

Interactive comment on “The Interactions between Soil-Biosphere-Atmosphere (ISBA) land surface model Multi-Energy Balance (MEB) option in SURFEX – Part 2: Model evaluation for local scale forest sites” by Adrien Napoly et al.

Anonymous Referee #1

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The paper is presented as a companion paper of a more technical one which describe the new multi energy balance approach developed and implemented within the interactions between the soil biosphere atmosphere model (ISBA) as part of the SURFEX platform. This second paper propose an offline evaluation of the new explicit bulk layer developments described as the so-called ISBA-MEB version, against three well-instrumented forest sites which cover a range in climate, soils and vegetation characteristics. Moreover, authors presented an adding complexity in introducing an explicit litter layer, detailed and called ISBA-MEBL version. Evaluation of these two new versions of the model (MEB and MEBL) against standard ISBA version are done by investigating

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the model new versions to simulate the sensible, latent and ground heat fluxes of the three selected forest sites. Finally, benchmark was performed against observation from 42 forested sites from the global micro-meteorological network (FluxNet).

Paper is well written and well constructed which facilitates reading. The evaluation results over the three forest sites present improvements by the two new versions (MEB and MEBL), on the simulations of mainly sensible and conduction fluxes. Net radiation and evapotranspiration fluxes remain unchanged between versions. Introduction of litter layer resolution in MEBL improve significantly ground conduction fluxes G compared to MEB which resulted in better modelisation of dynamic and amplitude of the soil temperature and consequently sensible heat fluxes.

Benchmark against the 42 forested sites compare standard version of ISBA and MEBL version. Results clearly show an overall improvement of the fluxes by MEBL version compared to ISBA standard version.

The developments presented, as much the multi energy balance in the bulk canopy layer as the introduction of litter layer are a significant advance for the LSM and SURFEX applications community.

I have just a comment on the article which does not call into question the quality of the work: the paper is presented as a companion paper of a description paper describing the new model developments (a more technical one) and is supposed to present evaluation and validation of this new model. However, the paper quickly addresses the introduction and evaluation of MEBL (with litter) in parallel with MEB (without litter) version. MEBL is presented as better than MEB on the sites exploited due to litter improvement. Then MEB is no longer used in the benchmark against the 42 sites. It is a bias by the authors, because the sites are all forest, but as reader, we would like to have results also for MEB or at minima conclusion about MEB quality even if results are not shown. In addition, MEB and MEBL are put at the same level. As I understand, MEBL is an option to activate in MEB and not an option of ISBA. ISBA is compare to

ISBA-MEB and MEB to MEBL in forest context. But it's not clearly introduced in such terms. However, in a way, validating MEBL actually amounts to validating MEB. And it's well explained in final of conclusion that there is a lot of prospective in following evaluation of MEB.

I suggest a modification of title according to this last remark:

The Interactions between Soil-Biosphere-Atmosphere land surface model with Multi-Energy Balance option (ISBA-MEB) in SURFEX – Part 2: Introduction of litter formulation and model evaluation for forest sites.

Therefore, I propose minor revisions before accepting the paper for publication.

P3 l90: “the” in excess

P4 l92: reference when introduce DIF option

P5 l126: “that” in excess

P5 l155: is there a condition in residual term such $res \geq 0$?

P7 l212: reference when introduce ECOCLIMAP database

P9 l272: ‘is’ in excess

P9 l274: is it possible to precise “veg” default value for forests

P9 l287: suppose fig. 3c instead of fig. 3b

P11 l359-361: Fig2 don't present very clearly that both MEB simulations simulate less ground evaporation compare to ISBA, even for MEBL. I suggest to moderate affirmation or link comment to another figure or table.

P13 l 431: ad “at different depth” after soil temperature

P16 l523: I suggest justifying here why only MEBL is considered here.

Legend Table 3: change “indicates that figures come from” by “indicates that values

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comes from”

Figure 2: precise if it is partitioning for a specific year or mean of many years

Figure 4 and 5: there is no unit on Y-axis

Legend figure 4: “indicated” and not “indciated”

Figure 7: a,b,c indication are missing

Figure 9: For total WG, please precise soil thickness used to calculus

Figure 10: G RMSE in legend, H RMSE in Y-axis legend. Need to be the same. Litter thickness is in 10-2m, not in m.

Figure 14: Precise H and LE in Y-axis title

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