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The Cryosphere Discussions

Interactive comment on "Simulated single-layer forest canopies delay Northern Hemisphere snowmelt" *by* Markus Todt et al.

Anonymous Referee #1

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Review of Simulated single-layer forest canopies delay Northern Hemisphere snowmelt by Markus Todt, Nick Rutter, Christopher G. Fletcher and Leanne M. Wake

This study assessed the effects of simple correction factors for partioning above and below simulated longwave radiation of forest canopies. These corrections were implemented for evergreen needleleaf trees in the off-line land-only simulations of the Community Land Model CLM4.5. Its impacts were tested on snow cover melting change.

Correction derived from forest stand-scale simulations (5 sites) results in a net increase of sub-canopy longwave radiation over the entire snow cover season leading in increasing average snow temperatures. This expands snowmelt duration across boreal forests by accelerating early snowmelt and delaying late snowmelt, in agreement with some previous studies.

However, the validation of the proposed improvements is not clearly demonstrated, using for example independent external database such as Globsnow2, including daily snow cover extent evolution, and/or MODIS snow cover products.

For the near future for validation and/or assimilation, the authors could mentioned the new radar Sentinel datasets that allow to monitor the wet snow evolution through open forest canopy (1). For closed forest area, the uncertainties seem still important?

Specific comments Please clarify how you estimate the "Longwave enhancement" parameter? Why do you differentiated day to night sky emissivities? (Fig. 3 d and e) Which ground (or snow?) emissivity value do you consider?

(1) Small, David; Rohner, Christoph; Miranda, Nuno; Rüetschi, Marius; Waser, Lars; Vögtli, Marius; Schaepman, Michael E(2018). Level 3 wide-area backscatter time-series for wet-snow mapping and forest classification. In: EGU General Assembly 2018, Vienna, 8 April 2018 - 13 April 2018.

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