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Plant-mediated greenhouse gas fluxes in a Swedish peat bog; revealing the role of individual species on landscape CO_2 and CH_4 exchange

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Most of the world's peatlands are found in bogs at high northern latitudes, which contain as much as 30% of global soil carbon (C), and so represent a major terrestrial carbon store. Carbon is commonly released from these ecosystems as the greenhouse gas (GHG) methane (CH_4), and depending on climatic conditions they can vary between a source and sink of carbon dioxide (CO_2). Thus, not only do these landscapes already have the potential to influence climate change, but may also increase GHG emission under a warming climate in the future. It is therefore vital that we have a thorough understanding of the mechanisms driving GHG emission from peatlands so that we are better equipped to manage these in the future.

Plant species commonly found in blanket bog ecosystems can strongly influence observed GHG fluxes, due to differences in their traits (e.g. *Eriophorum vaginatum* can transport CH_4 from the anaerobic sediment to the atmosphere (Greenup et al. 2000)), which can drive high spatial variation in GHG emissions. Additionally, confounding processes controlling GHG fluxes (e.g. photosynthesis and respiration, methanogenesis and methane oxidation) ensure high temporal variation in emissions. It is therefore important to measure GHG fluxes at high spatial and temporal resolution. We used SkyLine2D, a novel automated chamber system to measure CO_2 and CH_4 fluxes from experimental plots consisting of microsites dominated by the most common species (*Sphagnum spp.*, *E vaginatum*, *Calluna vulgaris*, mixtures and pools of water). We present near-continuous CO_2 and CH_4 data from a bog in western Sweden, 70 km north of Gothenburg and compare these data to GHG measurements made using an EC tower at the same site (Mycklemossen mire at Skogaryd station, see www.fieldsites.se).

Clear diurnal and seasonal variations were seen in CO_2 and CH_4 fluxes, with highest fluxes of both gases seen in the summer months, declining through winter. Photosynthesis dominated daytime fluxes in summer, driving negative CO_2 fluxes, but despite this all veg types were a net source of CO_2 during all months (August- December). Less strong, but clear diurnal patterns were seen in CH_4 fluxes during August and September from *E. vaginatum* and *C. vulgaris* with reduced CH_4 emissions during the day

Highest cumulative CH_4 fluxes were measured from *E vaginatum*, and then *Sphagnum spp.*, with the lowest from *C. vulgaris.* Methane fluxes from water bodies were characterised by brief events of high emissions following rainfall.

Our findings demonstrate the importance of species composition of peatlands with regards to landscape scale GHG fluxes. This will become even more important if the species composition of these ecosystems shifts as is predicted (Robroek et al. 2017) with a changing climate. We will discuss further plans to manipulate the experimental plots in the coming year to improve our understanding of GHG responses to a warming climate.