

The review comments are shown in black and the author responses in red.

We would like to thank the reviewer for reviewing our manuscript. We appreciate all the comments and will revise our manuscript according to them. Please find below our responses to the comments.

In this manuscript, the authors presented an evaluation of ERA5 and ERA5-Land SWE, albedo, and SCE products with different satellite-based datasets in the NH during the spring from 1982-2018. While the study is not that innovative, the manuscript is comprehensive, well-written and of interest to the snow community and final users. However, I think that some restructuring of the Introduction is needed, and some issues need to be better discussed throughout the manuscript.

### **Abstract**

I would appreciate seeing some quantitative results about the agreement among datasets rather than inserting all the information about trends, that is for sure useful but a little bit difficult to follow.

We will edit the abstract and will add some quantitative results about the differences between the datasets.

Also, when you mention “other datasets” (L20), it is not completely clear if you refer to the satellite-based datasets used as “reference” or if you are also accounting for differences between ERA5 and ERA5-Land.

We will reword this sentence to make it clearer.

L18 IMS first entire name than acronym

We will edit the text according to the comment.

### **Introduction**

To make it easier to follow, I would always keep the same order as in the abstract, i.e., SWE, albedo and SCE (or maybe a different order that better suits for discussion). I think the introduction needs restructuring. First, you introduce the snow importance, hence L48-56 should be moved at the beginning. Secondly, you introduce SWE, albedo and SCE. Then you should introduce the reanalysis data and their importance also linked to climate change. However, L58-67 might be shortened. Finally, the aim of the work.

We will edit the introduction according to the comment. We will also edit the text and figures so that the order of the variables will always be the same.

It should also be clearly stated why you focus on the NH. Is that because of the lack of studies? Is a global evaluation of the snow properties already available for such a period? I suggest highlighting the importance of snow in the NH in general, despite mentioning the Arctic region throughout the text (as L86) that still belongs to the NH but it is just a part of that.

This analysis has concentrated only on NH because there is not much seasonal snow in Southern Hemisphere (SH). In NH, at its largest in winter, snow covers on average more than 45 million km<sup>2</sup>, which is almost half of the NH land surface area (Estilow et al. 2015). Snow cover in the Southern Hemisphere (SH) accounts for less than 1% of SH land surface at its largest (Foster et al. 2009). As a consequence, the changes in SH snow cover are minor compared to the changes in NH and therefore, this study has concentrated only on the NH. We will edit the text to point out this issue.

Estilow, T. W., Young, A. H., and Robinson, D. A.: A long-term Northern Hemisphere snow cover extent data record for climate studies and monitoring, *Earth Syst. Sci. Data*, 7(1), 137-142., <https://doi.org/10.5194/essd-7-137-2015>, 2015.

Foster, J., D. Hall, R. Kelly and L. Chiu. Seasonal snow extent and snow mass in South America using SMMR and SSM/I passive microwave data (1979–2006). *Remote Sensing of Environment* 113:2, pp. 291–305, 2009.

## Minor comments

L51 “limits water availability” is expressed in a negative way. I would use something like “stores water”  
We will reword this sentence.

Provide short information about IMS and what kind of data is assimilated.

We will add information about IMS.

## Section 2

L138 keep same order SWE, albedo, SCE

This will be applied throughout the text.

Eq. 1 is not completely clear to me. From the first term you get the snow height, that is then multiplied by 1/0.1 to derive the snow cover fraction. Does this derive from a depletion curve? Please, add a reference.

The equation is directly from ERA5 documentation. We will revise the text and add a reference.

L159 very close: please quantify!

We will quantify the difference and edit the text.

Table 1. I would add the period of availability of the different data sources.

We will edit the table according to the comment.

L190 I am wondering if it might be problematic to use products that assimilate another reanalysis product (ERA-Interim) as “reference”. Might be that the differences that you obtain are due to the assimilation of the ERA-Interim product? I think this point needs further discussion.

We will add more discussion on this issue.

L212 How can you explain that the differences are negligible?

We will quantify the difference and edit the text.

L237 What is the reason why you choose the nearest neighbor interpolation instead of a cubic for example?

The nearest neighbor was sufficient for our study because the native grid resolutions of the datasets were already very similar. The higher-resolution MODIS albedo product was first coarsened to  $0.25^\circ$  resolution by calculating the mean value of all the grid cells within one  $0.25^\circ \times 0.25^\circ$  grid cell and subsequently resampled to 25 km equal-area projection using the nearest neighbor method.

I am wondering also why you haven't used the snow CCI SCF product as additional reference dataset.

We have only used two reference datasets to keep the number of datasets reasonable.

### **Section 3 Results**

I would appreciate to see some more metrics (RMSE, correlation).

We will add metrics as suggested.

L308 Please, explain better what you mean with “explained with the uncertainties”.

We will edit the text so that the meaning will be clear for the readers.

### **Discussion**

L488 quantify “typically” or add a reference

The reference (Key et al., 2001) is after the next sentence. We will reword these sentences.