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Titel

Rhizosphere Priming Effects under Zea Mays - A Field Study

Abstract

We conducted a field experiment at a location near Goettingen. We investigated the priming effects in the rhizosphere of maize plants by introducing three plant densities and a bare fallow control and two fertilization levels. Each resulting treatment was carried out in four 5x5 m field replicates. We collected long term soil CO₂ using NaOH traps. Short term soil CO₂ accumulation was measured with a CO₂ chamber system. In order to investigate the CO₂ fluxes inside the soil two silicon CO₂ collectors were installed between the plant rows on each plot in depths of 10, 20 and 30 cm. All CO₂ samples were analyzed for concentration and Carbon-13 signature. The field has been cropped with C3 plants only in the last decades. With the introduction of maize plants and their distinct isotopic composition we are able to differentiate the plant derived CO₂ in the rhizosphere from soil derived CO₂. Hence we are able to calculate a priming effect utilizing only natural abundance Carbon-13 in the CO₂ samples. Root samples were taken in between the rows to estimate root biomass in different depths, to analyze the isotopic composition and to determine root length density. Also above ground plant samples were taken to determine above ground biomass three times throughout the experiment. Temperature was monitored on the field over the whole growing season using temperature sensors which were installed in the three measurement depths. Soil water status was monitored on the main sampling events. Additionally we collected soil samples to determine the isotopic composition of the organic carbon on each plot and depth, to analyze enzyme activity and to determine microbial biomass and microbial communities via PLFA extraction. We compared all three CO₂ collecting techniques for their applicability in the field and hope to present an in-depth view on priming effects on field sites.