# Methane budget of a temperate forest: the underestimated contribution of understorey vegetation

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Methane is one the most important greenhouse gases, responsible for about 20% of global warming. Methane consumption by upland forest soils, carried out by methanotrophic bacteria where aerobic environments prevail, are known to be an important biological sink for atmospheric methane, but several studies have shown that net methane uptake of a forest ecosystem can be reduced when methane emissions by vegetation are considered.

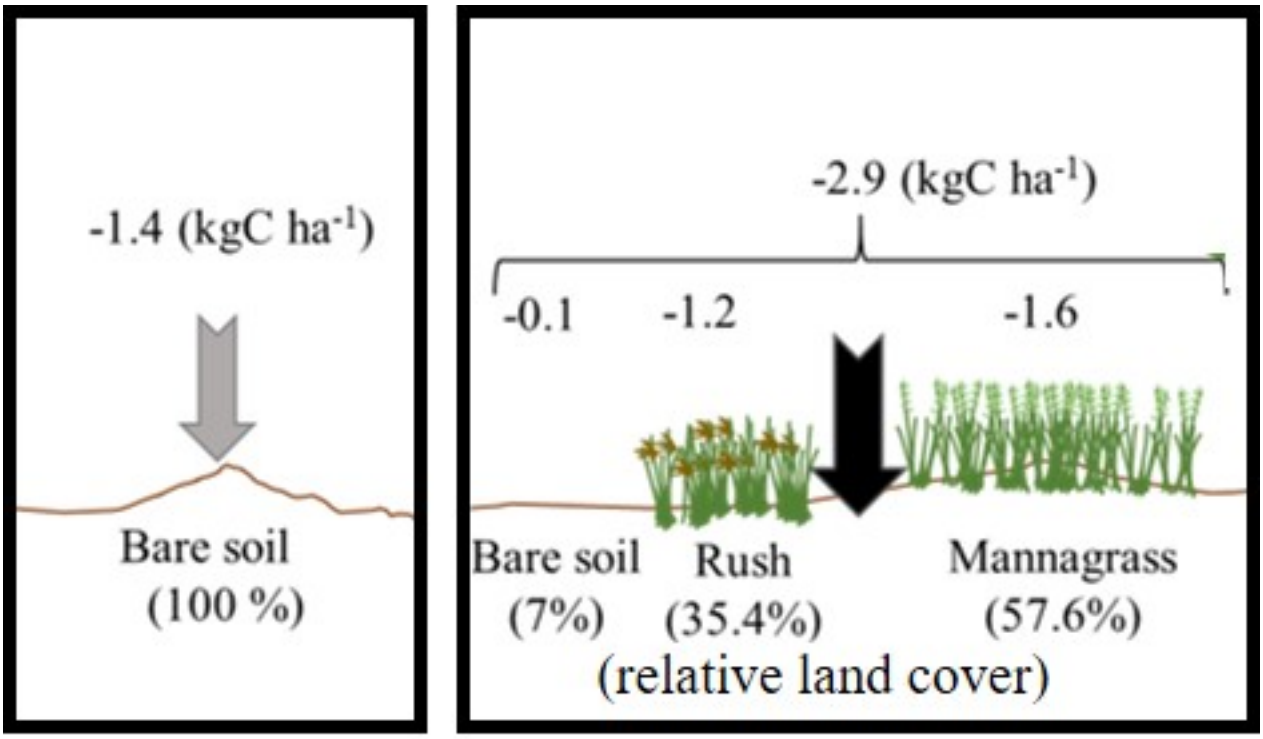
Methane produced in deep anaerobic silty or clayey soil layers by methanogenic bacteria during episodic temporary waterlogging may be transported to the atmosphere by the understorey vegetation, especially by aerenchymatous plant species that develop on this type of soils, because they provide a relatively low-resistance pathway for methane compared to soil. The questions that arise are: does understorey vegetation emit methane, and is it related to methane production in the deep soil layers?

To estimate the contribution of the understorey vegetation the methane budget of an oak forest, automated chambers located on bare soil and on soil covered with understorey vegetation were connected to a laser-based gas analyser, and methane fluxes were recorded for 7 months at 3 h intervals.

In contrast to our expectation, the presence of understorey vegetation increased soil methane uptake. Considering the presence of understorey vegetation when upscaling the data at the stand level doubled the consumption of methane (from -1.4 kg C $ha^{-1}$ when only bare soil is considered to 2.9 kg C $ha^{-1}$ when the understorey vegetation is considered. These results indicate that aerenchymatous plant species, which are known to transport methane to the atmosphere in wetlands, actually increase soil methane uptake in an upland forest.

Keywords: methane, forest soil, vegetation




*$CH_4$ budget of an upland forest soil accounting or not for the presence of the understorey vegetation*