Biogeosciences Discussions

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# Comment on bg-2022-63

Anonymous Referee #2

Referee comment on "Contrasting strategies of nutrient demand and use between savanna and forest ecosystems in a neotropical transition zone" by Marina Corrêa Scalon et al., Biogeosciences Discuss., https://doi.org/10.5194/bg-2022-63-RC2, 2022

The authors compared the nutrient stock, uptake, and demand of dominant trees between Neotropical savanna and transitional forests. These estimates have rarely been studied in tropical forests. This is partly because massive field work and continuous monitoring are required. Thus the work provides new and important knowledges on nutrient dynamics in tropical ecosystems. I liked particularly the focus on nutrient-use efficiency at the whole-plant level, which has been estimated mostly at the canopy level. I enjoyed reading the manuscript and have few major concerns and several minor comments that should be addressed before publication.

MAJOR COMMENTS

- Nutrient use and uptake efficiencies: These two terms a bit confused me as I thought that the uptake efficiency indicates the efficiency of nutrient uptake per unit uptake cost (or unit carbon or something like that). However, the uptake efficiency was calculated as the ratio of NPP to unit mass of the nutrient that was taken up from soils. Perhaps, 'nutrient-use efficiency (uptake basis)' or '$NuUE_{uptake}$' might be a more suitable term for example. Similarly, the use efficiency could be described as 'nutrient use efficiency (demand basis)' '$NuUE_{demand}$'. Also add the definition of nutrient use efficiency in the abstract.
- There were missing or errors in citations. I listed them in the specific comments. Please carefully double-check the literatures.

SPECIFIC COMMENTS

ABSTRACT:

L 15 I recommend the authors delete ‘for the first time’. There is a study that simulated vegetation-level nutrient-use efficiencies and flux by coupling NPP with stoichiometry.

Wang, Y., Ciais, P., Goll, D., Huang, Y., Luo, Y., Wang, Y.-P., … Zechmeister- Boltenstern, S. (2018). GOLUM-CNP v1.0: A data-driven modeling of carbon, nitrogen and phosphorus cycles in major terrestrial biomes. Geoscientific Model Development, 11, 3903–3928. https://doi. org/10.5194/gmd-11-3903-2018

L 24-26 I recommend the authors rewrite or delete this statement. I did not get how the authors evaluated the efficiencies of fine root and wood production. Did the authors calculate nutrient use efficiency in the production of fine roots or wood?

L 27 how did the authors know the P and K limitation in the forests? I need the evidence that the forests are considered under P and K limitation. For example, P- or K-resorption efficiency was higher than global average, etc.

L 28 I am not sure if this is a trade-off or not. I think that trees can increase N uptake and N-use efficiency simultaneously.

L 29-30 I thought that this simply means that Ca and Mg were little resorbed before leaf fall.

L 30 ‘species composition’ came out of nowhere. It would be good to clarify why species composition can be the major factor.

INTRODUCTION: the introduction was well edited.

L 73-76 it would be good to add references to these sentences.

METHOD:

L 143-144 As much as I remember, MLCF in Vergutz et al. 2012 is the ratio of green-leaf mass to senescent leaf mass but not Ca. Please double-check.

L 144-145 I would recommend the authors provide the equation to calculate community-weighted manes.

L 149-150 Add brief explanations for the NPP measurement. I was wondering if the NPP was estimated by litterfall monitoring and tree census.

L 157-158 As I mentioned in the major concerns, the nutrient uptake efficiency might be a bit misleading.

L 162 I think this sentence includes typos

RESULTS:

L 240-242 Please make where this statement came clear. Maybe, Tsujii et al. 2020?

Tsujii Y, Aiba S-I, Kitayama K. Phosphorus allocation to and resorption from leaves regulate the residence time of phosphorus in above-ground forest biomass on Mount Kinabalu, Borneo. Funct Ecol. 2020;34: 1702–1712. https://doi.org/10.1111/1365-2435.13574

L 242-245 Which results support this statement?

L 245-246 Aoyagi & Kitayama (2016) is a good reference for this statement but not for the following statement (L 247-248).

L 248 Aoyagi & Kitayama (2016) might not focus on P residence time. Please double check this reference.

L 250 P content in wood may be also affected by reproductive status, such as masting.

For example,

Ichie, T., & Nakagawa, M. (2013). Dynamics of mineral nutrient storage for mast reproduction in the tropical emergent tree Dryobalanops aromatica. Ecological Research, 28(2), 151–158. Retrieved from https://doi.org/10.1007/s11284-011-0836-1

L 278-281 Physiologically, Ca can be little resorbed from senescing leaves.

L 284-258 Please carefully check the citations. As much as I remember, Aoyagi & Kitayama (2016) did not estimate P residence time. Tsujii et al. (2020) estimated P residence time in above-ground forest biomass (canopy + wood). Gleason et al. estimated P residence time in canopy, but also estimated P-use efficiency at the above-ground biomass level (i.e. including canopy and wood). In addition to these papers, Paoli et al. (2005) estimated P residence time in canopy.

Paoli, G. D., Curran, L. M., & Zak, D. R. (2005). Phosphorus efficiency of Bornean rain forest productivity: Evidence against the unimodal efficiency hypothesis. Ecology, 86(6), 1548–1561. Retrieved from https://doi.org/10.1890/04-1126

L 285-286 The following papers analysed nutrient concentrations and estimated nutrient stocks in wood and/or fine roots for tropical trees.

- Hughes, R. F., Kauffman, J. B., & Jaramillo, V. J. (1999). Biomass, Carbon, and Nutrient Dynamics of Secondary Forests in a Humid Tropical Region of Mexico. Ecology, 80(6), 1892. Retrieved from https://doi.org/10.2307/176667
- Imai, N., Kitayama, K., & Titin, J. (2010). Distribution of phosphorus in an above-to-below-ground profile in a Bornean tropical rain forest. Journal of Tropical Ecology, 26(06), 627–636. Retrieved from https://doi.org/10.1017/S0266467410000350
- Johnson, C. M., Vieira, I. C. ., Zarin, D. J., Frizano, J., & Johnson, A. H. (2001). Carbon

and nutrient storage in primary and secondary forests in eastern Amazônia. Forest Ecology and Management, 147(2–3), 245–252. Retrieved from https://doi.org/10.1016/S0378-1127(00)00466-7

- Kauffman, J. B., Cummings, D. L., Ward, D. E., & Babbitt, R. (1995). Fire in the Brazilian Amazon: 1. Biomass, nutrient pools, and losses in slashed primary forests. Oecologia, 104(4), 397–408. Retrieved from https://doi.org/10.1007/BF00341336
- Tsujii Y, Aiba S-I, Kitayama K. Phosphorus allocation to and resorption from leaves regulate the residence time of phosphorus in above-ground forest biomass on Mount Kinabalu, Borneo. Funct Ecol. 2020;34: 1702–1712. https://doi.org/10.1111/1365-2435.13574

CONCLUSION:

L 303-305 It might be good to say 'the cerrado vegetation allocated more nutrient to root and wood' rather than say 'less efficient in their production'.

Tables & Figures:

Figure 1 I did not find asterisks.