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Interactive comment on "Spatial variability of snow precipitation and accumulation in COSMO–WRF simulations and radar estimations over complex terrain" *by* Franziska Gerber et al.

Anonymous Referee #3

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This study uses COSMO-WRF simulations to investigate the relative importance of cloud processes and the interaction between near surface flow and particles on snow accumulation in complex terrain. It shows that the WRF LES simulation, even at 50 m resolution, does not capture the particle-flow interaction near the surface in complex terrain. The authors conducted a scale analysis using autocorrelation maps and variograms to show a correlation with the terrain height, the orientation of the valleys and the precipitation distribution simulated. They also have access to radar measurements located at higher altitude to compare with the model simulations. This is a valuable study on precipitation distribution and evolution in complex terrain. I recommend the manuscript to be published after addressing these minor comments. The English

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Discussion paper

should also be improved before publication of the manuscript.

These are the specific comments:

1. The organization of the introduction should be improved. The goal of the study is not clearly stated. There is a question at the end of p.2. The following paragraph continues with the literature review and then, they elaborate a little more on the objective of the study. I would suggest focusing first on the literature review, listing the gaps in the field of snow redistribution near the surface, the objective of the study and how it will be addressed.

2. P. 4, line 1, do you mean northerly? The sub-domain is located on south-easterly of the domain.

3. P. 4, line 5, should probably give the precise dates here.

4. P. 5, line 10, the units should not be in italic. Please modify here and everywhere in the manuscript.

5. P.7, line 4: Should it be at noon instead of “during”? I am not sure what the authors mean here.

6. P.10, Figure 2: The font on the figures is too small. Letters should be added to all panels to help following the text.

7. P.11, Figure 3: The font is too small. It is very hard to read.

8. P. 11, line 8 and 9: Please clarify the sentence: “The introduction of drops in relative humidity by WRF may be due to an overestimation of subsidence in the model.” Subsidence is not necessarily directly linked to relative humidity. It contributes to warm the air adiabatically, which leads to drier conditions.

9. P.12, line 12: Similar comment as #7.

10. P.13, line 12: What do you mean by “advection in the microphysics scheme”?

The microphysics scheme predicts the mixing ratio and the number concentration of hydrometeor through phase changes, collection and fall speed. I think that advection of hydrometeor is computed in WRF. Please clarify this sentence.

11. P.14, Figure 4: The font is too small. It is very hard to read. It is also hard to compare among each other because the scale is different. Please use the same scale, if possible.

12. P.15, Figure 5: The lines associated with the figure axis are missing on the figure. The x-axis could be called the Data sources (or something like that). I think that the dates could be at the top of each panel. Also please add letters to panels for clarity.

13. P.16, line 3: The following sentence states that the model is overestimating precipitation: "...model tends to overestimate precipitation for higher resolution...". As mentioned in line 21, there is also uncertainty in the radar derived precipitation amounts. It would be good to add 1-2 sentences about his issue. For example, did you try other S-R relationship to derive precipitation information from the radar?

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