

## ***Interactive comment on “Improving the snow physics of WEB-DHM and its point evaluation at two SnowMIP alpine sites” by M. Shrestha et al.***

**Anonymous Referee #3**

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This is a thorough and well written description of recent changes made to the WEB-DHM model. Improvements in performance (RMSE if not necessarily Bias) as a consequence of these changes are evident through its application at two unvegetated alpine sites. Although the addition of process representations from the current literature, in a methodical and well cited manner, results in an improvement in performance, it is still the consequence of the application of parts of other models (BATS, SSiB3, SVAT, SNTHERM, CROCUS etc) to WEB-DHM. As a result, the improvement in performance is not a surprise. In short, this manuscript is an excellent technical report detailing changes to the latest version of WEB-DHM, but it falls short of being either a significant development in snow process modeling, or a thorough evaluation of why the additional process representations work so well. Consequently, I regret to suggest that the

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manuscript is not acceptable for publication in its current form. Suggestions to enable publication of a revised manuscript are listed below.

Comments / suggestions:

1. Why is only one annual cycle used from each site when more data are available? Inter-annual analysis would strengthen the evaluation.
2. Why are two alpine sites chosen for evaluation? It would be more appropriate to choose sites with different snow and hydrometeorological conditions (maritime, continental etc).
3. Considering WEB-DHM is a distributed ‘biosphere’ model why were the impacts of forest canopies on snow processes not tested (as remarked on in the conclusions)? Data from sites used as part of SnowMIP2 may be available for such an analysis.
4. A more quantitative description is required of the improvement in model performance (e.g. in section 4.1 performance improvements are referred to as ‘a very acceptable manner’ or ‘remarkably less’, neither of which really help the reader determine the magnitude of the improvement).
5. Although statistics for the entire winter are available in Table 3, and the plots visually show an improvement, a breakdown of the times in the winter where observed and modeled estimates of parameters diverge and converge would improve the analysis.
6. As the authors have such a thorough understanding of their model physics, a sensitivity analysis of change in performance through incremental addition of process representation would be an excellent way of critically assessing the impact of the changes made to WEB-DHM. This would be of high interest to the wider snow modeling community and would allow the authors to quantitatively demonstrate to what extent each improvement of the model gets it right for the right reasons.