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Methane uptake in temperate forest soils - what is the role of ectomycorrhizas?

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Methane (CH4) is an important greenhouse gas, globally responsible for 17% of current radiative forcing. Soils can be important net sources or sinks of CH4 depending on the net balance of two contrasting microbial processes - CH4 production and CH4 oxidation. Unsaturated soils in which the latter, aerobic process dominates form the only global terrestrial CH4 sink, but estimates are still highly uncertain, both spatially and temporally. Forest soils have shown some of the strongest net CH4 uptake rates, but this is not consistent across sites and the controls are poorly understood. Little is known about the effect of ectomycorrhizas on CH4 fluxes in forest soils.

In this field study, we determined the effects of ectomycorrhizas on net CH4 uptake in an unsaturated, sandy gley podzolic soil of a mature coniferous forest stand dominated by Lodgepole pine (Pinus contorta) in Northern England during three years. Methane fluxes were compared in cores with soil only (roots and ectomycorrhizas excluded through windows with 1 μm mesh) and cores with soil and ectomycorrhizas (roots excluded with 41 μm mesh). Net CH4 uptake rates were higher when ectomycorrhizas were present in summer, whereas the opposite was observed in winter. We will discuss potential mechanisms that underpin these intriguing effects of ectomycorrhizas on net CH4 uptake in unsaturated forest soils.