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Interactive comment on "Response of CH_4 emission to moss removal and N addition in boreal peatland of Northeast China" *by* H. N. Meng et al.

Anonymous Referee #1

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The authors measured methane fluxes over three growing seasons in a boreal peatland underlain by permafrost in NE China. In treatment plots they added N as urea twice per year to increase total N addition by 60kg/ha/y and removed the tops of Sphagnum mosses by clipping. There was no effect of N loading or moss clipping in the first two years, but then methane emissions decreased with both treatments in the third year.

I am sympathetic to the amount of field work and subsequent gas analysis conducted in the lab for this project. However I also view their treatments as being problematic to address relevant questions of how environmental change affects peatlands. What real environmental changes do these two disturbances represent? This was not established very well in the paper. As I see it, moss clipping would likely not represent either peat removal through harvesting, nor moss decline and death caused by drought or

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increased nitrogen deposition. The physical, chemical, and ecological situation established in this experiment seems too far away from the reality of what the environmental impacts that lead to moss death are.

Similarly with increased N loading, urea could be mineralized to ammonium, but what widely occurring environmental change leads to high ammonium loading alone? Most N deposition is in the form of nitrate that comes in much smaller and more regular doses, assuming this site is downwind from industrial areas. Some ammonia could arise from agricultural activities. However agriculture would not work well in higher elevation permafrost regions as studied. Although increased ammonium could arise from faster soil organic matter mineralization under drought conditions or a combination of drought and increased soil temperatures brought about by climate change, adding the N alone would only examine one aspect of this climate change situation.

I don't personally see how my principle concerns can be addressed, however if they are, I also have some other concerns with the interpretation and speculation of what caused reduced methane emissions. For example, the authors state that removing mosses eliminated C substrates for methanogens, but it isn't clear that the mosses are near enough to the water table to play this role. Only volumetric moisture content is provided, not the water table position, however the surface of this site seems quite dry. Others (Larmola et al cited here) have found that in dry hummocks high above the water table, rates of methane oxidation in mosses are low. The reason for this is probably that there is no/little methane, because it has already been oxidized lower in the soil near to the water table. The authors' interpretation that moss removal from dry hummocks would lead to increased methane oxidation is not clear in this context.

Interactive comment on Biogeosciences Discuss., 11, 3365, 2014.