Plants can change greenhouse gas emissions after warming

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Sphagnum moss, one of the types of vegetation at the field site. Credit: S E Ward

(Phys.org) —Different moorland plants, particularly heather and cotton grass, can strongly influence climate warming effects on greenhouse gas emissions, researchers from Lancaster University, The University of Manchester and the Centre for Ecology & Hydrology have discovered.

The findings, published this week in leading journal *Ecology Letters*, show valuable carbon stores, which lie deep below peaty moorlands, are at risk from changes in climate and from land management techniques that alter plant diversity.

But the study found that the make-up of the plant community could also play a key role in controlling greenhouse gas emissions from these

carbon rich ecosystems, as not all vegetation types respond in the same way to warming.

The research, supported by a Natural Environment Research Council (NERC) grant, took place at Moor House National Nature Reserve, high up in the North Pennines, a long-term, ecological monitoring site for the UK Environmental Change Network.

The newly set up experimental site manipulated both temperature and the composition and diversity of vegetation at the same time, allowing the team to study the combined effects of these global change phenomena for the first time.

Temperatures were increased by around 1°C using open-topped, passive warming chambers, specially built on site, which mimicked the predicted effects of global warming.

The researchers found that when heather was present, warming increased the amount of CO2 taken up from the atmosphere, making the ecosystem a greater sink for this greenhouse gas. However, when cotton grass was present, the CO2 sink strength of system decreased with warming, and the amount of methane released increased.

Professor Richard Bardgett, who led the research team, and has recently moved to the University of Manchester's Faculty of Life Sciences, said: "What surprised us was that changes in vegetation, which can result from land management or climate change itself, also had such a strong impact on greenhouse gas emissions and even changed the way that warming affected them.

"In other words, the diversity and make-up of the vegetation, which can be altered by the way the land is farmed, can completely change the sink strength of the ecosystem for carbon dioxide. This means that the way

we manage peat land vegetation will strongly influence the way that peat land carbon sink strength responds to future climate change."

Dr Sue Ward, the Senior Research Associate for the project at Lancaster Environment Centre, said: "Setting up this experiment allowed us to test how greenhouse gas emissions are affected by a combination of changes in climate and changes in plant communities.

"By taking gas samples every month of the year, we were able to show that the types of plants growing in these ecosystems can modify the effects of increase in temperature."

Dr Ward said the study would be of interest and relevance to ecological and climate change scientists and policy makers.

"Changes in vegetation as well as physical changes in climate should be taken into account when looking at how global change affects carbon cycling," she added. "Otherwise a vital part is missing - the biology is a key ingredient."

Professor Nick Ostle, from the Centre for Ecology & Hydrology, a joint partner in the research, said: "This 'real-world' study of the response of peat lands to climate change is unique, making these findings even more important.

"It seems that the identity of the plants present in these landscapes will exert a strong influence on the effect of climate warming on soil CO2 emissions back to the atmosphere. If this is true then we can expect similar responses in other carbon rich systems in the Arctic and Boreal regions."

Provided by University of Manchester