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Unravelling controls on methane uptake in a temperate forest soil: impacts of ectomycorrhizas

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Methane (CH_4) is an important greenhouse gas, globally responsible for 17% of current radiative forcing. Soils can be important net sources or sinks of CH_4 depending on the net balance of two contrasting microbial processes - CH_4 production and CH_4 oxidation. In unsaturated soils, the aerobic methane oxidation process often dominates. These soils form the only global terrestrial CH_4 sink, but estimates are still highly uncertain, both spatially and temporally. Forest soils have shown some of the strongest net CH_4 uptake rates, but this is not consistent across sites and the controls are poorly understood.

In this field study, we focused on the effects of ectomycorrhizas on net CH_4 uptake in an unsaturated, sandy gley podzolic soil of a mature coniferous forest stand dominated by Lodgepole pine (*Pinus contorta*) in Northern England over three years. Methane fluxes were determined in cores with soil only (roots and ectomycorrhizal mycelium excluded using windows with 1 μm mesh in the cores) and cores with soil and ectomycorrhizal mycelium (only roots excluded with 41 μm mesh). Net CH_4 uptake rates in summer were higher when ectomycorrhizal mycelium was present, whereas the opposite was observed in winter. We will discuss mechanisms that may underpin these ectomycorrhizal impacts on net CH_4 uptake in unsaturated forest soils.