

Review by Marius Schaefer, 6th of January 2020

General comments:

The revised version of the manuscript shows several improvements in comparison with the original submission. However many of the points which I mentioned in my first assessment remained unaddressed. To my point of view the model description section I still weak and the presentation of the results and their validation is insufficient. Both points could be easily improved (see detailed comments below). The general readability of the manuscript could be improved by separating the presentation of the results from the discussion.

Detailed comments:

Methodology:

DR-scaling: it is still not clear to me how the vertical precipitation gradient is “optimized”. Which function are you minimizing or looking for zeros using the Newton-Raphson algorithm (better know as Newton method)? I would very much recommend to perform this method with two drying ratios (0.45 and 0.6) to be able to compare systematically with the OPM.

Linear orographic precipitation model:

Some equation are shown now, but in my point of view they rather confuse than contribute. Several variables are not explained. If you want to show equations, I would very much prefer to see the two coupled advection equations for cloud water and hydrometeors. They contain the models essentials. Then you can describe the solution methods with words (or equations if you prefer) and give the necessary references. You should comment on how the choice of every model parameter influences the results. For the second experiment I would recommend to only change the drying ratio to 0.6 and leave the other model parameters untouched in order to get a better idea about the influence of this parameter (then you could also avoid the word extreme scenario).

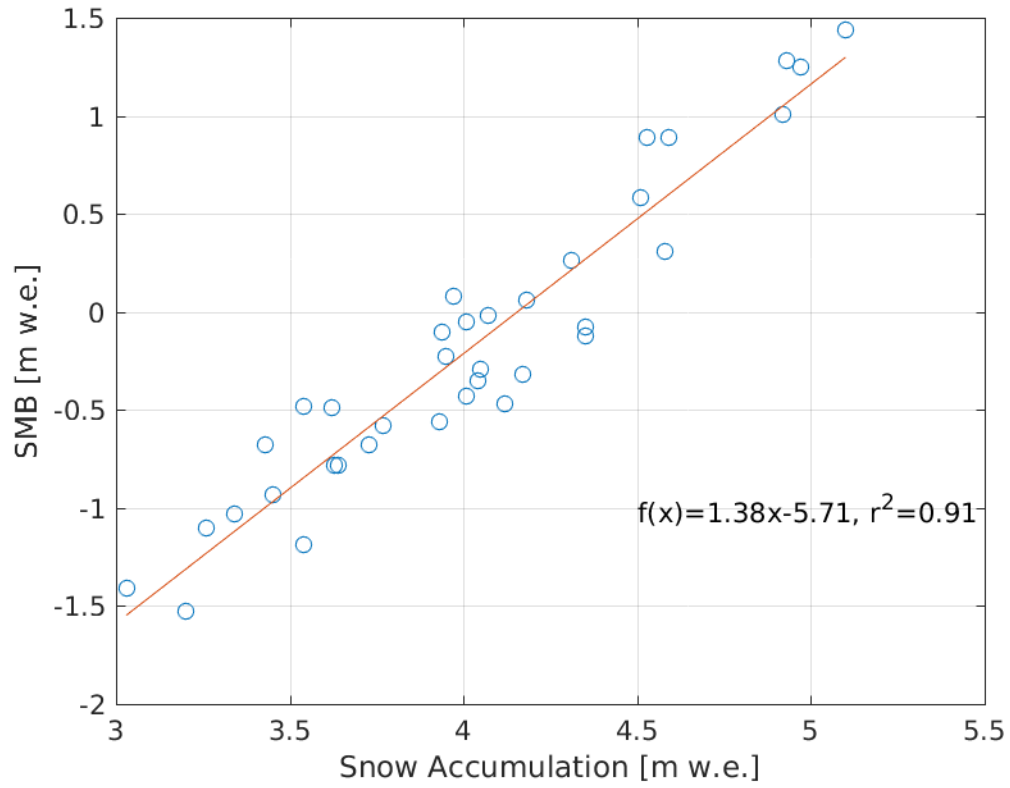
Results

Physical constrains on local precipitation.

In this section I would like to see all modeled precipitation fields (Figure 3) to the see the differences in precipitation distribution of the DR-scaling and OPM (similar as it was done in Weidemann 2013). Precipitation totals seem to be very similar between both methods (Table 1). And I would like to see an analysis (hopefully one or more figures) indicating which of the set-ups is reproducing best the station data and which are possible biases (a differentiated analysis of stations on the windward and leeward side of the icefields can indicate a lot about the models performance to simulate the process of orographic precipitation.)

Consequences of revised precipitation estimates on the surface mass balance of the SPI

Again, since this is a regional assessment, you should include the consequences of your modeled precipitation fields for both icefields. There is a very clear relationship between accumulation and surface mass balance for NPI as well. See figure below and attached data.



At NPI calving losses are much smaller and SMB can be much better validated against geodetic surveys (such as Braun, 2019).