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Interactive comment on "Snow farming: Conserving snow over the summer season" *by* Thomas Grünewald et al.

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Review of manuscript tc-2017-93 Snow farming: Conserving snow over the summer season by Grünewald et al.

The authors present a very interesting study about the monitoring of two snow heaps along with 1D modeling of the snow that is conserved over one summer season. Snow farming and snow management are topics that will receive more and more attention in the coming years. The focus of the presented study is in the scope of the journal. I like the study very much. However, I recommend some revisions of the manuscript prior to a publication in The Cryosphere.

The authors nicely describe the background and the motivation for snow farming. How-

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ever, there is missing the clear formulation of the motivation for the study and the most important research questions that the study will address at the end of the introduction section.

The methods are described clear and understandable. On page 7 (lines 24+25) the authors mention that they used the model SNOWPACK for the simulation of both snow heaps. However, there are only shown results from the Flüela snow heap in the results section later. I recommend showing also results from the Martell site for completeness of the study.

There are sentences that should be moved to the introduction section. The sentence on page 7, lines 25-27, for example, describes the motivation for the modeling of the snow heaps. Or the sentence on page 8, lines 22-25 describes the motivation for the sensitivity analysis.

The simulation of the stored snow was carried out using the one-dimensional snow cover model SNOWPACK. However, the authors mention twice that the use of a spatial distributed snow model such as Alpine3D for example would have been more appropriate to model the snow piles. The first thought while reading the manuscript is, why such a model was consequently not used in this study? Please provide an explanation for this.

The simulation was carried out just for one point of the snow heaps, the point with maximal HS. Please indicate those points in figure 5 and 6. Why was the simulation not carried out for multiple points at the snow heap?

Another concern is related to the used parameters shown in the results section. Why are the results shown for snow height? You have height/volume and density. Why are the simulations not carried out for SWE? Another possibility would be to calculate (and simulate) total snow mass and mass loss in kg. For the TLS measurements providing snow volume and the measured snow density it would be simple to present some quantities of total snow mass loss ect. This would also be possible for the simulations

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since the calculation was carried out for a quadratic area of 1 m2 as described on page 13. Please provide the results for actual snow mass or provide at least a detailed discussion why the results are only shown in snow depth.

Page 1, Line 1: Not only for touristic purposes. The examples (Davos and Martell) you describe in your study are more for a professional sport purpose. You could mention here a range of purposes for example.

Page 1, Line 7: Please include space between the words “measurements” and “agreed”.

Page 1, Line 8: “surface energy balance” would be more correct here.

Page, Line 11: of 12 instead of or 12.

Page 1, Line 13: air temperature for more clarity.

Page 2, Line 4: ..the energy balance of the snow and the glacier resulting. . .

Page 2, Line 10: . . .contribute, but are less. . . Page 2, Line 23: I am not sure if the word neuralgic is appropriate here. . .

Page 2, Line 32: In the context of meteorological conditions, the term humiditiy is more suitable than moisture.

Page 3, Line5: for hosting instead of to hosting.

Page 3 Line 6: weather conditions.

Page 4, Line . . .input for the simulations (. . .

Page 4, Line 20: In contrast to Flüela. . .

Page 4 Line 21 – Page 5, Line 2: Please revise this sentence. Redundant information.

Figure 1 and 2: The authors could think about providing a map for each study site showing the surrounding terrain.

Table 1: Is a result and should therefore be moved to the results section.

Page 6, Line 8-10: Were those measurements carried out in spring or in autum?

Page 6, Line 15: In contrast to. . .

Field measurements section: Please clearly mention here that snow temperature was not measured. The information appears some where later in the text.

Page 7, Line 7: You could introduce here the abbreviation for computer tomography mentioned later in the results section (Page 10, Line 2).

Page 7, Line 4ff: How many samples were collected and analyzed at Martell?

Page 7, Line 12: Next, . . .?

Page 7, Line 12-14: Thios information could be mentioned earlier in the description of the TLS measurements.

Page 7; Line 18: First, . . .?

Table 2: Needs a better explanation in the table caption.

Page 8, Line 1: . . .apportion of 3% liquid water.

Page 8, Line 5ff: Is this assumption really realistic that the properties of sawdust and the mixture of sawdust and wood chips are similar? I would expect that the porosity is different ect.

Page 8, Line 15: snow mass? You show snow depth in the model results. Please see also my specific comments to this aspect of the study.

Page 8, Line 18: Please update the number of the table you are referring to here.

Page 9, Line 8: Please introduce the abbreviation WT earlier.

Figure 3: You are showing net longwave, right? Please add this info. It would also be very helpful to indicate the exact dates when the snow heaps were covered with the

isolating material and when it was removed. Please provide the same figure for the Martell site as well.

Page 11, Line 2: Why is the focus on Flüela?

Table 4: Please provide this table after Figure 5 and 6.

Figure 5+6: The authors could also provide a figure with the fraction (in percent) of snow loss at the two snow heaps.

Page 14, line 9: You describe earlier that the model was initiated with 8,6 m. Please clarify.

Page 14, line 11: Same here. The max HS was described to be 7,2 m earlier in the text. Please check. It would also be very helpful to mention the actual measurements again here for more clarity,

Caption figure 8: Please revise this caption. Shown are the evolution snow height AND density. It would also be very helpful to add the actual measured values to that figure. Please provide the same figure for the Martell snow heap.

Page 15, line 2: Earlier in the manuscript you mention that snow density was 555 kg/m3. Please ckeck.

Page 16, Line 4: Please add here the number of the table.

Caption figure 9: Measured air temperature and simulated. . ..

Page 17: An explanation of figure 10b, 10c, and 10d is missing.

Page 18, Line 4: I think the term evaporation is better in this context.

Page 18, Line 21: Please quantify this high correlation here.

Page 18, Lines 7-9: This is hardly visible in figure 11. . .. I recommend to recolor the sum of the individual energy balance components and change the color of heat of precip to black.

Figure 11: Is there a reason why you just show those results for Flüela and not for Martell?

Page 21, Line 4: . . .and could also play a role. . . .stations directly on the heaps, . . .

Page 21, Line 19: limited instead of little.

Page 22, Line 2: Please provide more informationhere.

Page 22, Lines 9+13: the words “such” are a bit strange here. Please revise those sentences.

Page 22, Line 27: Please provide more information about operation costs. I think this is very important information here for interested readers.

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