Geoscientific
Model Development
Discussions

Open Access

[GMDD]

Interactive
comment

Interactive comment on "**The Interactions between Soil-Biosphere-Atmosphere (ISBA) land surface model Multi-Energy Balance (MEB) option in SURFEX – Part 1: Model description**" *by* **Aaron Boone et al.**

Aaron Boone et al.

aaron.a.boone@gmail.com

Received and published: 9 January 2017

REF: Geosci. Model Dev. Discuss., doi:10.5194/gmd-2016-269, 2016. Title: "The Interactions between Soil-Biosphere-Atmosphere (ISBA) land surface model Multi Energy Balance (MEB) option in SURFEX – Part 1: Model description" Authors: A. Boone, P. Samuelsson, S. Gollvik, A. Napoly, L. Jarlan, E. Brun and B. Decharme

Corresponding Author response to Anonymous Referee #2

Comment: p5. L146: "and" is misplaced

Response: Done: reworded as a new phrase using a break as: ...and shaded leaves. It was primarily developed to improve the modeling of photosynthesis within ISBA...

Comment: p6. L188: define Va in equation

Response: Done

Comment: Fig. 1: this figure is central and commented P.6 from L176 to 201. For a better understanding of different resistances and temperatures, a table showing symbology indices elements would be welcome such vg: vegetation, c: canopy, g: ground, n: snow surface ...) Moreover, this symbology is repeated in many other terms.

Response: We have done this and the new table is now labeled as Table 2. (thus the Table previously labeled as 2 is now 3). All of the symbols for distinguishing between prognostic and diagnostic variables, and the aerodynamics resistances are listed and described. This table is referred to right after Fig.1 is first mentioned in the text.

Comment: p8. L234:I supposed the reference is Eq. 5 instead of 6

Response: In fact, this should be Eq.6. (although indeed it is also applicable to Eq.5). But we can see this has lead to some confusion: Although p_ng cancels in Eq.6, it has been used here simply because by multiplying by p_ng, energy conservation can be obtained by summing Eq.s4-6. But indeed we have realized that this is a bit awkward, thus we have dropped p_ng in Eq.6 (essentially it cancels out since it appears on both the RHS and LHS of Eq.6, so in fact this represents no change to the math). The same is true for the discretized forms of the snow heat and mass prognostic equations...i.e. Eq.s G2 and G11 (so for consistency, we have also canceled out p_ng from both sides of those equations). We now emphasize later in the paper that when combining Eq.s 4-6 (to solve them simultaneously and for mass/energy conservation of the entire patch or grid cell), we must multiply Eq.6 by p_ng (specifically, we emphasize this now in the Appendices, notably G, just after Eq.G3 and G14, and I, after Eq. I3). Note that dropping p_ng from Eq.s6, G2 and G11 does not cause any of the other

derivations/equations to change. Finally, we edited the text to reflect the reviewers main commentÂǎ: that indeed the text can apply to Eq.5.

Comment: p10. L321: Snow surface temperature is missing.

Response: We have clarified this by adding the temperatures for the bulk vegetation, ground surface and snow surface to this line.

Comment: p11. L355: replace "over liquid water and ice" by "air and snow".

Response: q_sat represents the saturation specific humidity over liquid water (generally speaking, for v, g)...q_sati represents that over ice (for snow). But this section was apparently not very clear (the other reviewer also requested some clarification), thus we have rewritten the text between Eq.s21-22 to more clearly define the different q_sat definitions.

Comment: p13. L393: define "pn" as evaporative efficiency or adapted terminology

Response: The p_nv is now defined in the text: where p_{nv} is an evaporative efficiency factor which is used to partition the canopy interception storage mass flux between evaporation of liquid water and sublimation

Comment: p13. L394: define "LAI"

Response: We remove LAI from the dicussion here since it doesn't appear in the expressions. We defined it now just after Eq.45 (in response to this reviewer's comment below: comment after the next)

Comment: p14. L449: replace "m-6" by "10-6 m" (2 times)

Response: Done

Comment: p16. eq. 45: define LAI as Leaf Aera Index

Response: we have added the definition of LAI here as requested

Comment: p17. eq. 52: define "lw" (denominator)

Response: Done: lw=leaf width (m)

Comment: p18. eq. 58: is LAIf a particular LAI?

Response: No, in fact this is a typo, it has now been corrected as LAI

Comment: p22. L698: boeotian question: I supposed the maximum snow load per unit branch area is different according to species. Is value of 6.3 kg m-2 proposed could be consider as a median estimator? or a default value?

Response: In fact, 6.3 kg m-2 is an average value for both pine (6.6) and spruce (5.9) based on measurements from Schmidt and Gluns (1991). Thus, over these two different (and fairly representative forest types), the average value for this parameter only varies by about 10%. Thus, we currently use 6.3 as the default value for all species. The above has now been included in the text cited above.

Interactive comment on Geosci. Model Dev. Discuss., doi:10.5194/gmd-2016-269, 2016.