

We thank reviewer 3 for their additional comments.

Given that one of the purposes of GMD is to provide an opportunity to publish “geoscientific model descriptions” including new parameterisations, we feel, as the reviewer’s initial comment concludes, that text in section 2 and 3 are entirely appropriate for an article in this journal.

We have already pointed out that the new parameterisations are generic and that they are therefore equally applicable to other fire-prone ecosystems without regionally-specific tuning. Thus there is no justification for including text on potential challenges in implementing this model globally. Similarly, the original text in the discussion already pointed out that the inclusion of resprouting is of importance for the carbon cycle, and this is one of the justifications for including this in the model. However, given that the reviewer would like us to provide more big-picture justification for the model development, and in particular the implications of resprouting, we have:

1) expanded the sentence about the importance of resprouting in the introduction (pg 2 line 54) to read:

We then included a new treatment of woody plant recovery after fire through resprouting – a behavioural trait that increases post-fire competitiveness compared to non-resprouters in fire-prone areas (Clarke et al., 2013) and thus affects the speed of ecosystem recovery with major implications for the carbon cycle – and tested the impact of introducing this new component on model performance.

2) expanded the text on resprouting in the discussion section (pg 21 line 690), by adding two sentences at the beginning of paragraph two as follows:

The ability to resprout is a fundamental characteristic of many woody plants in fire-prone regions and means that these ecosystems recover biomass much more quickly after fire than if regeneration occurs from seed. Thus, in addition to improving the modern simulations, the incorporation of resprouting in LPX-Mv1 should lead to a more accurate prediction of vegetation changes and carbon sequestration in response to future climate-induced changes in fire regimes. The rapid post-fire regeneration in RS dominated ecosystems is well reproduced using the modelling framework adopted here.

3) we have also expanded the final conclusions (pg 23 line 751) to make the big-picture implications of the work clearer, and also to clarify that the improvements are not specific to Australia but generic and should lead to a global improvement in our ability to simulate fire accurately.

The new model incorporates a more realistic description of fire processes, and has been shown to produce a better simulation of vegetation properties and fire regimes across Australia. The new changes are generic and have not been tuned for Australian conditions, and thus the new parameterisations should produce an improvement in the simulation of fire regimes and transitions between vegetation types in other fire-prone regions of the world. Further tests are underway to establish that this is indeed the case. Our work has been motivated by the fact that fire has a major impact on the carbon cycle, with non-negligible feedbacks to climate. The improvements introduced

in LPX, resulting as they have from extensive data analysis and avoiding explicit tuning, give us greater confidence that this version of the model will provide more realistic predictions of the responses of vegetation, fire regimes and the terrestrial carbon cycle to potential future changes in climate. In this context, the incorporation of more realistic treatments of ecosystem-level fire resistance (through adaptive bark thickness) and post-fire recovery rates (through resprouting) is key to accurate simulation of fire-induced changes in the carbon cycle.

We hope that these changes will address the reviewers concerns.