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Above- and belowground fluxes of CH_4 from boreal shrubs and Scots pine

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Boreal upland forests are considered as an important sink for the greenhouse gas methane (CH_4) due to CH_4 oxidizing microbes in the soil. However, recent evidence suggests that vegetation can act as a significant source of CH_4. Also, preliminary measurements indicate occasional emissions of CH_4 above the tree canopies of a boreal forest. Nevertheless, the sources and the mechanisms of the observed CH_4 emissions are still mostly unknown. Furthermore, the majority of CH_4 flux studies have been conducted with the soil chamber method, thus not considering the role of the vegetation itself. We conducted a laboratory experiment to study separately the above- and belowground CH_4 fluxes of bilberry (*Vaccinium myrtillus*), lingonberry (*Vaccinium vitis-idaea*), heather (*Calluna vulgaris*), and Scots pine (*Pinus sylvestris*), which were grown in microcosms. The above- and belowground fluxes of the plants were measured separately, and these fluxes were compared to fluxes of microcosms containing only humus soil. In addition to the flux measurements, we analysed the CH_4 producing archaea (methanogens) and the CH_4 consuming bacteria (methanotrophs) with the qPCR method to discover whether these microbes contribute to the CH_4 exchange from the plant material and the soil. The results of the flux measurements indicate that the humus soil with roots of lingonberry, heather, and Scots pine consume CH_4 compared to bare humus soil. Simultaneously, the shoots of heather and Scots pine emit small amounts of CH_4. We did not find detectable amounts of methanogens from any of the samples, suggesting the produced CH_4 could be of non-microbial origin, or produced by very small population of methanogens. Based on the first preliminary results, methanotrophs were present in all the studied plant species, and especially in high amounts in the rooted soils, thus implying that the methanotrophs could be responsible of the CH_4 uptake in the root-soil systems.