EGU24-12362, updated on 19 Jul 2024
https://doi.org/10.5194/egusphere-egu24-12362
EGU General Assembly 2024

Effects of inorganic nitrogen additions on methane and carbon dioxide production from incubated boreal bog samples

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Peatland soils are projected to respond to rising global temperatures with an increase in microbial respiration rates. At the same time, nutrients that were previously bound in undecomposed organic matter will increasingly become available to the decomposer microbial communities. The pathway and magnitude of response in respiration rates to a changing nutrient status remains an open question, especially given that these ecosystems are typically limited in nutrients like nitrogen.

In my ongoing Master thesis within the FluxWIN project, I investigate the effects of adding nitrate and ammonium to incubated peat samples from Siikaneva bog in boreal Finland. Preliminary results from 190 days of incubation indicate that carbon dioxide production was reduced by ammonia additions. Data on methane production were less conclusive, but also point to an average reduction of total C respiration with the N addenda. In summary, this implies that nitrogen was not the sole limiting factor to microbial decomposition, and that the peatland carbon sink is not endangered by nitrogen release.

Samples from above and below the water table exhibit different patterns of carbon mineralization, which may be an expression of different microbial communities: most prominently, a complete lack of methanogenesis in the surface samples. Microbial abundance assays are currently on the way and will help understanding the microbial regime. Further analyses will focus on how the treatments impacted the trajectories of carbon production over time, which will help with understanding how the coupled C and N cycles interact in a warming climate.