Geophysical Research Abstracts
Vol. 18, EGU2016-15064, 2016
EGU General Assembly 2016

Soil warming affects soil organic matter chemistry of all density fractions of a mountain forest soil

Jörg Schnecker (1,2), Wolfgang Wanek (2), Werner Borken (3), and Andreas Schindlbacher (4)

(1) University of New Hampshire, Department of Natural Resources and the Environment, Durham, United States (joerg.schnecker@unh.edu), (2) University of Vienna, Department of Microbiology and Ecosystem Science, Vienna, Austria, (3) University of Bayreuth, Department of Soil Ecology, Bayreuth, Germany, (4) Federal Research and Training Centre for Forests, Natural Hazards and Landscape - BFW, Department of Forest Ecology, Vienna, Austria

Rising temperatures enhance microbial decomposition of soil organic matter (SOM) and increase thereby the soil CO_2 efflux. Elevated microbial activity might differently affect distinct SOM pools, depending on their stability and accessibility. Soil fractions derived from density fractionation have been suggested to represent SOM pools with different turnover times and stability against microbial decomposition.

We here investigated the chemical and isotopic composition of bulk soil and three different density fractions of forest soils from a long term warming experiment in the Austrian Alps. At the time of sampling the soils in this experiment had been warmed during the snow-free period for 8 consecutive years. During that time no thermal adaptation of the microbial community could be identified and CO_2 release from the soil continued to be elevated by the warming treatment. Our results which included organic C content, total N content, δ13C, δ 14C, δ 15N and the chemical composition, identified by pyrolysis-GC/MS, showed no significant differences in bulk soil between warming treatment and control. The differences in the three individual fractions (free particulate organic matter, occluded particulate organic matter and mineral associated organic matter) were mostly small and the direction of warming induced change was variable with fraction and sampling depth. We did however find statistically significant effects of warming in all density fractions from 0-10 cm depth, 10-20 cm depth or both. Our results also including significant changes in the supposedly more stable mineral associated organic matter fraction where δ 13C values decreased at both sampling depths and the relative proportion of N-bearing compounds decreased at a sampling depth of 10-20 cm. All the observed changes can be attributed to an interplay of enhanced microbial decomposition of SOM and increased root litter input. This study suggests that soil warming destabilizes all density fractions of this C-rich calcareous forest soil.