Biogeosciences Discuss., 12, C2547–C2548, 2015
www.biogeosciences-discuss.net/12/C2547/2015/


Biogeosciences Discussions
Open Access



# *Interactive comment on* "Soil microbial nutrient constraints along a tropical forest elevation gradient: a belowground test of a biogeochemical paradigm" *by* A. T. Nottingham et al.

**Anonymous Referee #2**

Received and published: 2 June 2015

It was pleasant to read this nicely written paper which suggests, along a tropical forest elevation gradient, a shift in microbial nutrient acquisition from P to N with elevation. This finding improves our understanding of nutrient limitation of tropical forests which is generally based on the responses of aboveground production. The main limitations of the study are: 1) the uncertainty of conclusions inherent to correlative approaches: are these nutrient constrains the driving force of plant-soil functioning or the consequences of other processes not studied in this work (rhizosphere processes, allelopathy...)? 2) to use an elevation gradient along which many environmental factors vary in the same time: temperature, rainfall, soil type... 3) to consider the pool of soil organic matter (SOM) as a homogeneous pool entirely available to microbial uptake. It's well known

that SOM are composed of different pools with different level of accessibility (some are not accessible at all) and different quality. Consequently, the total soil C:N:P ratio is a poor predictor of stoichiometric constrains of decomposers: this is also shown by your results since the high soil C:P ratio opposes to the high P availability in mountains. 4) a lack of discussions of some results that seem to contradict the theory: 1) if there is no P limitation in mountains, why soil C:P increases with elevation? 2) if nutrient constrains of microbes increase with elevation, why microbial biomass increase with elevation? Specific comments P6495 L13-14 The statement 3) is not clear to me: which ratio are you talking about? Why should it be enzymes involved in the release of N AND P? given you are talking about the decreasing N availability and increasing P availability with increasing elevation, I would expect an increase investment in enzymes releasing N only. P6499 L4-18 Quantifying enzyme activities with only one measurement time and not in kinetics is not advisable (though it's usual in soil science). Have you checked that the substrate was still in excess at the end of incubation? I disagree with the fact that enzyme activities need to be normalized by soil organic C (it's not clear whether you are talking about C stock or C concentrations, this should be clarified). It is well known that a large part of SOC is not accessible to microbes and does not fuel enzymatic activities: SOC can be linked to minerals or occluded in soil pore not accessible to microbes, some SOC compounds are too poor in energy to sustain microbial activity. . . This "normalization" can lead to important biases since the amounts of SOC vary substantially between sites. If you wish to conserve this way of presenting data, non-normalized activities must also be presented and must not challenge your main statements.

---

Interactive comment on Biogeosciences Discuss., 12, 6489, 2015.