Geophysical Research Abstracts
Vol. 18, EGU2016-18231, 2016
EGU General Assembly 2016


# Enzymatic mechanisms of soil-carbon response to temperature on Mt. Kilimanjaro

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Short-term acceleration of soil organic matter (SOM) decomposition by increasing temperature contradicts the acclimation observed in long-term studies. We used the unique altitudinal gradient (from colline tropical zone to subalpine zone) on Mt. Kilimanjaro to demonstrate the mechanisms of short- and long-term acclimation of extra- and intracellular enzymes that decompose polymers (cellulose, chitin, phytate) and oxidize monomers (14C-glucose).

Basing on Michaelis-Menten kinetics we determined the enzymes affinity to substrate (Km) and mineralization potential of heterotrophic microorganisms (Vmax) 1) for three hydrolytic enzymes: $\beta$-1,4-glucosidase, N-acetyl-$\beta$ –D-glucosaminidase and phosphatase by the application of fluorogenically labeled substrates and 2) for mineralization of 14C-labeled glucose by substrate-dependent respiratory response.

Here we show that the amount of available substrate is responsible for temperature sensitivity of hydrolysis of polymers in soil, whereas monomers oxidation to $CO_2$ does not depend on substrate amount and is mainly temperature governed. We also found that substrate affinity of enzymes (which is usually decreases with the temperature) differently responded to warming for the process of depolymerisation versus monomers oxidation. We suggest the mechanism to temperature acclimation based on different temperature sensitivity of enzymes kinetics for hydrolysis of polymers and for monomers oxidation