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# Spatial effects of aboveground biomass on soil ecological parameters and trace gas fluxes in a savannah ecosystem of Mount Kilimanjaro

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The savannah biome is a hotspot for biodiversity and wildlife conservation in Africa and recently got in the focus of research on carbon sequestration. Savannah ecosystems are under strong pressure from climate and land-use change, especially around populous areas like the Mt. Kilimanjaro region. Savannah vegetation in this area consists of grassland with isolated trees and is therefore characterized by high spatial variation of canopy cover, aboveground biomass and root structure. Canopy structure is known to affect microclimate, throughfall and evapotranspiration and thereby controls soil moisture conditions. Consequently, the canopy structure is a major regulator for soil ecological parameters and soil-atmospheric trace gas exchange ($CO_2$, N2O, CH4) in water limited environments. The spatial distribution of these parameters and the connection between above and belowground processes are important to understand and predict ecosystem changes and estimate its vulnerability. Our objective was to determine trends and changes of soil parameters and relate their spatial variability to the vegetation structure. We chose three trees from each of the two most dominant species (Acacia nilotica and Balanites aegyptiaca) in our research area. For each tree, we selected transects with nine sampling points of the same relative distances to the stem. Distances were calculated in relation to the crown radius. At these each sampling point a soil core was taken and separated in 0-10 cm and 10-30 cm depth. We measured soil carbon (C) and nitrogen (N) storage, microbial biomass carbon C and N, soil respiration as well as root biomass and -density, soil temperature and soil water content. Each tree was characterized by crown spread, leaf area index and basal area. Preliminary results show that C and N stocks decreased about 50% with depth independently of distance to the tree. Soil water content under the tree crown increased with depth while it decreased under grass cover. Microbial Biomass C and N in the upper 10 cm decreased with distance (C: $r^2$=0.22, p<0.001; N: $r^2$=0.3, p<0.001) as well as total soil respiration. This decrease was affected by tree size but independent from tree species. We conclude that savannah ecosystems exhibit a large spatial variability of soil parameters within the upper horizons which is strongly depend on the structure of aboveground biomass.