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Hydrology and Earth System Sciences
Discussions

Interactive comment on "A snow cover climatology for the Pyrenees from MODIS snow products" *by* S. Gascoin et al.

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Response to Anonymous Referee 2

First, we would like to thank Referee 2 for his/her attentive reading and the encouraging comments. We agree with most of the suggestions and will modify the manuscript accordingly. We have written a point-by-point response below.

The authors assess the accuracy of the standard MODIS snow gridded products, MOD10A1 and MYD10A1, on the seasonal snow cover mapping in the Pyrenees. They compare results from the snow maps with in-situ measurements. They also use Landsat images to validate the MODIS snow maps. They find high accuracies for the satellite-derived snow cover maps, with a slightly higher accuracy found for the

MOD10A1 (Terra) snow maps. Using the snow maps they compute a mean monthly snow cover duration in the Pyrenees, and analyze snow patterns in the 2011-12 winter and relate that to a drop in hydropower. While I like the paper a lot, I feel that there are several important topics described, and that the topics are not all equally well-developed. For example, very little is said about the snow cover duration in different elevation bands, in the Results section and in the Abstract, though there is a nice figure (Fig. 9). I would like to see a larger discussion of this interesting result. Also, how exactly can the snow maps be used to improve or predict hydropower production? That is discussed but a more detailed discussion of that would also be useful.

We will expand the discussion on this result also by incorporating an additional figure showing the effect of the slope aspect on the snow cover duration (SCD). It shows that the snow last longer on north-facing and east-facing slopes. This is consistent with the expected effect of the solar radiation on the snowpack energy balance. North-facing slopes receive less solar energy. West and east facing slopes are exposed to the same insolation but west-facing slopes receive solar radiation in the afternoon at the hottest time of day, which explains why the snow melts faster than on the east-facing slopes. If we further normalize the SCD with respect to the mean monthly SCD (not shown), we see more clearly that the difference between east and west facing slopes increases along the snow season (from November to June). This is again consistent with the previous comment. These results will be included in a new "Discussion" section.

Finally and very importantly, it seems that there is new information provided in the Conclusions. Some wording (which is good wording) should be described in the Results section first and then mentioned again in the Conclusions.

We will make sure that any information mentioned in the Conclusion was already described in the Results.

Figures: I cannot read the labels on the figures easily; the font is quite small on a lot of them. Please go through the figures to determine if they are all needed. There are

quite a few and many are not explained very well in the text.

We propose to merge the Figures 3 and 4 into one single Figure showing only "Ordiceto" station SWE and SD time series. This will improve its readability. Otherwise we do not see any other figure that could be removed without deteriorating the coherence of the manuscript.

So my suggestion is to try to develop all of the major findings or topics a bit better, or take one out and use it for a companion paper.

We will expand the discussion on the spatio-temporal dynamics of the snow cover that can be extracted from this snow cover climatology. This is consistent with the comments by Referee 1. We agree that there are several points to be discussed and we could have split this study in two papers. However, we would like to insist on keeping all the elements in a single manuscript, because we want to provide to the reader the full process: i.e. from the accuracy assessment to the application to an actual water resource issue (drought in 2012). We believe it is important to keep all the pieces together to illustrate how MODIS snow products data can be practically used by water managers.

Abstract Please provide some results of snow cover duration per elevation band in the Abstract.

Thank you. We will include this result in the abstract.

Introduction – there are numerous acronyms that need to be spelled out with the first usage.

We agree, these acronyms are the names of the satellite sensors.

Page/Line 12533/15 change to functions 12535/2 should reference Klein et al., 1998 here 12535/4 & 5 this should read NDSI instead of NDVI and NDSI should be spelled out 12536/7 should also reference Salomonson and Appel, 2004 and 2006 12536/14 should read ". . .which enables us to generate. . ." 12536/18&19 should re-phrase

this sentence for clarity 12545 end of Section 3.2 - the last couple of sentences are a bit confusing and should be re-written for clarity 12546/8 product should be products 12547/20 an should be a 12548/20 please describe MOD01A1 - it just comes out of the blue, though it's possible that I missed a description of it earlier in the paper 12548/25 also reference Riggs et al., 2006 online User Guide to snow products References I don't understand the 5-digit numbers at the end of each reference?

Many thanks for these suggestions. We will take them into account in a revised version. Regarding the NDVI it is not a mistake, the vegetation index is actually used in the algorithm to lower the NDSI detection threshold in forested areas. I presume that the 5-digit numbers are the line numbers where the reference is given (this was automatically generated by the Copernicus LaTeX style).

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 11, 12531, 2014.

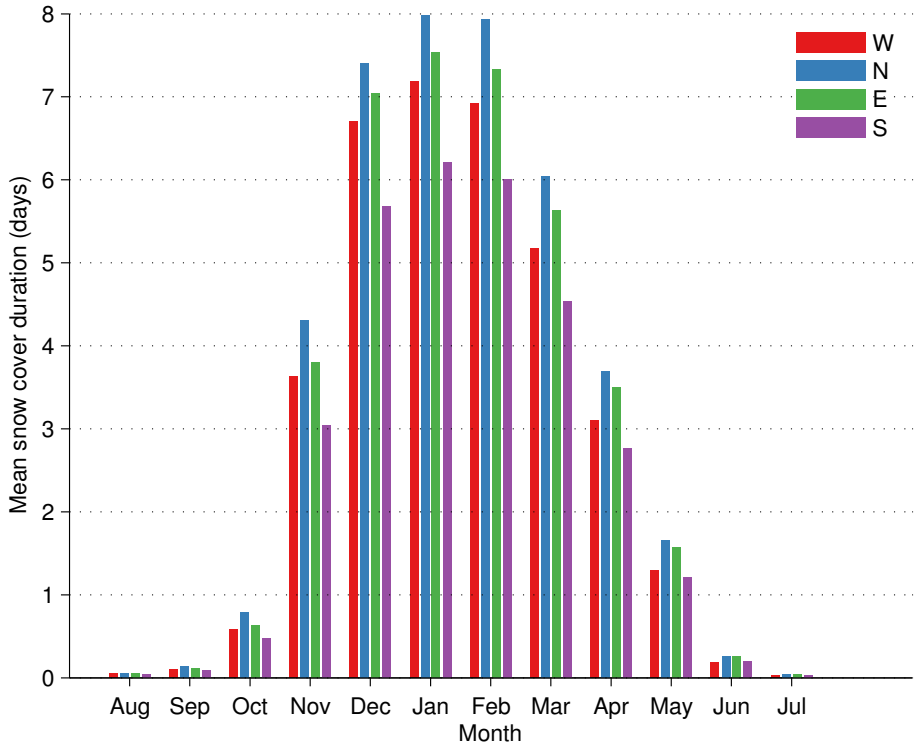
Mean snow cover duration (days)
0
1
2
3
4
5
6
7
8
Aug
Sep
Oct
Nov
Dec
Jan
Feb
Mar
Apr
May
Jun
Jul
Month
W
N
E
S

Fig. 1.