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Comment

## ***Interactive comment on “Inhomogeneous snow distribution and depletion patterns at grid scale in a shallow snowpack region” by H. Li et al.***

### **Anonymous Referee #2**

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#### General Comments:

The study attempts at finding general spatial patterns of the accumulation and ablation of SWE, which can be used for modeling purposes. More specifically the questions are: What snow distribution and depletion patterns exist at the grid scale in a shallow snowpack region? How do meteorological factors influence these patterns during different snow seasons?

I do think that these questions are highly relevant and well worth a study, but I am afraid the present paper does not give a basis on which future studies can be built. The main reason is the limitation in data, both spatially and temporally, that, in my view, prevents the answering of the two questions above. Also, the presentation of methods and results are unclear and imprecise and I find it hard to draw any conclusions. That

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said, I do believe the collected data contains information that can be put to use and reported, as you have collected a times series of the spatial frequency distribution of snow parameters (SWE, SD, snowmelt). Such data are rare and therefore valuable.

The terminology is very imprecise which leaves the reader quite confused and struggling to understand what is analyzed.

The figures need to be labeled a), b), etc, for easier reference when there are more panels in a figure,.

Detailed Comments.

p.4172, l.5. The “contrast” is not very clear

p.4172, l.11. Reformulate this point 1), it is not very clear

p.4172, l.22. You must define the grid scale, grids come in many sizes.

p.4173, l.3. Liston (2004, J. Clim.17) has a nice discussion on scale and processes regarding the spatial variability of SWE.

p.4174, l.1. I do think the spatial variability of precipitation need to be incorporated as a source of the spatial variability of SWE.

p.4174, l.12. This statement needs to be referenced.

p.4174, l.18. Why is this likely?

p.4177, l. 10. You are forcing a spatially smooth precipitation field by restricting the ratio to be between 0.8-1.2. How does this bear on the analysis of pattern from the modeled fields?

p.4178, l.8. The heading of this subsection is Spatial Accumulation Factor, whereas in the text it is called Periodical Accumulation Factor. I have three comments to this: i) I do not quite understand why it is called “Periodical”, ii) I think Spatial Accumulation Factor is a better name, and iii) one should not call the same thing by two names.

p.4178, l.14. . .temporal similarity between. . .

p.4179, l.15. Are these PDFs calculated for each day, i.e. is a temporal notation of the parameters missing?

p.4180, l.1. The First sentence in section 3.1 needs reformulation. I also think the comments on Fig. 2 are imprecise, i.e. the SDV a similar trend as SCF. It doesn't look that way.

p.4180, l.8-14. The commenting on Fig. 3 is also imprecise. I do not see "slow accumulation" in SWE and "nearly unchanged" SDV and CV. Also, CV both increases and decreases in the melting period.

p.4180, l.15-20. Discuss changes in the PDF using statistical terms. By referring to the "peak value", you mean the "peak frequency", and your point regards the "skewness" of the distribution.

p.4180, l.20-25. I do not understand the first point, isn't SWE also reduced if SCF is one? Regarding the third point, I do think CV and SDV varies during the "winter" (not precise terminology), and CV both increases and decreases during melt, and SDV.

p.4181, l.11. Strange sentence. When is SWE approximately 0? Is there an error?

p.4181, l.20. Again terminology, use accumulation and ablation (melt) periods.

p.4182, l.4. Same again, be consistent in the terminology.

p.4182, l.8. I do not understand: "we determined if the spatial rules of a prior snow distribution exist in the pre-melt period in our study region" what rules?

p.4182, l.11 Can it really sublimate at any time?

p.4182, l.11. Here it is really critical that the terminology is consistently used. You use stages, seasons and periods, and later on "winter".

p.4182, l.18-19. Are the distributions similar or different? You are comparing spatial

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distributions and spatial frequency distributions.

p.4182, l.24. How is the significance measured? And where is the figure with the distribution for the 21 of February?

p.4183, l.3. What rule is this?

p.4183, l.25. What is a snow period?

p.4184, l.1. I am not sure how to read the PAF in Fig 7. How is it correlated to SWE? There is a high scatter for high PAF.

p.4184, l.11. Is Figure 7 for a snow melt or an accumulation period. I thought it was for an accumulation period (“snow period”), but now I am not so sure..

p.4185, l.1. Similar?, how?

p.4185, l.7 “loose range”?

p.4185, l.14-15. This is a point which have been discussed by other authors which you have already made references to.

p.4185, l.16 and on. I do not find these sensitivity analyses by the SNOWPACK model complete. How high are the variations in forcing compared to, say, daily observed values? Are the variations (30, 60, 90 W) realistic or relevant?

Also, the other meteorological forcings, such as variability in precipitation, wind etc is needed in order to assume what is important for spatial patterns of SWE on small scale slopes.

I am really not very informed by the figures 9-11. Is there a better way to illustrate the sensitivity?

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Interactive comment on The Cryosphere Discuss., 6, 4171, 2012.

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