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Temporal changes in soil water repellency linked to the soil respiration and CH4 and CO_2 fluxes

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Soil water repellency (SWR) is known to be a spatially and temporally variable phenomenon. The seasonal changes in soil moisture lead to development of soil water repellency, which in consequence may affect the microbial activity and in consequence alter the CO_2 and CH4 fluxes from soils. Soil microbial activity is strongly linked to the temperature and moisture status of the soil. In terms of CO_2 flux intermediate moisture contents are most favourable for the optimal microbial activity and highest CO_2 fluxes. Methanogenesis occurs primarily in anaerobic water-logged habitats while methanotrophy is a strictly aerobic process. In the study we hypothesise that the changes in CO_2 and CH4 fluxes are closely linked to critical moisture thresholds for soil water repellency.
This research project aims to adopt a multi-disciplinary approach to comprehensively determine the effect of SWR on CO_2 and CH4 fluxes. Research is conducted in situ at four sites exhibiting SWR in the southern UK. Flux measurements are carried out concomitant with meteorological and SWR observations
Field observations are supported by laboratory measurements carried out on intact soil samples collected at the above identified field sites. The laboratory analyses are conducted under constant temperatures with controlled changes of soil moisture content. Methanogenic and Methanotrophic microbial populations are being analysed at different SWR and moisture contents using the latest metagenomic and metatranscriptomic approaches.
Currently available data show that greenhouse gas flux are closely linked with soil moisture thresholds for SWR development.