

Thank you for the constructive review. We believe the manuscript was greatly improved following these suggestions. Please find all our answers below in blue.

Thanks for your amendments to the manuscript. The inclusion of data not shown as supplementary material and removal of some subplots is hugely beneficial. Although your response to reviewers indicated you would revise the text to make this shorter (and I requested a refocus on the main messages of the paper), it does not appear to be shorter. The discussion currently covers almost 7 double-spaced pages and this does the work presented here a disservice. Please could you revisit the text here. Some of the discussion repeats methodology and results (e.g. lines 535-539, 548-551,..613..) and this can be cut. Please aim for around 3-4 pages for the discussion.

Thank you. We have now revisited the discussion, and removed the repetition and restructured the paragraphs around the main messages. Now the reader can find the main message as a starting sentence for each paragraph. That is followed by discussion related to existing literature and justification for arguments. The revised discussion makes up roughly 4 pages.

Please also think about the methodology and how this could be reduced to focus the readers attention - for example lines 214-218 including equation 9 isn't needed. As ISBA, MEB and CROCUS are reasonably well-known, some details can be left to the reference. However, turbulent transfer, vegetation differences and soil heat transfer details are important as these form part of the (focused) discussion so need to stay.

We have reduced the methodology as requested. We agree that the Eq. 9 is not absolutely necessary in the paper and have removed it. We also identified other instances where to make the section more compact: combination of some equations (Eq. 1+2 and Eq. 5+6), and removal of equations were conducted (Eq. 11, 14). Also, some parts of the text were shortened.

Although this will lengthen the manuscript slightly, please remove the acronyms LSA, MOST, HS, NWP and GCM. This is a worthwhile trade to aid readability. Define what you mean by albedo early and use albedo thereafter - you can use the discussion to refresh what you mean by albedo. MOST is only used twice I think. Snow depth is easier to read than HS. It's fine to use these acronyms in the figures - as long as you define them in the captions. Also move definition of LSM out of the abstract.

We understand that removing acronyms can improve the readability. Thus, we have revised the paper accordingly:

- MOST removed and now written always as the Monin-Obukhov similarity theory
- Land surface albedo defined now as albedo. LSA acronym is kept in equations and figures. Land surface albedo is mentioned again in the discussion to refresh the reader.
- HS removed from the text but this abbreviation is maintained in the figures and equations as this is the official vocabulary and notation from the International Classification for seasonal snow on the ground (Fierz et al., 2009 ; <https://unesdoc.unesco.org/ark:/48223/pf0000186462>).
- Acronyms NWP and GCM removed altogether.
- LSM removed from abstract.

A shorter, more succinct manuscript will be more impactful. There's certainly far more to pick out than can be presented - it's worth sacrificing some content to broaden the audience. Those who care about the details will contact you! Some specific comments are given below.

We appreciate your feedback and have done our best to deliver an improved manuscript in these regards.

Other specific recommendations are:

line 8 'We tested the sensitivity...': make this more explicit e.g. tested different turbulent flux representations. Although this includes the ESCROC subset 2 parameterisations, this is not a focus of this paper. Section 2.3.2 first paragraph is sufficient.

The sentence revised as:

"We tested different turbulent flux parameterizations..."

line 39-40 move the definition of energy flux acronyms into the methodology

Introduction and methodology were revised as requested. We revised the presentation of model acronyms with same logic.

line 99-101 'On the ... sites' -> 'At thesites'

These prepositions were revised as requested.

Section 2.1.1. Title: add '(N-WET and N-FOR)'

Section 2.1.2. Title: add '(S-WET and S-FOR)'

Titles were edited accordingly.

line 127 'N-FOR' -> 'S-FOR' also 'is managed' -> 'is a managed'

Thank you for pointing out the wrong site code. However, it seems that it was already written as 'is a managed'

line 136. Bring in Figure 2 at this point and state ISBA-FS with Crocus is used at all sites, ISBA-VS and MEB only for forest sites.

We revised this part by being clearer about the use of ISBA coupled to Crocus and MEB coupled to Crocus at different sites, with references to Fig. 2:

"Specifically, ISBA coupled to Crocus is used for both peatland and forest site experiments (Fig. 2A,B) whereas MEB coupled to Crocus is only used for the forest site experiments (Fig. 2C)."

However, we did not use ISBA-FS and ISBA-VS definitions but instead referred to model configurations that are defined later on:

"Parameterizations and different configurations of ISBA, MEB and Crocus models are detailed later in Sect. 2.3"

line 155. Use this opportunity to reinforce C_H being critical by adding 'and is one of the parameters that is the focus of this study' or similar to the end of the sentence.

Good point, this was revised.

line 237. Remove 'so-called'

This was removed.

line 240 add 'p_{sn}' after effective snow cover fraction - although it equation 11 needed? It's useful to know the proportion of snow over vegetated or bare soil is governed by snow depth (can be said explicitly in text after 'atmosphere' in line 239)

Equation 11 was removed as the computation of effective snow cover fraction is already defined in the text as “The effective snow cover fraction is the weighted average between the snow fraction of vegetation (p_{snv}) and snow fraction of the bare ground (p_{sng})”. We now mention that the fraction is governed by snow depth.

line 241 clarify 'bare ground' rather than 'ground'

This clarification was added.

Figure 2 consider switching the order from A, B, C to C, B, A i.e start with general and simplest case, then increase in complexity for the forest.

Figure order was switched as requested. It indeed makes more sense in this order. We have also edited the order of presenting these cases in the text.

Section 2.3.2. Define ESCROC-E2 for the E2 subensemble and use thereafter in place of ESCROC? Line 285-287 can then be simplified (and remove 'while')

ESCROC-E2 subensemble was defined and used thereafter.

line 295-296 remove 'BONE' and 'BOGR' acronyms. It's fine to leave them in Table 2 as they have already been defined in the caption.

These acronyms were removed from the text.

line 354-358. Shorten: both cases use site parameters and default ESCROC-E2 but differ in treatment of turbulent transfer and soil representation.

This was shortened as requested.

line 421. N-FOR isn't shown in figure 5. Is this a typo?

Thank you pointing this out. It was a typo that is now corrected to N-WET.

Figure 6 caption should be LWU rather than LE?

You are right, this was another typo that is now corrected.

line 500 'LSA is underestimated....' where is this shown? It is not in Figure 11. If this relates to section 3.3.4, the text from 'LSA is...' to 'Sect. 3.3.4' can be removed.

It is shown in Fig. 11 A): SWU of the lower end (0 to 75 Wm⁻²) is underestimated by the model. This is also visible as underestimated albedo during winter in Fig. 12.

line 652-656 belongs in the introduction (if anywhere)

This was removed completely.

line 763 'in expense' -> 'at the expense'

This was corrected.