

Interactive comment on “Uncertainty in predicting the Eurasian snow: Intercomparison of land surface models coupled to a regional climate model” by Da-Eun Kim and Seon Ki Park

Anonymous Referee #2

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In this study, the authors tried to address the uncertainty in predicting the Eurasian snow by inter-comparing the performances of four land surface models coupled to WRF. They have four goals to achieve but the purpose of the work is not clearly articulated. The manuscript can be accepted to be published only after some major concerns have been addressed:

(1) Many studies show errors in the input and validation data, rather than model formulation, seem to be the greatest factor affecting model performance. The manuscript lacks of discussion of the quality for those “observation” used to evaluate the model performance.

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(2) Among four goals of this paper only the third one has been addressed sufficiently. The first two haven't been explained clearly. The reader can easily understand the difference between four models if a table is used to show the different treatment of snow albedo, snow density, snow compaction, snow interception, snow age, and etc. The authors need to make some sensitivity tests like the different microphysics schemes to address and make any conclusion on the last goal of this paper.

(3) For fair inter-comparison the forcing should be as close as possible. For snow predictions how to differentiate snowfall or rainfall from the total precipitation is critical. This process should be mainly determined by microphysics scheme. The authors should use the same MP for all models to determine the amount of snowfall and rainfall rather than the empirical method by each model.

(4) For the most part, snow models are built on similar principles. The greatest differences are found in how each model parameterizes individual processes (e.g., surface albedo and snow compaction). Parameterization choices naturally span a wide range of complexities. Ensemble is a promising way to reduce these uncertainties. It would be greatly beneficial to the title of this paper if the authors can also compare the performance of the ensemble mean of four models.

(5) Noah MP itself has so many options to choose. Many of them can have significant impact on the snow prediction. The authors should have optimal options before comparing it to the other three models.

(6) The quality of figure need to be improved. Some of them are very blurry and hard to read. Like figure 4a only 6 curves can be seen.

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