

***Interactive comment on* “Spatial distribution of stable water isotopes in alpine snow cover” by N. Dietermann and M. Weiler**

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Dear reviewer, Thank you for considering our manuscript and the useful review comments. I very much appreciate your ideas and comments and I will incorporate them without reservation. I also would like to thank you for your support and your condolences.

General comments The authors present in their paper an interesting dataset of stable isotope values of a large number of snow samples collected at the end of the accumulation period and during the snowmelt season of 2010 in the Swiss Alps. Notable is the fact that the sampling strategy was set up in such a way that the samples span a wide range of elevations and that they were collected at different topographic locations. With

this setup the authors were able to use a multiple linear regression approach to explain the isotopic composition of the snow cover. As a result they could clearly demonstrate that variables like altitude, aspect, slope etc can hardly explain the variations of isotopes values in the snow cover, but that variables like deviation of snow depth and the day of the year have significant influence on predicting isotope values at the catchment scale. The paper is well structured and written with an adequate amount of figures and tables. Results are presented in a clear and concise way and they contribute to an improved understanding of the spatial variability of stable isotopes in snow covers. I am recommending accepting the paper for a publication in HESS, considering the minor revisions according to the specific suggestions and technical comments given below.

→ Thank you for the supportive comments. Please find below a list of responses to the specific comments.

Specific comments The paper would benefit from an additional figure showing the relationship between oxygen-18 and deuterium. In such a classical diagram the values could be displayed in the context of the Global meteoric water line (GMWL) and the Local meteoric water lines (LMWL) of the investigated areas (one for the Eastern Alps and one for the Bernese Alps). This figure would also help interpreting possible fractionation effects of the snow samples during the ablation phase.

→ As also suggested by the other reviewer I will add the requested diagram to the revised paper.

The method section could be improved by giving more information about the sample numbers and the location of those inside the catchments. Also the third ascent, presented in figure 3, is not explained in the methods section.

→ I was hoping that Figure 2 would provide the required information about the location of the samples in the catchment according to elevation and aspect. I believe that showing a detailed map, which would be easy to do, would not provide much more information as is shown in Figure 2. However, we can certainly add the total numbers

of sample locations for each catchment. In addition, we will provide the information in the method section that in the Engstligen catchment samples from a total of three ascents of the northern slopes were taken beginning of April, end of April and end of May, respectively.

Like the second reviewer I also would like to suggest an independent regression analysis for the pre-melt and melt situation.

→ I will include the required independent regression analysis for the two situations.

Technical comments:

2644, 20: The meaning of “expert” is not clear; Do you maybe mean “experience” or “undergo”?

→ Yes, this sentence makes not much sense “expert” will be replaced with “exert”

2647, 12: Please reformulate the sentence “For this reason, ... ”.

→ The sentence will be reformulated to: “Therefore, the MLR was only applied to predict the observed variability of deuterium since the relative standard error of $\delta^{2}\text{H}$ measurements is smaller than for $\delta^{18}\text{O}$ and the behavior of both isotopes in the hydrological cycle is nearly the same as long as evaporation is not a dominating process.”

2649, 16: Change “signifcantly” to “significantly”.

→ will be changed accordingly

2651, 26: Change “in average” to “on average”.

→ will be changed accordingly

2654, 6: Change “proof” to “prove” or to “verify”.

→ will be changed to prove