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Geoscientific Model Development Discussions
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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.

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Comment : Change the title to: "The Interactions between Soil-Biosphere-Atmosphere land surface model with a Multi-Energy Balance (ISBA-MEB) option in SURFEXv8 - Part 2: Model evaluation for local scale forest sites"

Answer : In accordance with both referee suggestions, we have modified the title to : "The Interactions between Soil-Biosphere-Atmosphere (ISBA) land surface model Multi-Energy Balance (MEB) option in SURFEXv8 - Part 2: Introduction of a litter formulation and model evaluation for local scale forest sites"

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Comment : P3. L83: Remove “from kilometer resolution” or change to “at the resolutions of kilometers”

Answer : The text has been modified to : “This is essential since ISBA is used within the SURFEX platform in various configurations at resolutions ranging from several to just under 10 kilometers at the regional scale, such as within the operational mesoscale numerical weather prediction model AROME, (Seity et al., 2011) and the operational istributed hydrological model system SIM, (Habets et al., 2008), to resolutions ranging from tens to hunderds of kilometers in global scale models, such as within the global climate models CNRM-CM5.1 (Voldoire et al., 2013) and CNRM-ESM1 (Séférian et al., 2015).”

Comment : P4. L92: What DIF stands for? Is it ISBA-DF in Boone et al. 2000? Also correct it in P7 L203.

Answer : A reference has been added. DIF stands for the diffusive option from Decharme et al. 2011 but is replaced by DF for more clarity.

Comment : P4. L 93: change to “ The prognostic soil temperature is represented by Tg for Ng soil layers”

Answer : This has been changed

Comment : P4. L 93: Change to “ soil volumetric water content and water content equivalent of frozen water”

Answer : This has been changed

Comment : P4. 104: Are you referring to the part 1 of this article? Boone et al. 2017a? Correction should be done in reference section and also line 835.

Answer : This is right, date has been corrected

Comment : P4. 108: change to “water content equivalent of snow”

Answer : This has been changed

Comment : P4. 118: change “models” to “simulates’

Answer : This has been changed

Comment : P4. 125: Change to “litter water content equivalent of ice”

Answer : This has been changed

Comment : P6 168: Correct T to Tg

Answer : This has been corrected

Comment : P6 191 Correction “assess”

Answer : This has been corrected

Comment : P7 210: Ags??

Answer : We clarify what the A-gs definition by changing the sentence to “The canopy resistance formulation is based on the A-gs (leaf net assimilation of CO2 - leaf conductance to water vapour) model (Calvet et al. 1998, Givelin et al. 2006) which simulates photosynthesis and its coupling to the stomatal conductance in response to atmospheric CO2”

Comment : P7 L 12 : Define ECOCLIMAP

Answer : The appropriate reference has been added

Comment : P8 230: Add “leaf are index (LAI)”

Answer : It was defined previously on P4.L116, so we opted not to re-define it here

Comment : P9 L 270 : Change Rnet to Rn as it is in eq 1

Answer : This is done

Comment : P9 L 273 : Remove “is”

Answer : corrected

Comment : P9 279: Is these averages based on the results of the all models at all three sites? For which variable? Swnet?

Answer : It is true that this sentence was not really clear, it has been changed to : “Despite these differences, results are very similar for the SWnet calculation, as seen in Table 4. The models perform well with relatively low values of RMSE (< 10 W m-2) and annual error (AE < 8 W m-2) for all three sites.” With these changes, we hope that it is now more clear that this sentence is about SWnet and that it is valid for each model and site and not the average.

Comment : P9 287: correct Fig 3b to Fig 3c and a,b,c to the figures

Answer : corrected

Comment : P9 294: Based on table 4, RMSE is higher than 8 Wm-2 for Barbeau! Also, is this average AE for all the models and sites? It does not seem to be correct. Check your calculations please. The values of RMSE and AE are not quite similar across the models as it is mentioned in the text.

Answer : Indeed, this is a mistake: the maximum value for RMSE and AE are changed to 10 Wm-2. It is true that the values are not similar in terms of relative difference (e.g. 5.8 and 9.3 W m-2) but for such small values, we think it is more pertinent to consider the absolute differences. We clarify this by modifying the text to : “quite similar in terms of absolute errors”.

Comment : P10. 304. Define RCA, replace “one” with “1”

Answer : The sentience is modified to : “ A ratio of 1 is used for forests within the default version of the original two-source model in the RCA (Samuelsson et al. 2011) dual-energy budget LSM”

Comment : P10. 317. Except with ISBA for Le Bray!

Answer : this has been added. The text is now worked as : “Except with ISBA at Le Bray, the simulations tend to slightly underestimate”

Comment : P10 327. Do you mean good results for the sensible heat flux?

Answer : We mean good results for LE. This has been clarified by changing the sentence to : “For the Mediterranean forest at Puechabon, most of the net radiation is converted into sensible heat flux (Fig.6a) which leads to low values of LE in accordance with observations (fig.6b)”

Comment : P 16. Can you also include a figure for Rnet comparison?

Answer : Please find attached the figure named fig2.png for an Rn comparison. However, we think that this figure does not add much since there are mostly minor differences between the two models. The main information in fig2.png is that the average over all sites is slightly biased and that RMSE is higher, compared to the three local sites (due to more uncertainties in albedo, LAI . . .) : this is already explained in the text. We can add this figure, but since we feel it does not add alot of additional information and since the paper already includes a lot of figures, we can let this reviewer the editor decide.

Comment : P19 548: New paragraph “ In terms of prospective”

Answer : A new paragraph has been designated

Comment : P19. 549: MEB or MEBL? Define SIM

Answer : corrected and the definition of SIM has been added “within the SIM chain (SAFRAN-ISBA-MODCOU, Habets et al., 2008)”

Comment : Section 5.3: In world wide assessment, is it possible to report also the results with MEB? It would be interesting for readers to see how including litter layer will affect the results.

Answer : We plot on fig5.png the results for RMSE calculations for H (left panel) and

LE (right panel). It shows that the litter option almost always performed better for both H and LE. We chose not to show this result mainly for 2 reasons: first, because the paper already includes many figures and we have tried to include those that are the most essential, and second, because the first part of the validation already showed the necessity of the litter representation so that the litter option can be considered for forest as the default version. That being said, if this reviewer think that it is necessary, we propose to add this figure (fig5.png) in the appendix. We propose to refer to it in the text (if it is added) by adding the text: " As mentioned in Section 5.1, significant improvement is obtained with MEB compared to ISBA, and even more improvement with MEBL. An example of the improvement in H and LE between MEB and MEBL is shown in Appendix C Fig.16. But because of the consistently best behavior with MEBL verses ISBA compared to MEB, MEBL has become the default option for forests."

Comment : Table 1. nedle? You mean needle?

Answer : yes, this has been corrected

Comment : Table 2: Correction required : "Mean annual temperature" and "annual rainfall "

Answer : corrected

Comment :Change the number of Fig 11 to Fig 2. Change order of Table 1 and Table 2. Try to number figures and tables in the order that they are mentioned in the text.

Answer : These modifications have been done

Comment : Figures 4b and 5b: Hard to see the lines. Can you possible change the scale of the yaxis ? also add the units in on Y-axis. Shaded are is not shown well in the figures.

Answer : We have plotted both turbulent flux components with the same scale so as the reader can easily understand that the energy from the G mostly goes into H. fig3.png and fig4.png shows figures 4 and 5 of the paper, respectively, with changes to the yaxis

scale. We think that the new figure could bias the reader in terms of the relative weigh of H and LE and that it doesn't add much information since the LE fluxes are quite similar between the models.

Comment : Figure 9: what is the total depth of the soil for WG (better to change it to wg). Can you specify on the figure?

Answer : the total depth is the root depth indicated in Table 3. This information has been added in the legend.

Comment : Figure 10: Correct the Y-axis title to G RMSE also litter thickness should be in cm on X-axis title

Answer : This change has been done

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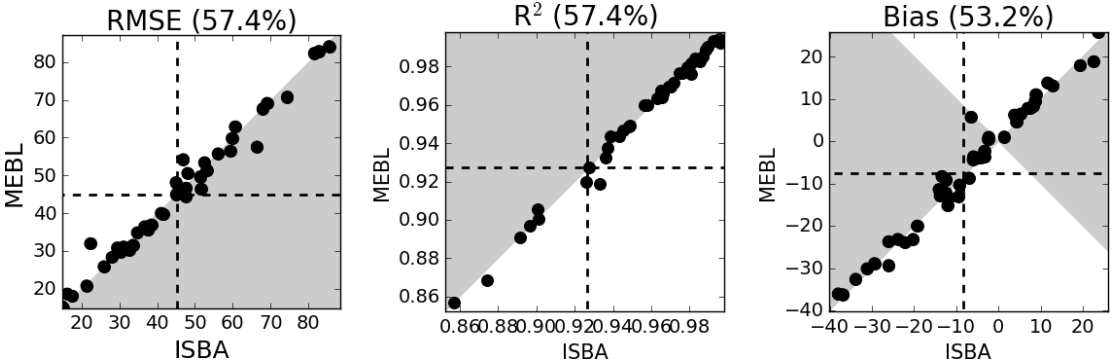

Fig. 1.

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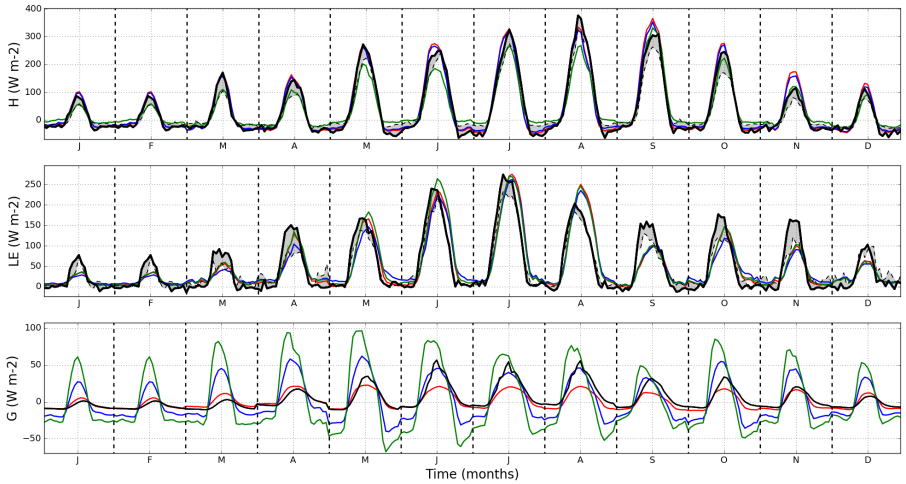

Fig. 2.

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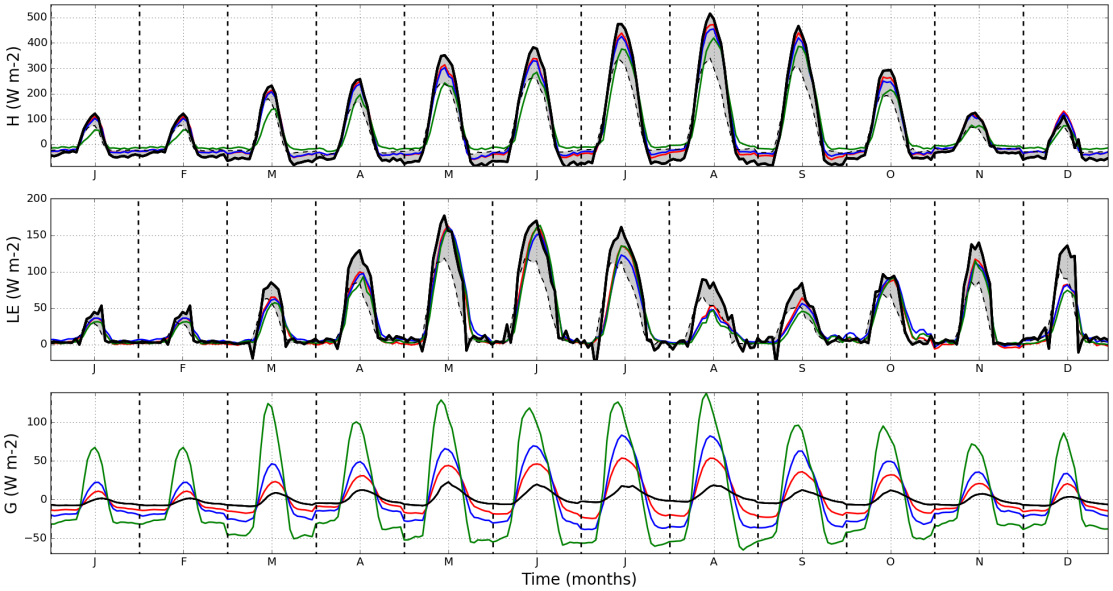

Fig. 3.

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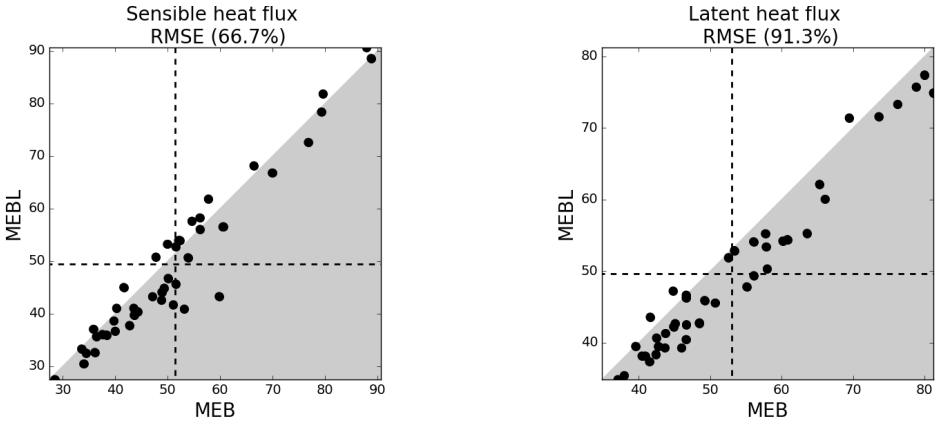

Fig. 4.

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