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Titel
Sodium demand of microorganisms in the phyllosphere and the organic layer of a tropical montane forest in south Ecuador

Abstract
Recent studies raise the hypothesis that Na shortage restricts decomposition and affects the carbon cycle in tropical forests. When Na concentrations in soils are low and the stands are far off-coast, they do not receive substantial Na inputs from the atmosphere. Since terrestrial plants have low concentrations of Na, which is not considered as an essential element, the demand of soil fauna may not be covered. Yet, in contrast to animals, little is known of Na demands of fungi and phyllosphere microorganisms.

We present results from a study on Na limitation in a montane forest ecosystem in South Ecuador, which is located on the eastern cordillera of the Andes. We tested the hypotheses that (1) the study area is characterized by low Na concentrations because of low deposition rates with incident precipitation (wind directions mainly from the Amazonian Basin), (2) decomposition processes are limited by fauna and fungal Na restrictions and (3) Na is retained in the canopy because of Na limitation of microorganisms in phyllosphere.

Since 1998, we measure Na fluxes in rainfall, throughfall, stemflow, litter leachate, litterfall and organic layer in a microcatchment under an undisturbed lower montane rainforest. Results reveal comparatively low Na concentrations in the ecosystem and similar Na concentrations in throughfall and stemflow. Since Na fluxes are lower with throughfall than with incident rainfall, we conclude that Na is retained in the canopy.

To explore the role of the phyllosphere in Na retention we sampled leaves covered by phyllosphere microorganisms and leaves without phyllosphere cover from several tree species, which were sprayed with a NaCl solution containing 0.5 mg L^{-1} Na, corresponding to the Na concentration in incident rainfall in our study area.

Additionally, responses of litter decomposition to Na additions and the involved interaction of soil fungi and fauna were tested in a litterbag experiment at two sites (1000 and 2000 m a.s.l.). Results revealed enhanced decomposition rates following Na additions, though only in the presence of soil fauna.

These results might have future ecosystem implications, since our time series showed that total Na deposition decreased within the past 15 years from ca. 40 kg ha^{-1} a^{-1} to 10 kg ha^{-1} a^{-1}, suggesting a potential role of Na in regulating ecosystem processes.