

Geosci. Model Dev. Discuss., referee comment RC2
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Comment on gmd-2020-440

Anonymous Referee #2

Referee comment on "Accounting for forest management in the estimation of forest carbon balance using the dynamic vegetation model LPJ-GUESS (v4.0, r9710): implementation and evaluation of simulations for Europe" by Mats Lindeskog et al., Geosci. Model Dev. Discuss., <https://doi.org/10.5194/gmd-2020-440-RC2>, 2021

Including a more realistic forest management in DGVMs is important, and this manuscript clearly addresses and demonstrates this. Although everything is presented and explained, it was difficult to follow all approaches and concepts in the first read, perhaps because I am not familiar with LPJ-GUESS. Including (many) different options to achieve the same result, and extensively listing alternative options or exceptions are confusing and distract from the main message. An example of the first case is the presentation of 3 alternative ways of creating an (initial) age class distribution (Section 2.2.2., Figure 2), which requires already quite a good understanding of the concepts on patch/stand/management type in LPJ-GUESS. An example of the second case is section 2.3.2.1 (Species selection). It is full of words like "may", "can", "or", "optionally" and "possibly".

I think it would be worthwhile to introduce early on in the paper predefined categories, and explain how these are implemented in LPJ-GUESS. For Europe, I would say three types of management are important to consider: age-class (even-aged) based forestry, uneven-aged forestry/continuous cover forestry, and pristine forests. Pristine forests would be implemented as Natural (PNV) in Figure 1, while even-aged and uneven-aged management would have a separate stand type/management type. Even-aged forestry would logically be represented by having stands of different age, with patches of the same age. Uneven-aged forestry would then be represented by one stand, containing patches of different ages.

Similarly, in Section 2.3 (Forest management routines), it would be very helpful to announce which systems will be covered in this section (simplified forestry, detailed forestry and continuous cutting), and connect this to the management types defined earlier. Also, I think it makes sense to present Table 1 already here in the introduction to this section. Table 1 could be extended with columns that indicate for the different systems (simplified, detailed, continuous) the options implemented. Please see the example attached.

The authors use the term "old-growth" forests for forests that have a certain age. However, in the literature old-growth forests is commonly used as a synonym for pristine forests, and the authors should avoid this confusion by using another term. The assumption that forests older than 140 years of age are not managed is not totally realistic, and the assumption that these have a species distribution equal to PNV is not realistic at all. I see no problem in applying assigning species to this class in the same way as for the younger age classes. Rather than assuming no management, these forests could be managed with low intensity using the continuous cover forests management type.

Line 107 mentions that 30% of leaf biomass is removed from the site in case of harvesting. This is way too high. Delimiting of felled trees is mostly done in the forest and in that case all branches and leaves remain in the forest. In case of harvest residue extraction, branches are left on piles for a while to dry out and drop the foliage. These piles may be at the roadside, not sure that counts as being in the forest or not. Foresters like to keep the foliage in the forest for nutrient recycling, and biomass plants prefer having as little as possible foliage. Harvest residue extraction is only applied at large scale in part of Europe's forests (mainly Nordic countries). I would estimate this value at 5-10%. A sensitivity analysis on this number would be very valuable.

Line 200: the minimum diameter for harvesting can be lowered if no trees are available. I wonder if this is realistic. Harvesting small trees is costly and the revenue is small. In such cases I would think harvesting is simply not done at all.

Please also note the supplement to this comment:

<https://gmd.copernicus.org/preprints/gmd-2020-440/gmd-2020-440-RC2-supplement.zip>