The manuscript described the construction and evaluation of the machine learning based decision tree model (DTM) in detecting blowing snow occurrence by exploiting routine meteorological observations from 10 sites in the European Alps. The constructed DTMs demonstrated good performance in temporal extrapolation, and were also able to accurately detect blowing snow at stations outside the training range. In general, both the SSDTMs and SIDTM are useful tools in detecting the occurrence of blowing snow events, and achieve acceptable accuracy in terms of their spatiotemporal predictions.

Traditional blowing snow occurrence or simulation in land surface model or climate models has the difficulty of obtaining reliable observations for the required input. However, this study developed a simple but efficient tool to detect blowing snow occurrences and to advance our understanding of the relationships between blowing snow processes and ambient meteorological conditions. It also provide a potential insight to the future machine learning studies and modeling studies for the blowing snow events in the highland areas, such as the Tibetan Plateau.

Scientifically, the machine learning based DTM and the evaluations are well conducted and the results are reasonable. The manuscript of this paper is well organized and it is logical in its presentation. I believe this manuscript is suitable for publication in HESS, but have some primary concerns shown as following. I suggest publication of this paper with following minor revisions.

Response: We thank the reviewer very much for their constructive comments on our manuscript. We have studied those comments carefully and have made corrections accordingly which we hope meet with approval. The main changes in the manuscript, in response to the reviewer’s suggestions, are the following (changes in the manuscript are in blue):

1. Could you give a schematic flowchart of the machine learning based decision tree model (DTM)? This would enrich your manuscript and also make it easier for the reader to understand.

   Response: The following schematic flowcharts have been added to the manuscript. The first one is used to clarify the procedures to identify the presence of snow on the ground, while the second one is to show the logical framework of the work and in the second one, we choose WSMAX and T as the two key feature variables to construct the simplest DTM to detect blowing snow occurrences.

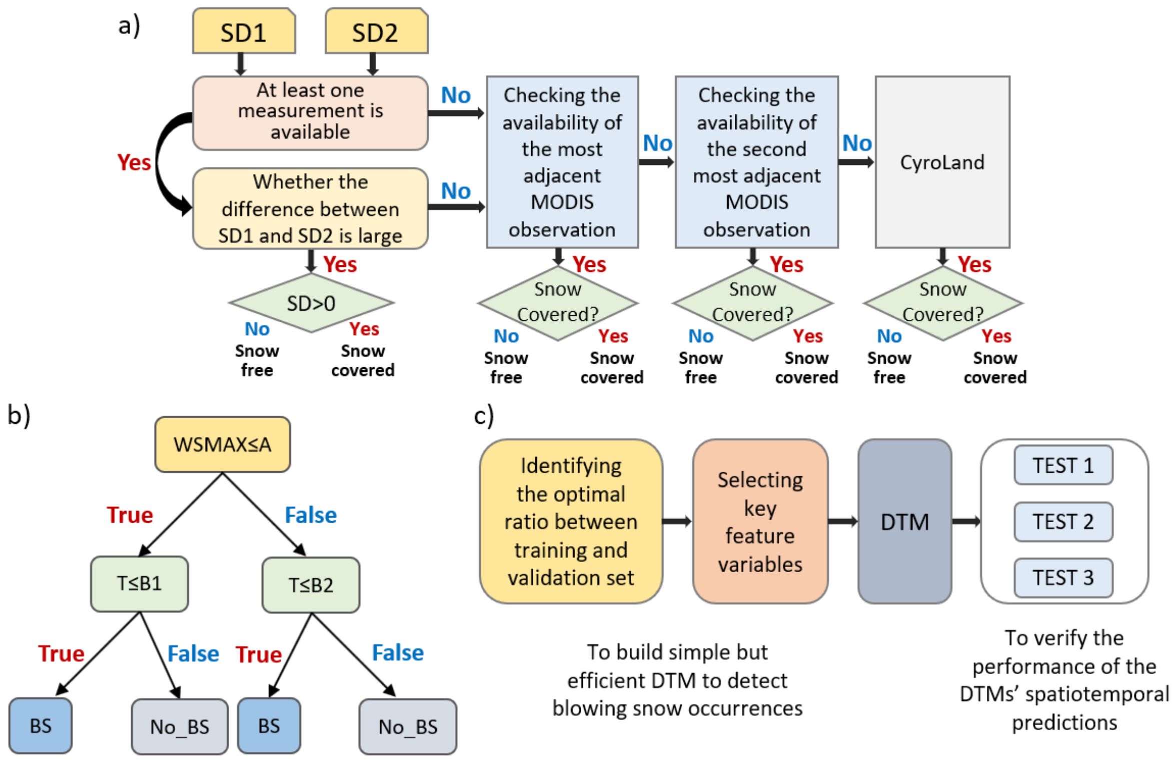

Figure 1. Schematic flowchart of a) the procedures to identify the presence of snow, and b) flowchart of a simple decision tree model to detect blowing snow occurrence (only WSMAX and T were used to construct the DTM, A denotes the threshold maximum wind speed, B1 and B2 denote the threshold air temperature), and c) logical framework of this study.

2. How is the DTM's computation cost? Your study just involve 10 sites over a small region. I'm not sure how much computation time it would take if this method was applied to large area or other regions.
Response: Special thanks to you for your concerns to the DTM's computational cost. Actually, the computation cost of constructing and assessing the DTM is pretty low. For example, when constructing the site-independent decision tree model (SIDTM) in condition which surface covered by dry snow and without concurrent snowfall with observations from all stations (327387 samples in total, with WS, WSMAX, T and RH as feature variables), the total execution time is 1.6s. What's more, to reduce the classification uncertainty attributable to training data selection, twenty repetitions of a random sub-sampling validation method were applied in the construction of each decision tree model, and the decision tree model constructed under this condition is the most complex and the highest computational cost in this study. Therefore, there is no need to worry about the computational cost when apply this method to large area or other regions, the high computationally-efficient of the decision tree model has been well tested in this study.

3. At line 38, it would be better to replace the "causing a loss of visual sight" by "causing severe reductions to visibility near the ground".
Response: We have made correction according to the Reviewer's comment.

4. Replacing the word “distribution” in line 40 by “redistribution”.
   Response: Correction has been made.

5. The definite article “the” in the “at the local scale” in line 47 is needless.
   Response: We agree and have deleted the needless word.

6. At line 51, some references should be added to describe alternative methods that have been proposed.
   Response: Thanks for pointing this out. We have added the following references:
   [1] He, S. W., and Ohara, N.: A New Formula for Estimating the Threshold Wind Speed for Snow Movement. Journal of Advances in Modeling Earth Systems, 9(7), 2514-2525, 2017.
   [2] Li, L., and Pomeroy, J. W.: Estimates of threshold wind speeds for snow transport using meteorological data. Journal of Applied Meteorology, 36(3), 205-213, 1997a.
   [3] Schmidt, R. A.: Threshold Wind-Speeds and Elastic Impact in Snow Transport. Journal of Glaciology, 26(94), 453-467, 1980.
   Alternative methods using empirical formulae to parameterize blowing snow occurrence have been proposed (e.g., He and Ohara, 2017; Li and Pomeroy, 1997a; Schmidt, 1980).

7. It would be better to replace “this method” in line 71 with “the remote retrieval algorithms”.
   Response: Correction has been made. Thanks.

8. Maybe you need to check the manuscript again. For example, at line 504, “…….., and can were also able to accurately……” It seems the “can” is needless.
   Response: Agreed. A thorough check was made to the manuscript to improve the accuracy of language.

9. Please give the full name of ISAW while it first appears in the article.
   Response: The full name of ISAW is not available because the website only provides the abbreviated station name. Other studies (e.g., He and Ohara, 2017; Vionnet et al., 2018) use the abbreviated station name as well. We hope you will understand that.
   [1] He, S. W., and Ohara, N.: A New Formula for Estimating the Threshold Wind Speed for Snow Movement. Journal of Advances in Modeling Earth Systems, 9(7), 2514-2525, 2017.
   [2] Vionnet, V., Guyomarc'h, G., Lafaysse, M., Naaim-Bouvet, F., Giraud, G., and Deliot, Y.: Operational implementation and evaluation of a blowing snow scheme for avalanche hazard forecasting. Cold Regions Science and Technology, 147, 1-10, 2018.