hemisphere and accelerating warming to disastrous proportions — may be less justified than previously thought. That's the conclusion of a new study on the topic in ACS' journal *Environmental Science & Technology*.

Christian Blodau and colleagues explain that peat bogs — wet deposits of partially decayed plants that are the source of gardeners' peat moss and fuel — hold about one-third of the world's carbon. Scientists have been concerned that global warming might dry out the surface of

peatlands, allowing the release into the atmosphere of carbon dioxide and methane (a greenhouse gas even more potent than carbon dioxide) produced from decaying organic matter. To see whether this catastrophic domino effect is a realistic possibility, the scientists conducted laboratory simulations studying the decomposition of wet bog peat for nearly two years.

Far from observing sudden releases of greenhouse gases, they found that carbon release and methane production slowed down considerably in deeply buried wet peat, most likely because deeper peat is shielded from exchange of water and gases with the atmosphere. In connection with previous work, the study concluded that "even under moderately changing climatic conditions," peatlands will continue to sequester, or isolate from the atmosphere, their huge deposits of carbon and methane.

More information: Experimental Burial Inhibits Methanogenesis and Anaerobic Decomposition in Water-Saturated Peats, Environ. Sci. Technol., Article ASAP. DOI: 10.1021/es201777u

Abstract
A mechanistic understanding of carbon (C) sequestration and methane (CH4) production is of great interest due to the importance of these processes for the global C budget. Here we demonstrate experimentally, by means of column experiments, that burial of water saturated, anoxic bog peat leads to inactivation of anaerobic respiration and methanogenesis. This effect can be related to the slowness of diffusive transport of solutes and evolving energetic constraints on anaerobic respiration. Burial lowered decomposition constants in homogenized peat sand mixtures from about 10–5 to 10–7 yr–1, which is considerably slower than previously assumed, and methanogenesis slowed down in a similar manner. The latter effect could be related to acetoclastic methanogenesis approaching a minimum energy quantum of –25 kJ mol–1 (CH4). Given the robustness of hydraulic properties that locate

the oxic–anoxic boundary near the peatland surface and constrain solute transport deeper into the peat, this effect has likely been critical for building the peatland C store and will continue supporting long-term C sequestration in northern peatlands even under moderately changing climatic conditions.

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