Geophysical Research Abstracts
Vol. 21, EGU2019-12216, 2019
EGU General Assembly 2019

Changed by fire: Linking C and energy fluxes by microbial decomposition of soil organic matter after frequent forest burning events

Anna Gunina (1), Olga Ogneva (2), Chengrong Chen (3), Maryam Esfandbod (3), Mehran Rezaei Rashti (3), and Yakov Kuzyakov (4)

(1) Departments of Environmental Chemistry, Kassel University, Witzenhausen, Germany (guninaann@gmail.com), (2) Alfred Wegener Institute, Helmholtz Centre for Polar and Marine Research, Bremerhaven, Germany, (3) Griffith School of Environment and Australian Rivers Institute, Griffith University, Nathan, Australia, (4) Agro-Technology Institute, RUDN University, Moscow, Russia

Global warming has a strong impact on soils, including changes in organic carbon (C) pools, cycles of nutrients and microbial biomass and activity. The present study aimed to investigate the impact of fires on the functioning of soil microbial communities, specifically on priming effect, as one of the main phenomena of nutrients and energy mining by microorganisms from soil organic matter (SOM).

A fire field experiment in a wet sclerophyll forest established in 1972 in southeast Queensland was used to investigate the consequences for SOM and microbial functions. The fire frequency regimes included never burnt, burnt every 2 and every 4 years, both with low fire intensity and destruction of only forest floor and understory. Soil samples were collected in December 2017, and three temperature treatments were prepared for each soil: fresh soil (at the natural moisture conditions), soil dried at 20 ºC and 40 ºC for 48 h. To induce priming effects, ^{14}C-labelled glucose was applied at the concentration of 120 mg C kg-1 soil (30% of microbial biomass), whereas water addition served as a control. Soils were incubated in glass jars at 25 ºC during 4 weeks with the continuous analysis of SOM- and glucose-derived CO_2 fluxes. At the end of the experiment, total and ^{14}C in microbial biomass were analyzed. Parallel with the CO_2 efflux, energy production was measured by isothermal microcalorimetry approach for the 2 periods: for the first four days (the time when negative priming effects on SOM switched to positive), and for the last two days (stable phase of positive priming effects). This study demonstrate differences in priming effects for soils affected by frequent fire and droughts. The calorimetry-respirometric ratio (ratio of heat-to-CO_2) will be presented to evaluate metabolic efficiency of soil microorganisms during various phases of priming effects, namely during the switch from negative to positive phase.