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Biotische und abiotische Steuerung von Bodengasflüssen

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Titel
The role of plants on methane flux out of upland soils

Abstract
Soils play an important role in cycling of methane (CH_4), a greenhouse gas contributing roughly 20% to the observed climate warming. While knowledge about the influence of plants on methane cycling is growing for wetland ecosystems, we are still limited in our understanding for upland soils. Thus, the objectives of this study were to investigate the influence of plants on net CH_4 fluxes from forest and grassland soils depending on bedrock, temperature, and plant species, and to determine if changes in CH_4 fluxes are reflected on microbial level.
The present study used soils from forest and grassland sites located in Tyrol, Austria. Soil sites were chosen to represent soils from limestone and siliceous bedrock. To study grassland soils, two site-specific plants, Plantago lanceolata and Poa pratensis, were grown from seeds in pots. In case of forest soils, two site-specific trees, Picea abies and Larix decidua, were chosen and grown from seedlings. Besides profound soil microbiological analyses, lab-scale gas measurements were conducted at different temperatures. To characterize the microbial community structure of bulk and rhizosphere soil, NGS (next-generation sequencing) was performed. Further microbiological and molecular analyses aimed to determine if changes in CH_4 fluxes are reflected in the activity and abundance of microorganisms in rhizosphere soil compared with bulk soil.
Results showed that forest and grassland soils had a high potential to consume methane under ambient conditions, thus serving as methane sinks. Distinct differences depending on bedrock, plant species, and temperature were established. The studied site-specific grassland plants P. lanceolata and P. pratensis significantly increased methane balances to a varying extent depending on temperature. In contrast, the studied forest plants P. abies and especially L. decidua significantly boosted methane consumption. Further studies have focused on the influence of photosynthetic rates of plants on CH_4 fluxes out of soils and the indirect influence of plants on soil microorganisms engaged in the methane cycle.