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Geoscientific Model Development Discussions

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 #1

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I understand that it is difficult to parameterize and evaluated a phenological model that differentiates for leaves in different layers in a structural forest. However, if the model is not considering these structural effects, it may be accurate but is not new and is not particular related to the specific approach of HETEROFOR. This would change if at least the option would be available (e.g. as a yet uniform parameter) to make budburst (I see you found some examples already) and leaf fall (Gressler et al. 2015) dependent on tree size or specific environmental conditions. In particular, since I assume that the model should be applied to more tree species than those presented here, which may

respond differently.

Regarding the question on "the benefit in comparison to cohort-based approaches" I see that you would like to differentiate between processes that you can more or less accurately determine on the individual trees (such as light availability) and those where the uncertainty is larger and that are thus treated in the same way as in cohort or even stand scale models (such as water availability). Not be able to precisely determine root competition indeed increases uncertainty. On the other hand, neglecting it makes the model inconsistent and biased towards aboveground competition process (that by the way are relying on crown form assumptions and leaf area distribution also based on rough assumptions). Actually, this is the reasoning to apply stand-scale and cohort models which are therefore more consistent. I am even aware of an approach that recalculates individual growth from cohort-based biomass gain (Poschenrieder et al. 2013). The basic criteria, however, may be if your half-individual approach is actually performing better than a cohort-based approach. I am therefore excited to see your analysis in this behalf.

P.S. Please try to understand my remark about 'runoff is not included'. It refers to the water at the surface when the water capacity of the soil is reached. Is it nevertheless forced to percolate into or through the soil or does it pile up at the surface?

Gressler, E., Jochner, S., Capdevielle-Vargas, R. M., Morellato, L. P. C. and Menzel, A. (2015). Vertical variation in autumn leaf phenology of Fagus sylvatica L. in southern Germany. Agric. Forest Meteorol. 201, 176-186. doi: 10.1016/j.agrformet.2014.10.013

Poschenrieder, W., Grote, R. and Pretzsch, H. (2013). Extending a physiological forest model by an observation-based tree competition module improves spatial representation of diameter growth. Eur. J. Forest Res. 132, 943-958. doi: 10.1007/s10342-013-0730-1

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