

Geosci. Model Dev. Discuss., referee comment RC1  
<https://doi.org/10.5194/gmd-2021-151-RC1>, 2021  
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## **Comment on gmd-2021-151**

Anonymous Referee #1

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Referee comment on "Influence of modifications (from AoB2015 to v0.5) in the Vegetation Optimality Model" by Remko C. Nijzink et al., Geosci. Model Dev. Discuss.,  
<https://doi.org/10.5194/gmd-2021-151-RC1>, 2021

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### **Summary**

This technical paper is a companion to a terrestrial biosphere model inter-comparison in HESS Discussion (<https://doi.org/10.5194/hess-2021-265>).

The paper documents new parameterization and inputs to VOM to achieve consistent boundary conditions as the other models in the companion inter-comparison, implemented one at a time and finally all together. Authors also test the new version's ability to reproduce results of the original reference.

Authors use an open-science approach

### **General comments**

While this paper is not meant to present novel concepts or significant improvements to VOM, I see the value of documenting the various changes implemented with respect to providing a new version of VOM that can be used in model inter-comparisons and in understanding each change in isolation. Thus the scope of this paper is quite narrow and there is not much to comment on scientifically.

However, I felt that the goals/sequence of the analysis were not explicit enough and the presentation of the methods rather unorganized, that is, it was difficult for me to clearly understand why things were done from the beginning, and identify/distinguish what parameterizations are part of the 2015 model versus the new version. It seems important for the goal of this paper that these aspects be as clear as possible.

The results are clear but I was left thinking at the end that something was missing in the conclusions to broaden the relevance of this paper to the community and comment on the utility and value of doing such a systematic analysis of individual model changes; discuss the robustness of VOM overall; the implications of the findings; put the information in a broader context versus replicating the Whitney 2016 boundary conditions.

I have mostly made comments on the presentation, which I hope improve the structure of the paper for an easier read and increase the relevance of the information.

### **Specific comments**

- The word 'step-wise' in the title is poorly chosen. I expected the modification to be done one at a time in a sequence building on each other – but this was not exactly the case – they were just done one-by-one.
- The introduction is not specific enough and difficult to follow to take away the important information. What are the shortcomings that are meant to be addressed? What is proposed to address them, why and how? what is the specific outline of boundary conditions that need to be changed? Referencing the companion and it's goals could be helpful to provide more context and understand the relevance of this paper
- In section 2.2, it is helpful to mention in the first paragraph that detailed descriptions are in Schymanski et al. 2009, 2015 (and perhaps even mention the few other earlier ones referenced later about specific processes). But then it doesn't seem necessary to constantly repeat "according to Schymanski XX", "after Schymanski XX"; defined as "Schymanski XX" in the rest of the section. To lighten up the rest of the model description, I suggest clearly stating at the beginning of the section that all parameterizations and processes are the same as in the original references, except those explicitly mentioned. This would better highlight what is different and needs to be remembered and relevant here. It may be even worth completely separating the description of the original model structure versus the parameterizations (and their rational ) relevant in this paper, that is, having a completely separate description/list of individual modifications versus having multiple changes mixed into each other and described together as they seem to be here. A clearer structure may need more thought as these are the key aspect in the paper. Maybe even a table of the information in section 2.2.8 would be an effective summary
- It would be helpful to name or number the multiple different model variants in a more systematic/tractable way versus referring to the 'new' model and "Schymanski 2015" or "previous application" versus "here" or "current". And be able to more easily reference

the text while looking at the figures for the step modifications.

- It would be helpful if results in 3.1 follow the same sequence as how the cases are presented in the methods and in the figures. Is there a rationale for this sequence (can you explain it?) and can it be consistent throughout?

### **Line-specific comments**

L26 -28: These are a very general statement maybe be more specific about what are "novel modelling approaches" ; "fluxes"; "vegetation dynamics". What are specific shortcomings that are relevant to the VOM?

L28 "therefore, we use here" seems misplaced relative to the broad explanations in the next 2 paragraphs. Maybe just simply state "Optimality theory predicts ..."

L40-42 this is repeating what was stated in the previous paragraph

L50-63 What shortcomings versus what modifications? In the next few paragraphs there seems to be a mix of information that should be in the model descriptions / site description. I suggest structuring more in parallel and in a more explicit outline of what shortcomings or what boundary conditions are addressed and what modifications were required and tested here to address them.

L65 Could be helpful to mention how many steps were taken.

L84 "found in" ?

L91: Here and elsewhere use Net Carbon Profit or NCP consistently rather than defining it multiple times

Table 1: maybe write out all words like precipitation. potential evaporation; radiation ; delete \'. After aridity ; correct units of net radiation MJ m<sup>-2</sup> year<sup>-1</sup>

L103: components – plural?

L114: “essentially” is informal writing

L142: space between “cost” and “factor”

L173: Maybe separate model input data from evaluation data in different sections?

L187: What does “eventually” mean?

L194: see <https://doi.org/10.1029/2020WR028055>

L203: is there a rationale for this sequence of modifications? Could be helpful to number the cases or model variants

L205: up until now I do not have a clear map of what are the different inputs and process representations.

L211: can you mention how the original model is optimized in the model description?

Figure 4. Suggest editing/condensing the legend so it does not cover the time series

L306: in other models of the intercomparison?

Figure 5: label x axis