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Seasonal variations in CH_4 emissions and stable isotope signatures from an ombrotrophic peat bog

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Natural wetlands are the largest source of CH_4 emissions globally. However, despite a wealth of literature and field measurements, there is still considerable uncertainty about total emissions, largely due to the high seasonal and inter-annual variability in fluxes. The use of Stable isotopes provides a powerful technique for investigating CH_4 biogeochemistry. In order to better constrain wetland greenhouse gas emissions we need to improve our understanding of how emissions and their isotopic signatures respond to seasonal changes in environmental controls. In peatlands, part of the CH_4 produced under anaerobic conditions may be oxidised by methanotrophic bacteria in the top aerobic layer of the peat. Both microbial CH_4 production and oxidation will be driven by environmental conditions, but may show independent responses, while their relative magnitude will affect total emissions and their isotopic signature. In order to improve our understanding of these important processes in wetland CH_4 emissions we set up a 12-month study at an ombrotrophic peat bog in northern England. Weekly chamber flux measurements were combined with monthly stable isotope ($^{13}C/^{12}C$, $^{2}H/^{1}H$) measurements, climate, and soil parameters to investigate how seasonal changes in environmental conditions affect CH_4 fluxes and their isotopic signatures as an indicator of the balance between CH_4 production and oxidation. We show a seasonal pattern in total emissions with higher fluxes in summer and autumn, and expect to find a concomitant seasonal pattern in isotope signatures due to changes in the relative activity of methanotrophs.