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Soil water repellency affects production and transport of CO_2 and CH4 in soil

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Soil moisture is known to be vital in controlling both the production and transport of C gases in soil. Water availability regulates the decomposition rates of soil organic matter by the microorganisms, while the proportion of water/air filled pores controls the transport of gases within the soil and at the soil-atmosphere interface. Many experimental studies and process models looking at soil C gas fluxes assume that soil water is uniformly distributed and soil is easily wettable. Most soils, however, exhibit some degree of soil water repellency (i.e. hydrophobicity) and do not wet spontaneously when dry or moderately moist. They have restricted infiltration and conductivity of water, which also results in extremely heterogeneous soil water distribution. This is a world-wide occurring phenomenon which is particularly common under permanent vegetation e.g. forest, grass and shrub vegetation.
This study investigates the effect of soil water repellency on microbial respiration, CO_2 transport within the soil and C gas fluxes between the soil and the atmosphere. The results from the field monitoring and laboratory experiments show that soil water repellency results in non-uniform water distribution in the soil which affects the CO_2 and CH4 gas fluxes. The main conclusion from the study is that water repellency not only affects the water relations in the soil, but has also a great impact on greenhouse gas production and transport and therefore should be included as an important parameter during the sites monitoring and modelling of gas fluxes.