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Measuring Methane (CH4) Fluxes from Two Rewetted Peatland Sites located in Irish Midlands

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Rewetting of drained peatlands is known to substantially reduce the carbon dioxide (CO_2) and nitrous oxide (N_2O) fluxes. However, rewetting can increase the methane (CH_4) fluxes from peatlands to the atmosphere, especially from peatland/wetland vegetation species specialized in plant-mediated transport. The typical peatland/wetland vegetation species exhibiting plant-mediated transport and commonly found in rewetted Irish peatlands are *Eriophorum vaginatum*, *Carex rostrata*, *Typha latifolia* and *Phragmites australis*. Two rewetted peatlands (namely Ballycon and Derries), located in Co. Offaly, Ireland were monitored for CH_4 fluxes using the chamber method. Both sites were used for industrial peat extraction from the 1960s until 2000-2001. Ballycon and Derries were rewetted in 2005-2006 and 2017 respectively by constructing drain blocking structures to raise the water table at the peat surface. Ballycon has shallow (0.5-2.5 m) and deep (> 2.6 m) peat depths, while the Derries has a shallow peat depth of less than 1 m. The CH_4 flux monitoring at Ballycon and Derries began in June 2023 and October 2023 respectively and is on-going at both sites. The CH_4 flux is being monitored in different microsites at Ballycon (*Sphagnum* mosses, *Eriophorium*, Molonia grass, open water (no vegetation), *Carex rostrata* and *Phragmites australis*) and Derries (*Carex rostrata*, open water (no vegetation) and *Typha latifolia*). At both the peatland sites, CH_4 fluxes in each microsite measured using a 60 x 60 cm stainless steel square collar (3 collars each microsite), transparent chamber (L x W x H: 60 x 60 x 50 cm), 2 stacked transparent chambers (50 cm height) and a LICOR 7810 gas-analyzer. The CH_4 flux measurements were conducted at each of these microsites between 10.00 am to 4.30 pm on the sampling days. The measurements were conducted twice every month in the spring, summer, and autumn, and once in the winter months. Alongside the CH_4 flux measurements, environmental variables such as peat and air temperatures and water table depths were measured. In this presentation, the field measured CH_4 fluxes from different wetland vegetation species (*Carex*, *Eriophorum*, *Typha* and *Phragmites*) at two peatland sites (Ballycon and Derries) will be discussed alongside environmental variables. Field results from the Ballycon site showed that the CH_4 fluxes from the *Carex* species (range: 0.029 to 0.144; average: 0.083 g m^{-2} hr^{-1}) were larger than CH_4 fluxes from the *Eriophorum* species (range: 0.0028 to 0.24; average: 0.059 g m^{-2} hr^{-1}), while the CH_4 flux from the *Phragmites* species (range: 0.00023 to 0.004; average: 0.00158 g m^{-2} hr^{-1}) was the smallest. Field results from the Derries site showed

that the CH_4 fluxes from the *Typha* species (range: 0.0019 to 0.083; average: 0.033 g m^{-2} hr^{-1}) were higher than the CH_4 fluxes from the *Carex* species (range: 0.0026 to 0.0161; average: 0.011 g m^{-2} hr^{-1}) based on the transparent chamber data. We concluded that all wetland vegetation species specialized in plant mediated transport at both peatland sites (Ballycon and Derries) were CH_4 sources to the atmosphere.