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A new approach for continuous *in-situ* quantification of methane oxidation in peatlands

Cecilie Skov Nielsen, Niles J. Hasselquist, Mats B. Nilsson, Mats Öquist, Järvi Järveoja, and Matthias Peichl

Swedish University of Agricultural Sciences, Department of Forest Ecology and Management, Sweden (cecilie.skov.nielsen@slu.se)

Methane (CH_4) oxidation is an important process for controlling CH_4 emissions from peatlands as it oxidizes CH_4 to carbon dioxide (CO_2). Our current knowledge about its temporal dynamics and contribution to ecosystem CO_2 fluxes is, however, limited due to methodological constraints. New methods are therefore needed, and we will here present data from a new method for *in-situ* quantification of CH_4 oxidation in peatlands at high temporal resolution.

We measured the carbon (C) isotopic signature of heterotrophic respiration (vegetation-free plots) from a boreal mire, Degerö Stormyr, Sweden, using an automated chamber setup connected to a Picarro G1101-i isotopic CO_2 analyzer. In addition, we determined the isotopic signature of pore water CH_4 and peat C from the mire. Then, by combining these isotopic signatures in a two-source mixing model, we were able to partition the heterotrophic respiration into CO_2 emanating from organic matter decomposition and CH_4 oxidation.

Using this new approach, we found that 78 % of potential CH_4 fluxes were oxidized during our measurement campaign. Furthermore, CH_4 oxidation contributed on average 25.5 $\pm$ 3.4 % of heterotrophic respiration corresponding to 11.7 % of ecosystem respiration. In addition, we found that the contribution of CH_4 oxidation to heterotrophic respiration showed a distinct diurnal cycle being negligible during nighttime while contributing 49.7 $\pm$ 6.7 % during daytime.

Our results show that CH_4 oxidation may represent an important component of the peatland carbon balance and highlight the value of our novel method for measuring *in-situ* CH_4 oxidation to better understand carbon dynamics in peatlands.