This manuscript presents a soil-plant-atmosphere transfer model suited for simulating plant dessication and drought-induced mortality. Few models can simulate plant dessication 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.

We thank the reviewer for this positive appreciation of our work and his thorough revision of the manuscript.

The reviewer highlighted important aspects of the current version of *SurEau-Ecos* regarding its parametrization. A similar question was also raised by the other reviewer, and we have tried to reinforce our manuscript by providing more elements regarding model representation, the degree of importance of each parameter in the model and how each parameter can be can they be extracted or estimated. One of the main reasons why we developed *SurEau-Ecos* while *SurEau* was already available (Cochard *et al.*, 2021) is that we aimed for a different balancing between plant representation in one hand and the possibility to apply the model for operative large-scale purpose on the other. This was achieved through two main changes: (i) implementing different (faster) numerical schemes and (ii) lowering the number of parameters. As consequence, *SurEau-Ecos* requires fewer parameters than *SurEau,* mostly thanks to the reduction of the number of plant compartments (removing roots and branches). As noticed by the reviewer, some parameters that may appear hard to find, particularly because they are not commonly used in the ecosystem modelling community. The vast majority of these parameters, however, can be either extracted from available datasets or, when not directly available, be easily derived from these datasets with the proper methodology. To address this important point, we added a section in the manuscript that specifically focus on how to parameterize *SurEau-Ecos*, including a table, that summarizes, for the most sensitive plant parameters, (i) the level of organization the parameter applies to (soil, leaf, stem, plant or stand), (ii) if it can be readily be extracted from a database, (iii) some potential databases or reference where they can be find, (iv) or how to derive the parameter from data (if not directly available). In addition, for the purpose of predicting hydraulic failure, not all parameters are equally sensitive and some of them can be set to default values if not available. We also provided an index of sensitivity that helps to identify the most critical parameters.

We also agree that the model, in its current form, is mostly applicable at the seasonal drought scale. The processes related to photosynthesis, respiration, growth and carbon allocation that are necessary to account for legacy effects of drought or acclimation have been overlooked there. Such processes are indeed often the focus of most models. When developing *SurEau-Ecos* we envisioned two main types of applications:

- first it could be applied alone, in its current form. This can be useful to estimate spatialized index of vulnerability that could account for both stand level parameters such as leaf area index (derived from remote sensing), soil properties (derived from databases), and species-specific hydraulic traits. In this case it can be forced by remote sensing data and global re-analysis data in order to predict indices such as hydraulic failure and drought survival or moisture content, but it would neglect long term effects and species interactions within a community.

- Alternatively, it could provide a comprehensive hydraulic basis for larger scale land surface, ecosystem or community models. Current projects of the group aim at integrating *SurEau-Ecos* with the forest growth models CASTANEA (Dufrêne *et al.*, 2005) and GO+ (Moreaux et al. 2020) and the gap model ForCEEPS (Morin *et al.*, 2021) under the Capsis platform (Dufour-Kowalski *et al.*, 2012). Thus, future researches and development should focus on how to link carbon and growth metabolism to hydraulic properties and how to model feedbacks between growth and hydraulic properties.

We added a last section to our manuscript providing potential for application of *SurEau-Ecos*, including the current limitations and explaining the possibility to parameterize and to integrate the model into larger scale models.

Finally, regarding our approach to model soil evaporation, we run a few tests to see if integrating the minimum of two functions (the first as a function of PET and the second of VPD) did indeed improve our estimations of the dynamics of soil water content by comparison with the soil water content measured in the 20 first centimeters at the Fontblanche study site. After examination of these results (no shown, we concluded that adding PET to this formulation did not permit to improve our estimations of soil water content in the first soil layer compared to observations. We therefore decided to adopt the more standard formulation such as E_{soil} depends on the maximum soil conductance (g_{soil0}) and the REW of the first soil layer:

$$E_{soil} = g_{soil0}.REW_1.\frac{VPD}{P_{Atm}}$$

We hope that these changes in the manuscript will answer the reviewer's comments and are, of course, prepared to reconsider any point that would remain unclear. Please find below a point-by-point response to the other minor comments raised by the reviewer.

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.

Thank you for this comment. As the reviewer noticed, *SurEau-Ecos* is both a plant hydraulic model and a SPA model. We agree with the reviewer that switching from one form of expression to another is likely to create confusion for the reader. For consistency, we now referred to *SurEau-Ecos* as a plant hydraulic model and kept that definition throughout the manuscript.

L19. 'schemes'

Corrected

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

Corrected. The term SPA has been removed from this sentence and is now introduced in the next paragraph.

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.

We thank the reviewer for this relevant comment. We agree that soil water balance should not be considered as "plant hydraulic" process, but nor can it be integrated with the "stand water balance box" as its temporal resolution is that of plant hydraulics (1-3600s). The best option was to change the labels of the boxes. The first box that represent the process at a daily time step is now called "stand water balance" and the second box that represents processes at a smaller time step is called 'Plant hydraulics and soil water balance".

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

Corrected.

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

We thank the reviewer for rising this point and apologize for these unclear notations and units in the manuscript. Q ($kg.m^{-2}{}_{leaf}$) results from the volumetric integration of q ($kg.m^{-3}$). Please note here that, for convenience, the state variable Q is expressed per unit leaf area. We added these different units in the manuscription to help to clarify these points.

L134. 'controls'

Corrected

L136. 'units'

Corrected.

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

The model code along with instructions on how to run the current version of the model are available from https://doi.org/10.5281/zenodo.5878978. This is specified in the section "code availability' at the end of the manuscript. The most recent version of the code is also available on GitHub from https://github.com/julien-ruffault/SurEau-Ecos

L161. Remove 'by'

Corrected

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

Corrected

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

Yes, Corrected

Eq. 25. Remove right-hand '='

Corrected

L256. 'E_leaf' or 'E_L'?

Corrected

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

Corrected

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

Yes, Corrected

L324. I suggest using a different notation for ‘dt’ (e.g. â□□t) here, to avoid the confusion with the differential operator.

Yes, thank you for this relevant suggestion. Throughout the manuscript and the appendixes, ‘*dt*’ was replaced by ‘δt’ when referring to the temporal integration

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

Agreed, corrected

Tab. B2. PI0 for leaf should be ‘-2.1’

Corrected

L486. Why not using an indicator of plant dessication, such as REW_stem = 0.5?

This is an interesting and relevant comment. We agree with the reviewer that the water content of plant tissues is probably a better indicator of plant mortality than the percent loss of conductivity (Martinez-Vilalta *et al.* 2019, Mantova *et al.*, 2021). However, to match the abundant literature on plant hydraulic failure (*e.g.*, Adams et al. 2018), we decided that it was probably better to simulate the probability of hydraulic failure as a function of PLC in a first approximation. In addition, an accurate prediction of moisture content would require an overall integration of the carbon metabolism (Martinez-Vilalta *et al.* 2019), some processes which are currently not simulated by *SurEau-Ecos* but will be considered in future developments.

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

Yes, we agree with the reviewer on that point and we apologize for this unclear explanation of the setting of the sensitivity analysis. Our goal was to avoid to enter into too many details about the role of g_{crown} versus the role of g_s in the model. To clarify the results and conclusions brought by our sensitivity analyses, we performed a few changes in this section. In the new version of the manuscript, we removed the influence of g_{canopy} and only focused on $g_{s,max}$.

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.

We thank the reviewer for this relevant comment. We added a sentence in the text to explain that while the risk of hydraulic failure was close to 0 in the temperate part of the country, where summer drought is less intense, Quercus ilex is not observed because more productive species (or cold resistant species) dominate in these areas.

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Parameter	**Organisation Level**	**Importance***	**Direct availability**	**Source**	**Protocol**	**Comments**
LAI_{max}	Stand	High	Yes (Remote sensing, inventory and allometries)	-	-	Dynamic parameters, can also be related to growth/photosynthesis module
V_L and V_S	Leaf and stem	Intermediate	No	-	Computed from inventories or remote sensing	-
rfc_j	Soil layer	High	Yes (from soil databases)	Hengl et al., (2017)	-	-
d_j	"	"	Partial (from soil database)	"	-	Not available for forest root depth
θ_s	"	High	No (but can derived from soil database)	"	Derived from soil texture with pedotransfert functions	-
θ_r	"	High	"	"	"	-
α	"	High	"	"	"	-
n	"	High	"	"	"	-
I	"	High	"	"	"	-
k_{sat}	"	High	"	"	"	-
ε_L, ε_S	Leaf and stem (symplasm)	Intermediate	Yes, for leaf (PV Curves)	(Bartlett et al., 2016, 2012; Martin-StPaul et al., 2017; Guillemot et al., 2022)	-	Rarely available for stem (use leaf values instead). Note this parameter can be used to inform the stomatal conductance regulation model
π_{0_L}, π_{0_L}	"	Intermediate	"	"	-	"
α_{LApo}, α_{SApo}	Leaf and stem	Intermediate	"	"	-	"
g_{stom_max}	leaf	Intermediate	Yes (gs response curves)	Kattge et al., (2011)		-
$\psi_{gs,50}$	Leaf stomata (symplasm)	High	"	Martin-StPaul et al., (2017); Klein, (2014)		-
$slope_{gs}$	Leaf stomata (symplasm)	Low	"	"		-
g_{cuti20}	Leaf & stem cuticle	High	Yes	Duursma et al., (2019)		
Q_{10a}	Leaf/stem cuticle	Intermediate	Partial (very few data)	Billon et al., (2020)		
Q_{10b}	Leaf & stem cuticle	Low	"	"		
T_{Phase}	Leaf & stem cuticle	Low	"	"		
P_{50}	Leaf & stem	High	Yes (Vulnerability curve)	Choat et al., 2012 ; Lens et al., 2016 ; Martin-StPaul et al 2017		Take care of segmentation and methods
$slope$	Leaf & stem	Low	"	"		"
K_{Plant}	Plant	High	No	Mencuccini et al., (2019)		
$K_{R-SApo,max}$	Plant	-				Can be computed from K_{Plant} and hypothesis on resistance distribution within the plant
$K_{SApo-LApo,ma}$	Plant	-				
K_{SSym}	Plant	-	No			
K_{LSym}	Plant	-	yes	Bartlett et al., (2016)		
β	Plant/Soil	Low		Jackson et al., (1996)		At the biome scale, probably dynamics