

## ***Interactive comment on “A multiphysical ensemble system of numerical snow modelling” by Matthieu Lafaysse et al.***

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I think that this is an important paper. Several recent studies have also used multiphysical snow models, but they have been rather exploratory in nature, e.g. investigating sensitivity to missing or simplistically represented processes. The different approach of this paper in seeking to construct an ensemble of equally plausible models is a necessary step towards being able to use multiphysical ensembles to characterise model error for data assimilation.

I have some minor questions, correction and suggestions:

p8, Figure 2

Because there is only one option used for snow drift, and that is not to have snow drift,

C1

it doesn't seem worth having a box for it in this figure.

p11, Table 2

Where does the parameter value  $l_f = 0.05$  m come from? Why not just add dry deposition to the surface layer?

p13, equation 8

It is fairly obvious what  $P$  is, but I don't think it has been stated anywhere. Same comment about  $\rho_w$  and  $\rho_i$ .

p14

The number of typos identified in previous papers concerning maximum liquid water holding capacity of snow is striking. This paper itself is not immune. Are the options W14 in section 3.7, S14 in Figure 6 and SPK in Figure 2 all the same thing? Plotting equation 11, I don't get the same curve for C98 as on Figure 6; please check.

p16, equation 18

The dimensions of this equation are wrong, according to the units of the variables given in the text. Incidentally, what are the thickness and heat capacity of the first soil layer, and is freezing of soil moisture allowed for?

p23, Figure 8

The first two columns appear to be identical and both are labelled E2.

p27, Figure 13

Is it worth repeating the black triangles for heat capacity options? The conclusions about the dependency of B60 on heat capacity could be drawn from the same triangles on Figure 11, leaving the possibility of comparing options for solar radiation absorption and defaults in Figure 13.

p29, Figure 14

C2

The argument that equifinality results from counteractions of the extreme TA+/B60 absorbed solar radiation options and RIL/M98 turbulent heat flux options is plausible. Do pairs of members differing only in these options exist within E1? The SD plot could include observations.

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