

Interactive comment on “HETEROFOR 1.0: a spatially explicit model for exploring the response of structurally complex forests to uncertain future conditions. II. Phenology and water cycle” by Louis de Wergifosse et al.

Anonymous Referee #2

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1. The authors present two modules (phenology and water budget) of a new forest growth model HETEROFOR, which is a process-based model considering spatial distribution of individual trees of mixed-species forests. This paper is the second one of the series papers (seems will be more than 2). After reading the first paper (Jonard et al., under review process in GMD) and the comprehensive comments by Referee #1 to this one, my additional comments will be given here.

2. The connection between the phenology module and the processes of photosynthesis and the allocation of NPP was not described in this paper and the first paper. The

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leaved period from budburst to the start point of yellowing is the period of leaf development. In the phenology module, the progress of leaf development is solely controlled by the temperature. However, the photosynthesis process modelled in HETEROFOR (as described in the first paper) has complicated controlling mechanism including other factors like PAR. The allocation of NPP to leaves and fine roots is further controlled by the nutrient status of the plant. Both the photosynthetic rate and the allocation to leaves will determine the leaf development and the further photosynthesis. Please clearly specify the relationship of photosynthesis, allocation, and leaf development.

3. For the soil water simulation, what's the domain of each individual tree? How does HETEROFOR deal with the spatial heterogeneity of soil water budget? Although the partition of rainwater to interception, throughfall, and stemflow for each tree is one-dimensional in the module, the spatial distribution of the individual trees will make the soil water input different under each individual tree. As the soil water availability will have control on foliage conductance (equation 54) and thus on photosynthesis, it is necessary for a clearer description of the 3-dimensional soil water budget.

4. P3L15: I don't see any focus on climate change in this paper

5. P3L16: a temperature increase in which year?

6. P7L10: what's the endpoint of the gradual loss of photosynthesis and transpiration of the yellowing leaves

7. P8L1: the average budburst date, average of what?

8. P8L16: equals -> reaches

9. P11L4: epsilon in equation 12 is not defined

10. P11L10: how can the threshold for stemflow appearance is tree size-independent?

11. P1123: why equation 16 does not use equation 12 as the stemflow rate?

12. P27L9: for the calculation of annual drainage by the chloride mass balance, a

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monthly calculation won't produce more reliable result?

Interactive comment on Geosci. Model Dev. Discuss., <https://doi.org/10.5194/gmd-2019-201>, 2019.