

Interactive comment on “Improved simulation of fire-vegetation interactions in the Land surface Processes and eXchanges dynamic global vegetation model (LPX-Mv1)” by D. I. Kelley et al.

Anonymous Referee #3

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[General and specific comments]

This paper describes a re-parameterization of fire processes in the LPX-Mv1 model. Improvements include treatments of lightning ignitions, fuel drying and decomposition rates, and rooting depth. Schemes for adaptive bark thickness and resprouting were also introduced. The new parameterization was evaluated with a benchmark system previously developed by the authors. Overall, I found this paper very thoroughly written and of interest for publication of GMD. I have several general and specific comments as follows:

I would recommend to adjust the overall structure of the manuscript. The audience

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needs to get the idea, up front, of where you did the work. Perhaps try to rearrange Section 2 (i.e. model basics before re-parameteration), so that you keep a concise description of the fire module e.g. Fig. 1.; and combine equations 1-8 and related texts with Section 3 to have a clear comparison of what was changed and what was not. Table 5 may be more suitable for supplementary information except for site information and recovery times.

The authors made several statements about savanna ecosystems that feel disconnected. I see why the new parameterization may target toward a better representation of (wild)fires in savanna (arid region, mixed woody and grassland interfaces, seasonal fire occurrence). However, DGVM sees the world as a mixture of plant functional types, *pe se*, and so does the analysis in the manuscript. Please elaborate on your statements.

Why do you use AVHRR in the benchmark? Conversion factor to derive burnt area from AVHRR number of fires varies among plant functional types [see work by Wooster et al].

Some points in model performance were over-stretched without support. A performance score 5% better than random but 30% worse than mean null model is still a miss. The conclusion of 65-95% improvement in burnt area in SE Australia was made on the fact that it was 129% worse than mean null model. Additionally, I think that the major contribution of re-parameterizations of lightning, fuel drying times and decomposition is at vegetation fields, not burnt area. Resprouting is an interesting feature and the authors did an admirable amount of work for allocation of resprouting species. It did not, however, improve burnt area reported by LPX. I would love to see an analysis in the future when runoff and NPP data sets are available for the benchmark.

[Technical corrections]

[Page 934, Line 18]: “the number of lightning strikes that reach the ground...” change to: ...the number of lightning strikes that reach the ground...

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[Page 938, Line 25]: “RL” What is this?

[Page 939, Line 16]: “CPC” [Page 939, Line 21]: “CRU” [Page 943, Line 7]: “TRY”
Please spell them out.

[Page 941, Line 20]: “. . .fuel size x hours” change to: . . .fuel size at x hours. . . or. . .fuel size in x hours category

[Page 941, Line 22]: “There are several choices of fuel equilibrium models. . .” change to : There are several choices of fuel equilibrium models. . .

[Page 941, Line 23]: “HR” Spell out “relative humidity” when it first appears as you did with ET. I suppose HR is not a universal understood term.

[Page 946, Line 17]: “parmid changes each day. . .” Consider making the sentence shorter, or altering punctuations: “parmid changes daily when there is a fire event, based on bark thickness of surviving plants, and also annually from establishment, based on. . .”

[Page 948, Line 14]: ca. Use “approximately” instead. And check through the manuscript and edit the others.

[Page 950, Line 22]: “the effect of this change were small.” Can you put in the numbers?

Interactive comment on Geosci. Model Dev. Discuss., 7, 931, 2014.