



EGUsphere, author comment AC2
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Reply on RC2

Ivan Cornut et al.

Author comment on "Potassium limitation of forest productivity – Part 2: CASTANEA-MAESPA-K shows a reduction in photosynthesis rather than a stoichiometric limitation of tissue formation" by Ivan Cornut et al., EGU sphere,
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Here I review the 2nd part of the work submitted by Cornut et al., focusing on simulating growth limitation induced by K deficiency. Overall, I find this manuscript well-written. I have one comment regarding the model structure. Here, the authors indicated that the model structure accounts for additional processes relating to K allocation, remobilization and turnover. I do not understand why the model structure is different in this paper as compared to the model structure of the first paper. I know two papers have different focus, but it would be valuable to justify the reason as to why the authors decided to omit processes described here in the first paper. Particularly, does it mean that the results of the two papers are not directly comparable even if they were used to simulate processes for the same site? Apart from this comment, I think the manuscript is generally well presented.

We thank reviewer two for the positive remarks and the constructive criticisms that they bring to the manuscript. These remarks will be thoroughly taken into account when improving the manuscript. The model structure that was used is the same in the two papers. In the first paper we chose to focus the description on the canopy and the processes related to leaves and C acquisition. In the second paper we focus instead on allocation of K and C in the trees. The schematic attempted to show this but our explanations lack clarity. The results of the two papers are thus comparable. This was an attempt to avoid redundancy between the two papers. We will thus improve the description of this aspect in the manuscript.

Specific comments:

L64: no hypothesis on sink limitation was previously introduced yet. It would be great to make it explicit. And, it would be useful to describe what you meant by parsimony principle.

We are not sure to understand the first comment. Sink limitation was introduced line 49. By sink limitation (which also include carbohydrate transport mlimitations) we include processes that could limit wood production by affecting sugar transport from source

organs to sink organs (or from sap to sink organs) or direct limitation of sink organ functioning by K deficiency (by affecting cell expansion, metabolism or lifespan).

By parsimony principle means that we did not introduce more processes in the model if the ones that were already included in the model could explain the observed patterns (here, K limitation). This was to limit hypothesis on functioning and focus on using only available information.

Both these clarifications will be added to the manuscript.

L 91 – 93: Why these modules on carbon allocation and K effect on organ growth not important in the first manuscript? In particular, why the model structure of the two papers different? Does it mean the results of the two papers are not directly comparable, even if simulated for the same site?

The structure of the model is exactly the same between the two manuscripts. The Part 1 (Cornut et al., 2022) is focused mainly on the canopy, carbon assimilation and the calibration of these processes. Part 2 is focused mainly on the allocation of this carbon and the validation of the model using measures of biomass production. We therefore just change the focus on different processes in Part 1 and in Part 2.

Figure 4b: Why litter K content starts so high and declines over time?

This was due to the presence of ground litter on the soil following the clear-cutting of the previous plantation corresponding both to litter that was present on the ground at cutting and branches, leaves and bark of the cut trees that were added to the soil as litter.

Equation 8: Btrunk should be biomass, not in unit of g C m⁻², right?

No, the biomasses inside the model are all in grams of carbon per square meters of soil (gC.m⁻²)

Equation 12: Knpp in the unit of gK m⁻²? Shouldn't it be in the unit of gK m⁻² d⁻¹? But if this is the case, what's the correct unit for Kavailable in equation 14?

The correct unit for K_NPP in equation should be gK.m⁻².d⁻¹ And this should also be the unit for K_available.

References :

Cornut, I., Delpierre, N., Laclau, J. P., Guillemot, J., Nouvellon, Y., Campoe, O., ... & le Maire, G. (2022). Potassium-limitation of forest productivity, part 1: A mechanistic model simulating the effects of potassium availability on canopy carbon and water fluxes in tropical eucalypt stands. *EGUsphere*, 1-37.