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Hydrology and Earth System Sciences
Discussions

Interactive comment on "Obtaining sub-daily new snow density from automated measurements in high mountain regions" *by* Kay Helfricht et al.

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We would like to thank the anonymous referee for the time invested reviewing our manuscript and for the positive and constructive feedback. We will revise the manuscript with respect to the comments of the referee. We will consider in detail the conclusiveness of names and abbreviations.

P6 L5-8: Did you estimate the effect of the estimation error of air pressure on the value of Tw?

We didn't estimate the effect for the calculation of Tw. Tw is only used as a threshold to exclude mixed phase precipitation. Thus, the estimation error of air pressure does not have a direct effect on the calculation of the new snow density from observation. It

might have an effect on the statistical relation of Tw and new snow density, but it can be assumed to be rather small compared to the overall variability of new snow density. Air pressure dependency of wet-bulb temperature is generally minor and only relevant for air temperatures larger than +2°C (Olefs et. al, 2010, supplemental material section b)).

P7 L14: -13°C < T >= -2.5°C in Eq.(6) should be wrong.

Yes, will be changed to -13 < T <= 2.5°C

P7 L16-17: the ranges of root in Eq. (8) are ambiguous. Please clarify them.

Will be clarified and presentation of all equations will be revised to match journal guidelines.

P8 L4. "high HNW values are accompanied by rather high HN". Which figure shows this result? This needs to be addressed as well.

If the density is low even at high HNW, then HN must be also high to achieve low density values. This can be seen in the rather few values of more than 3 mm HNW at Kühtai and Wattener Lizum station in Fig. 2.

P8 L5-L7. Fig. 7 shows only wet bulb temperature while the authors discuss the air temperature in this part. Moreover, Tw of Kuehtai seems to be higher than Weissfluhjoch in Fig.7. Please check it

Will be corrected to wet bulb temperatures at snowfall.

P9 L19-20: Mean Tw at Weissfluhjoch is not lowest in Fig. 7. It seems that the mean Tw at Wattener Lizum is lower than Weissfluhjoch. Please check it.

Wattener Lizum is lower than Weissfluhjoch . Sentence will be revised.

P9 L24-L25. I can not agree the sentence that "A relationship between NSD and Tw is obvious for Kuhtai stain between the different periods, with higher NSD for higher Tw."

Which figure shows this result? This needs to be addressed as well.

This result is based on Fig. 8, where the statistical distributions of NSD and TW are shown. This will be addressed and clarified in the revised manuscript.

P10 L12-31: The description in this part should be moved to “Data and Methods” because they explain how to control the quality of calculated NSD. Therefore, they should be before “Results”.

The general structure of the manuscript will be revised taking into account this comment and the comments made by reviewer 2.

P13 L1-L2: I can not agree the sentence that “The relative low densities presented in this study are..”. Are there any evidence or references ? This needs to be addressed as well

This sentence is a general assumption based on the relationship between snow density and the potential of drifting snow. Corresponding literature will be added.

Literature: Olefs, M., Fischer, A., and Lang, J.: Boundary conditions for artificial snow production in the Austrian Alps. J. Appl. Meteorol. Climatol., 49(6): 1096-113, doi: http://dx.doi.org/10.1175/2010JAMC2251.1, 2010.

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