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Interactive comment on "Representation of vegetation effects on the snow-covered albedo in the Noah land surface model with multiple physics options" *by* S. Park and S. K. Park

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Park and Park discuss simulations of albedo for vegetation with snow cover in the Noah-MP model. I have speculated (Essery 2013) that some current models use unrealistic parameter values in their representations of masking of snow albedo by forests, so I am interested to see a specific demonstration of this problem. However, I think that the manuscript requires some clarifications. The English is good for non-native writers, but will need editing for correct usage.

It needs to be pointed out that the minimum leaf and stem area indices quoted are only used by the dynamic vegetation option in Noah-MP. Otherwise, monthly indices

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are read from tables which could contain more realistic values.

Page 3198, line 5

“Snow albedo of forest is typically lower than that of short vegetation” – that, indeed, can be the case due to litter in snow beneath trees (Hardy et al. 2000), but what is meant here is that the albedo of forests with snow cover is typically lower than that of short vegetation with snow cover.

3200, 23

The CLASS albedo option in Noah-MP may compute an overall snow albedo, but CLASS itself computes albedos for direct and diffuse radiation in visible and near-infrared bands (Verseghy et al. 1993).

3202, 24

Why not show Noah-MP snow-covered albedos in Fig. 2? The difference between these and observations is the main point being made.

3203

A brief discussion of how Noah-MP predicts leaf and stem are indices would be useful. A large seasonal cycle in forest stem area does not seem like an intended behaviour.

3205, 7

How were the four radiation components weighted to calculate the total albedo in Figure 3?

3205, 12

Why is K_open set to 0.05? It should also vary with vegetation cover. If the comparison is with MODIS white-sky albedo, only the model diffuse albedo should be used.

3205, 16

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Please consider doi:10.1029/2010EO450004

3206, 20

Because the influence of SI in Figure 4 saturates at positive bias values, it is not just possible but in fact clear that snow cover fraction is too high, forest fraction is too low or snow-covered forest albedos are too high to match the observations.

3206, 27

If showing results from the other radiative transfer options, brief descriptions of them are required.

3213

Please comment on why the optimized LI turns out larger for deciduous than evergreen forest.

3215

Figure 2 caption should state that these are from observations.

3218

Note that OPT_RAD1 in Figure 5 is MTSA in the text. Explain why OPT_RAD3(new) differs from the other options much more with the BATS snow albedo than with CLASS.

Essery, R (2013). Large-scale simulations of snow albedo masking by forests. Geophysical Research Letters, 40, 5521-5525, doi:10.1002/grl.51008.

Hardy, JP, R Melloh, P Robinson and R Jordan (2000). Incorporating effects of forest litter in a snow process model. Hydrological Processes, 14, 3227–3237.

Verseghy, D, NA McFarlane and M Lazare (1993). CLASS: A Canadian Land Surface Scheme for GCMs. II. Vegetation model and coupled runs. International Journal of Climatology, 13, 347–370.

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