Geophysical Research Abstracts
Vol. 21, EGU2019-4815, 2019
EGU General Assembly 2019

Microbial carbon use efficiency in grassland soils on three continents as dependent on nitrogen and phosphorus addition

Meike Widdig (1), Per-Marten Schleuss (1), Lori A. Biederman (2), Elizabeth T. Borer (3), Mick J. Crawley (4), Kevin P. Kirkman (5), Eric W. Seabloom (3), Peter D. Wragg (6), and Marie Spohn (1)

(1) Department of Soil ecology, University of Bayreuth, Germany, (2) Department of Ecology, Evolution and Organismal Biology, Iowa State University, USA, (3) Department of Ecology, Evolution, and Behavior, University of Minnesota, USA, (4) Department of Life Sciences, Imperial College London, England, (5) School of Life Sciences, University of KwaZulu-Natal, South Africa, (6) Department of Forest Resources, University of Minnesota, USA

Soil microorganisms might strongly shape carbon (C) cycling through changes in their carbon use efficiency (CUE), which is the ratio between C allocated to growth and C taken up. Soil microbial CUE might increase due to nutrient addition. We studied how soil microbial CUE and microbial biomass turnover are affected by nitrogen (N) and phosphorus (P) addition in six grassland soils located in South Africa, USA, and the UK that had been subjected to a full factorial element addition experiment. We sampled the soil of four treatments (control, +N, +P, and +NP) in two depth increments (0-15 and 15-30 cm depth) at all six sites. We determined CUE and microbial biomass turnover by a recently developed method that is based on incorporation of ^{18}O into microbial DNA. In addition, we determined soil chemical variables such as dissolved organic C (DOC), and dissolved N (DN). Soil microbial CUE varied between 28 and 61 % with a mean value of 44 % across all sites, depth increments, and treatments. In a linear-mixed effects model, 72 % of the variability among sites of microbial CUE was accounted for by the combined variability in the DOC:DN ratio, mean annual temperature, mean annual precipitation, and sand. Addition of N or P did not change CUE showing that soil microbial CUE may not depend on nutrient supply rates. Microbial growth and respiration in both depth increments of all soils were not affected by nutrient addition, either. Mean microbial biomass turnover of all sites and depth increments ranged between 62 and 227 days. Taken together, N, P, and NP addition did not influence microbial CUE and microbial biomass turnover in grassland soils on different continents, indicating that soil microbial CUE may be less affected by N and P inputs to soil than expected. However, soil microbial CUE differed among sites and declined with increasing DOC:DN ratio and increased with increasing sand content.