The Cryosphere
Discussions

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Interactive comment on "A satellite-based snow cover climatology (1985–2011) for the European Alps derived from AVHRR data" *by* F. Hüsler et al.

Anonymous Referee #2

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The study presents snow cover climatology for European Alps based on satellite derived AVHHR snow cover data. The snow cover data from AVHRR is obscured by cloud cover and in the first part of the study cloud removal is undertaken based on spatial and temporal filtering approach. Afterwards, cloud removed snow cover product is used to analyze snow cover climatology over entire Alpine region divided into four climatic regions. The study is within the scope of the journal ant it brings some new insights to snow climatology of European Alps from satellite snow cover perspective. Additionally, the study presents a new cloud removed snow cover dataset for this highly heterogeneous topography which can be very useful for hydrological studies, both as input or calibration/validation purposes. However, in my opinion, the paper would benefit from more detailed validation of snow cover maps which is a prerequisite for accurate analysis of snow cover climatology.

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Specific comments:

1. The validation of cloud removal methodology is done only using modeled monthly mean SCA. However, in order to assess the accuracy of applied approaches for cloud removal and to assure generation of accurate daily data on which further analysis (e.g. SCD, SCOD and SCMD) depend, it would be better to validate them against daily point or spatially distributed data. I assume authors have daily point or gridded station dataset which could be used to test specific cloud covered days. Moreover using MODIS snow cover product could also be useful to validate the methodology for cloud removal on individual scenes given that clear sky condition from MODIS is available due to different capturing time and possible clear sky condition during MODIS observation. The latter could be better due to the fact that MODIS observes snow cover independent from effects such as south/north facing mountain ridges which I assume is not considered in the interpolation methodology of gridded station data. Alternatively, the point data from stations could be used to test the accuracy of cloud removal methods.

2. I suggest to separate "Study Area" description from "Data" section unless you name the section "Study area and data". Study Area itself can be one section and this would be a standard publication structure.

3. Figure 7: Please extend the explanation in text. Please give reasons why e.g. SCD at lower elevation should / could have positive departure from long-term value whereas SCD at higher elevation have at the same time negative departure from long term?

4. Page 3008, lines 3-8: Please explain how the monthly mean values are computed for different data availability periods (1985-1989, 1989-2002 and 2003-2011)?

5. Page 3012, lines 10-15 and Figure 3a and 3b: It is difficult to recognize the difference (improvement) of SNOWL method on cloud removal from figures 3a and 3b visually. I would suggest to also including a table with % values of cloud removal after each step to see the performance of each approach. This is also important to see how much

cloud cover remains at the end.

6. Page 3012, lines 15-17 and Figure 3d. It is not clear from the figure and in the text how "mean" value is computed. It would be better to include some more explanation to this figure as it is not easily understandable.

Technical comments:

1. Figure 6 Caption: In text you write "long-term mean" whereas in the caption it is "long-term median". Please correct.

2. Figure 7: Delete "Connecting lines are displayed for easier readability of the figures only". It is clear anyway.

3. Figure 8: Please use lines for sat1 and sat2 legend instead of dots as they are not dots in the figure but lines.

4. Figure 8: The dots (model) is unfilled in figure but filled in the legend. Please be consistent in both cases.

5. I would suggest to use AVHRR1 and AVHRR2 instead of sat1 and sat2 in the legend.

6. The sentence "To assess the influence of the number of data available, the dataset was artificially reduced to one satellite at the time" belongs to text and not figure caption. In the figure caption you could write something like: e.g. "AVHRR2 – snow cover data with reduced number of scenes".

7. References: a. Hosmer & Lemeshow, 2000 is missing, please add it to references b. Remove page numbers (3004, 3003, 3020..) at the end of each reference as this is not standard referencing style of TC.

8. In some of the figures the legend text is too small. Please enlarge them for better readability (e.g. figures 4, 5, 10 and A1).

9. Figure 3: Please use labels other than circle with outline which does not represent

the figure and is difficult to read.

10. Figure 7: Please use better indication for the years 1995 and 2001 if the statistics were not computed for these years (e.g. gap in connecting line between 1994-1996, 2000-2002). "No point" indication is not recognizable.

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