

Geosci. Model Dev. Discuss., referee comment RC1
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Comment on gmd-2022-17

Miquel de Cáceres (Referee)

Referee comment on "SurEau-Ecos v2.0: a trait-based plant hydraulics model for simulations of plant water status and drought-induced mortality at the ecosystem level" by Julien Ruffault et al., Geosci. Model Dev. Discuss., <https://doi.org/10.5194/gmd-2022-17-RC1>, 2022

This manuscript presents a soil-plant-atmosphere transfer model suited for simulating plant desiccation and drought-induced mortality. Few models can simulate plant desiccation after stomatal closure, and as far as I know SurEau is probably the best option for this purpose. In this respect, bringing SurEau to regional applications by lessening computational burden and simplifying parameter estimation is a good contribution of this paper. Furthermore, the "implicit" numerical scheme can be helpful for other models with similar design of plant architecture. The model presentation is very complete, and I agree that the comparison with the original SurEau can be taken as a sort of model evaluation. I particularly enjoyed the global sensitivity analysis, which nicely illustrates the importance of different plant traits before and after stomatal closure.

Even if the model already constitutes a valuable contribution, there are some points that could be improved. First, I think the authors could have complemented the presentation of the model by discussing how easy is to determine parameter values for multiple species. SurEauEcos decreases the number of parameters with respect to SurEau, but still there are several hydraulic parameters that may be hard to get for most species. In addition, if the model is to be used at the regional scale and for climate change impacts, the process of conduit refilling or replacing via sapwood growth should be somehow accounted for, or at least discussed in the manuscript, since this would overcome the assumption of setting PLC to zero each new year (as the authors did in the application example). Given the importance of LAI both before and after stomatal closure, further refinement of applications could include not only from estimation of spatial LAI variation, but also from coupling SurEauEcos with a model of forest dynamics so that temporal variation of LAI could occur, to better represent the adaptive capacity of forest to climatic changes. Finally, the approach to model soil evaporation (i.e. the minimum of the two supply functions) should be better justified.

Minor corrections

L11. In some parts of the ms, the model is referred to as 'plant hydraulic model' and in others as a 'soil-plant-atmosphere (SPA) model'. Please homogenize.

L19. 'schemes'

L45. The acronym 'SPA' has not yet been defined.

Fig. 1. I suggest moving the rectangle 'soil water balance' into the upper box (stand water balance), since it does not strictly belong to plant hydraulics. Alternatively, change the labels of the two boxes.

L112. "To account for..." the sentence has no verb. Revise.

L116. Notation: 'Q' or 'q'? Similarly 'S' or 's'? In eq. (1) these letters were in lower case.

L134. 'controls'

L136. 'units'

L149. It would be nice to specify the code availability, here or somewhere in the ms.

L161. Remove 'by'

L185. 'The third term represents...' (no fourth term here)

L231. KRjT? Shouldn't it be K_Rj-Sapo?

Eq. 25. Remove right-hand '='

L256. 'E_leaf' or 'E_L'?

Eq. 33. Take gsoil and REW1 out of the min operator.

Eq. (44) and L311. Should be Psi_LSym , not Psi_LApo ?

L324. I suggest using a different notation for 'dt' (e.g. Δt) here, to avoid the confusion with the differential operator.

L427-428. I would use the term 'evaluation' instead of 'validation'

Tab. B2. PI0 for leaf should be '-2.1'

L486. Why not using an indicator of plant dessication, such as $REW_{stem} = 0.5$?

L495. Not clear how variation in gcanopy is obtained, given that three different components can be varied.

L545. Here you could add that more productive species dominate over Q. ilex in parts of the country that do not have a strong summer drought.