Methane Emissions from a Minnesota Peatland

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With global climate change a growing threat, understanding methane emissions from sensitive regions such as peatlands is critical. Peatlands store more carbon than any other terrestrial ecosystem, but are sensitive to climate change and will likely release carbon as warming continues. Several environmental factors affect methane emissions, both steady-state flux and episodic ebullitions, and understanding their effect is critical to modeling methane emissions. The SPRUCE project in the Marcell Experimental Forest, Minnesota, uses greenhouses with elevated carbon dioxide (CO2) and temperature to examine how climate change affects peatlands. I examined how temperature, air pressure, water table, and vegetation affect methane flux and ebullition from SPRUCE. Statistical analyses suggested that soil temperature and water table were important variables in modeling methane flux. While methane flux didn't differ with elevated CO2, it increased with higher temperature. Ebullition frequency was also higher with higher temperature, but was affected by soil temperature and air pressure rather than water table. Clearly, temperature is an important variable, and something to consider as climate change continues. Air pressure and water table were also important to methane emissions, while vegetation was not. These models offer further explanation of how a combination of environmental variables affect methane emissions and the relative importance of these variables, as well as describing conditions behind ebullition events. This will be helpful to other researchers using the SPRUCE project for carbon studies as well as researchers exploring methane emissions and climate change.