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Hydrology and Earth System Sciences
Discussions

Interactive comment on "Statistical modelling of the snow depth distribution on the catchment scale" *by* T. Grünewald et al.

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1) The title will be changed to "Statistical modelling of the snow depth distribution in open alpine terrain"

2) It is quite probable that the lower elevation parts of ARO and HEF have been affected by melt at that time (beginning of May) of the season but it should concern only a very minor part of the catchments. The exact area affected cannot be identified from the ALS data. The melt in the lowest elevations reduced the snow depth in these areas and will also have an effect on the models. But we think that including a meteorological parameter (e.g. melt energy) is beyond the scope of the paper (our scope is to only apply simple model parameters which can be derived from a DEM) as it would either

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require physical modelling or spatial interpolation of very few measurements. Moreover appropriate, continuous meteorological observations are not available for all data sets. Including climatic information as suggested by the reviewer would introduce a different level of complexity and is therefore omitted.

Minor comments: Conclusion P3260 L16: When we started our analysis, based on the findings of Lehning et al. 2011, we were hoping and also expecting to find a reasonable "global" model. From our new results (combined model) we must conclude that such a model might not exist, at least not a single model which statistically explains a large portion of the variability. Nevertheless our study showed that similar parameters are important in the different areas and that a global model with elevation and slope could still explain about 23% of the variability if some aggregation is made. The findings indicate that similar parameters qualitatively influence the snow distribution in most mountain areas, even if the site-specific quantitative differences lead to a limited transferability of the statistical models.

The data set presented in this paper covers different types of mountainous terrain (glaciers, gentle terrain, rough terrain) and climatic regions (European inner Alps, Pyrenees, Rocky Mountains). But it is only a very small sample in comparison to the tremendously large area of mountain ranges worldwide. We think that the physiographic coverage of diverse physiographic features is quite good, but by far not complete. But for climate regions it is only a very small selection (even for the Alps). One can therefore not state that the results are fully representative.

We have changed the corresponding sentence of the conclusion: "It will be interesting to see if the main topographic parameters that provided some explanation of snow depth distributions here for a limited section of climatic and physiographic environments are also important in other environments."

L24: In principle the calculation of snow depth from LiDAR data is also possible for vegetated areas. And there are several studies which have done so (e.g. Hopkinson

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et al, 2004; 2012, Trujillo et al 2007; 2009). To date it must be expected that the accuracy of such data is clearly lower than in open terrain. But generally such data are existing. Nevertheless, including vegetated areas would require a redesign of the study by including additional parameters.

Reference list: Winstral et al. 2002 - one is Winstral et al. 2002 and the other is Winstral and Marks 2002

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