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Interactive comment on "Forests, savannas and grasslands: bridging the knowledge gap between ecology and Dynamic Global Vegetation Models" *by* M. Baudena et al.

Anonymous Referee #1

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The paper addresses the general question of how the feedback mechanisms relevant for tropical vegetation dynamics and described in the ecological literature are represented in Dynamics Global Vegetation Models (DGVMs). Particularly, the authors present a discussion based on the different characteristics of 3 frequently used DGVMs applied for Africa: 1) DYNVEG/ JSBACH which is currently coupled to an atmospheric circulation model; 2) LPJ-GUESS which is an offline model and coupled to the SPITFIRE fire module to better represent fire dynamics; 3) aDGVM, an offline process-based model designed to represent in detail the main ecological features of forest, savanna and grasslands in Africa. I identify two major novel aspects: 1) model results are compared to recent field-work and remote-sensed data, and then discussed for

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both arid/semi-arid and humid regions separately pointing out respective mechanistic processes driving the hypothesis of multi-modality in DGVMs for Africa; 2) surprisingly, even though demography representation has been the subject of major concern in the past few years, the authors show that more basic processes, like tree-grass competition/water limitation and the grass-fire feedback, are still lacking representation in the DGVMs they tested.

Despite many technical differences between the models, the authors found an elegant way of comparing all of model outputs and reach the main core drawbacks they have. Together with the substantial and consistent discussion based on an inter-disciplinary literature, the results presented potentially represent one of the first steps towards identifying forms of improving current vegetation representation in DGVMs to have more reliable predictions for the future.

Please, find below minor comments and suggestions (p = page number; l = line number).

1. p9473, l22-23 (abstract): "... and distinguish between fire-prone and shade-tolerant savanna trees, and fire-resistant and shade-intolerant forest trees...". I think it is the opposite. In the rest of the text this information is correctly described, e.g., p9475, l10-13 (intro)

2. p9477, l1: I did not understand why you replaced "feedback mechanisms" by "ecological interactions". In p9478, l20-22, you mention "Processes affecting PFT composition, such as competition for resources, mortality, and demography (i.e., what we call here the ecological interactions)...". It sounds different than the analogy to feedback mechanisms on p9477. Check to keep the term consistent along the text and with previous studies.

3. In which spatial resolution the models were run? If it was different, could it make a difference in the results? I missed this information.

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4. p9480, l27: "... but tree can cumulate...". Would "accumulate" fit better?

5. p9483, l16: "... can potentially shade (and hide) the target tree.". What are the competitor and target trees? Better described to improve understanding.

6. p9488, l27-28: "... but data do not display bimodality of high and low tree cover (not shown)". It would be interesting to see a figure of the no-bimodal frequency distribution of JSBACH in the same manner you showed bimodality for aDGVM in the supplements. Moreover, you could try to use latent class analysis to fit the distribution. It seems more convincing than the 2-gaussian approach.

6. Fig. 2a: even though there is no bimodality for JSBACH outputs, I wonder what are the 3 points (outliers) between 1000 and 1500 mm yr-1. They are completely out of the range. Have you verified that?

7. Along the text: I was a bit confused with the terms "high and low tree cover" because they may be ambiguous in the sense that low tree cover may represent low trees (e.g., shrubs) or the abundance of tree cover (which is meaning you use). I suggest a replacement to high and low tree cover values or amounts.

8. p9488, l19: you use the term vegetation-fire feedback (grasses + savanna trees benefiting from forest tree removal after fires) that leads to a stable savanna biome at intermediate rainfall values. It seems a quite important feedback mechanism (even though without a citation) but it has not been explored along the text and included in the discussion. Does it fit within the secondary improvements related to demography? You could explore it further for the model outputs.

9. p9489, l19-20: "... at high precipitation, the fuel does not dry out sufficiently to promote fire spread. This may be caused partly be the average fire probability used in this version of SPITFIRE...". I do not see the connection of the former sentence (related to drying out to promote fire spread) with the average fire probability, which is related to the representation of fire triggering. Better explanation of what you meant. Besides,

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has LPJ-GUESS been benchmarked for Africa? The authors mentioned DGVMs are not parameterized for tropical ecosystems, but could not find any commentary on a specific usage of this model for Africa.

10. p9494, l16-17: "... would get dampened by the consequent increase in fire frequency". According to what has been described for JSBACH, wouldn't it be better "the consequent increase in fire spread"?

Interactive comment on Biogeosciences Discuss., 11, 9471, 2014.