

Comment on bg-2021-294

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Community comment on "Improving the stomatal resistance, photosynthesis and two big leaf algorithms for grass in the regional climate model COSMO-CLM" by Evgenii Churiulin et al., Biogeosciences Discuss., <https://doi.org/10.5194/bg-2021-294-CC1>, 2022

General:

The present study compares three different approaches to simulate stomata resistance and the connected against a very simplified approach in the regional climate model COSMO-CLM, which is not capable to simulate vegetation processes dynamically. These processes are very important in the coupling with the atmosphere and thus very important to calculate in more dynamic way.

I extremely appreciate the comprehensive description of the methods, but I think the evaluation needs a broader application for additional variables and sites to better assess the different methods. Furthermore I encourage the authors to introduce at least one tree as well to evaluate, if these three approaches lead to a better representation of the biosphere-atmosphere interaction.

Detailed comments:

Page 4 line 124: Is T_r and Tr_k the same? Would you please provide how foliage resistance and stomatal resistance is related and if that has changed?

Page 5 line 150: A new description of a new parametrization scheme for the maximum rate of carboxylation is mentioned, please give the link to appendix and explain Eq. A8 in more detail. What is meant with the plant wilting factor and what is k ?

Page 5 line 170: If the former version do not calculate photosynthesis, could you give a brief overview, how plants are represented in the model?

Page 6 eq.4: Why is only the minimum stomatal conductance influenced by the soil water stress function. Please give the equation of this function. Why is parameter b so different in the two different calculations?

Page 7 Eq. 7 and 8 are identical

Page 8 line 237: Could you explain more precisely what is meant with "adapted equations for dry leaf calculation". Best would be to add a link to the equation that is used. For the other experiments I'm maybe able to identify the differences, but an overview table would definitely help to understand this differences much easier.

Page 9 Table: Do you mean v4.5 instead of Date in table header?

Comparison of the stomatal resistance shows that all versions seem to be too high for all regions. Do you have a reason not to adjust the parameter values? Have you any other indication that would disagree with lower stomatal resistance values? I would appreciate a comparison to V_{max} (leaf photosynthesis carboxylation capacity values) which are very common and available from the TRY database (<https://www.try-db.org/TryWeb/dp.php>) as well as stomata conductance. That would make the evaluation more valuable and would demonstrate that the models are able to represent the relation between V_{max} and stomatal conductance well, and as the manuscript emphasizes the coupling between photosynthesis and transpiration.

Please add some statistical values to the evaluation plots against observational data that always helps to assess the results. That's what you did in figure 5, but you could also just add that to the legend on the plot than it is available at a glance. Is figure 5 done for the three domains only? It's not indicated in the caption, but I assume it.

You conclude that the implementation would be valuable for the regional climate model, could you indicate which approach you are going to introduce.