EGU23-357, updated on 22 Feb 2024
https://doi.org/10.5194/egusphere-egu23-357
EGU General Assembly 2023

Is priming influenced more by in situ or incubation temperatures? Evidence from a 1500 m elevation gradient in the Amazon

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Abstract

Growing attention has been paid to the significance of microbial metabolism for soil carbon (C) and nutrient cycle as well as their feedback effects on global warming. The estimated annual release of carbon dioxide from soil microbial respiration is 60 petagrams, and because aged native soil organic matter (SOM) has higher temperature sensitivity, the anticipated warming is expected to speed up its C release. Warming might increase litter and root exudate C inputs to hasten the decomposition of older SOM through priming effects. Microorganisms, however, have a rapid rate of growth and turnover and the new SOC formation from labile C inputs may be able to partly counteract the C losses through primed SOM decomposition. We are examining how temperature and the availability of C and nutrients affect the size and direction of priming effects. We conducted an incubation experiment on intact soil cores collected from altitudes ranging from 1500 to 3050 m a.s.l, and that were part of the Kosñipata gradient in the Peruvian Amazon. We incubated the soils for seven months, at two different temperatures to evaluate the impact of temperature, on the magnitude of priming effect caused by added ^{13}C-labeled glucose, which was used as a model compound for labile root derived C inputs. At the end of the incubation, we determined the amount of ^{13}C integrated into the microbial biomass and amino sugars, as well as the ^{13}C remaining in bulk SOM.

Keywords

Soil organic carbon, Priming effect, Soil respiration, Microbial residues, Elevational (altitudinal) gradient, Amazon