1) It is very optimistic to speak about climatology or trend at all in this particular study. The dataset investigate is only 11 years long and, as the authors, write in text this period subject to several extreme events; the episodes 1999-2003 and 2006-2009 were very dry. It is impossible to derive a trend from such a highly variable and short dataset.

We agree with the referee that here, trend cannot be statistically significant, and speaking about climatological values could be misleading. Our aim is to show that the tendencies presented in our analysis are indicative of the on-going processes and are a confirmation of other trends related to different variables in the same area. All those signals are, of course, related to cause-effect relationship. This is why we refer to the works of other authors which highlighted the presence of trends in other relevant variables.

2) From the manuscript it appears as if snow cover is the only variable of a snowpack whereas snow albedo, density and depth are very important states that in essence define the snow processes and the resultant snow cover. In fact, there is a snow albedo product and perhaps also a few other snow-related products available from the MODIS. This background information is missing in the manuscript and that is important for the motivation of the study. Many of the modelling studies the authors refer to adopt simplified model structures that ignore these processes.

We agree with the referee that the snow albedo, density and depth are very important variables in determining the snow pack and the snow cover. However, as variations in the snow cover is a consolidated function of the accumulated snow, its depth, its density and prevailing temperature regime, snow cover provides an indirect measure of snow water resources (Brown 2000; Brown et al., 2003), by studying only a single variable. Pu et al., (2007) report that snow cover is a comprehensive indicator of the mean conditions of temperature and precipitation in the Tibetan Plateau and its surrounding areas. Snow cover maps are reported to be of great use for calibrating/validating and even improving the hydrologic applications for assessing snow melt processes/responses (Blo¨schl et al., 1991; Grayson et al. 2002; Parajka et al. 2007) and its forecast (Rodell and Houser, 2004; Andreadis and Lettenmaier, 2006). We agree with the referee that in addition to snow cover, albedo is an interesting variable and MODIS data give the opportunity to study it in an accurate way. In order to use the information obtained from albedo in a constructive way, we should change our approach and use hydrological and radiative transfer models to understand the effect of changing albedo on snow. We will take this suggestion as a possible input for a new paper, more oriented on the modelling of melt-runoff from the region. We agree with the referee that studying other snowpack variables will also be quite valuable, however, various issues hindering estimation of such variables from remote sensing data (e.g. snow mass - Ko¨nig et al. 2001; Sturm et al., 2010) need to be addressed in detail and require independent study.

3) The procedure for developing the improved snow cover product is based on reducing the number of cloud cover pixels via spatial and temporal filtering technique. This seems a bit awkward because by spatial/temporal filtering you lose information and snow cover varies spatially and temporally. Temporally because of snow melt that is defined by the available energy (incoming and albedo) and spatially also because of the wind-redistribution of snow. As such I am not convinced that the developed snow cover product is an improvement of the existing.

There are numerous cloud filtering techniques consisting of various levels, and it is the case that with each successive level there is more cloud reduction but there is more probability of loss of information (Gafurov and B´ardossy, 2009). We have restricted our cloud filtering procedure to most common and robust cloud filtering techniques (combining MODIS Terra and Aqua, temporal and spatial filtering), in order to either avoid or to keep the loss of information low. In our analysis, we have carefully arranged our cloud removing filters in a sequence of their theoretical accuracy and effectiveness that the end product again faces either minimum or no loss of information. For example, firstly, we have chosen the MODIS Terra snow product as a base for cloud filtering procedure as it experiences relatively less cloud cover than its counterpart (Parajka and Blo¨schl, 2008; Wang et al., 2009). Then, in the first cloud filtering step, by taking the benefit of twice a daily MODIS images (aboard Aqua and Terra Satellites with a minimum duration between their viewing time – just 3-4 hours at the Equator), we have merged both images for cloudy pixels in order to remove short-persisted (instant) clouds from the base image (MODIS-Terra). This technique is most effective and accurate as both the observations are few hours apart (Gafurov and B´ardossy, 2009).

In the temporal filtering, we assume that the snow cover often persists longer than one day, thus the present-day cloud pixel can be replaced with the corresponding cloud-free pixel at adjacent day. However, in this step, if the corresponding previous-day cloud-free pixel was actually taken from the MODIS-Aqua image of that day (as a result of first step) than the time duration between the present day cloud-covered pixel and the previous day cloud-free pixel is again few hours. Moreover, if the present day conditions are cloudy, the contradiction to above given assumption is the possible rapid snowmelt, which is again limited to the incoming solar radiation being blocked by the present day cloud cover (Gafurov and B´ardossy, 2009). The relatively high probability is rather the snow fall or no change than the snow melt, which is consistent with our taken assumption. The possibility of snowmelt can be confirmed from the prevailing temperatures but it is not considered in the study.

Though the MODIS Terra and Aqua snow products are in good agreement with each other, these still have little differences (Wang et al., 2009) - change from land to snow due to snow fall and vice versa due to intense melting -, which are particularly high during transitional periods, such as, start of snow accumulation and end of snowmelt (Prajka and Blo¨schl, 2008). As we consider one observation per day, our analysis cannot depict variability at a sub-daily scale. Such loss of information even exists in clear sky conditions and does not necessarily belong to our applied cloud removal procedure at this step. We will briefly mention this in the revised version of our manuscript.

In the spatial filter step, we agree that the selection, whether the current pixel will be snow/land/cloud based on information from the neighboring cells, cannot always be accurate, but its probability being so is high. We have considered a 7x7 spatial window, in order to decide the new class of current cloudy pixel based on reasonable number of neighboring grid cells. This window size has been reported optimal for such use (Gurung et al., 2011). Further, this step marginally improves the snow product (reducing cloud cover and improving snow cover), thus least prone to loss of information.

We will cite numerous studies (Zhou et al., 2005; Prajka and Blo¨schl, 2008; Wang et al., 2009; Gafurov and B´ardossy, 2009; Gurung et al., 2011; L´opez-Burgos et al., 2013; Hüsler et al., 2014 etc.), who have applied such cloud filtering in their analysis and reported its effectiveness. We will clearly explain the applied cloud filtering steps and their associated assumptions in more detail in the methodology section of the revised manuscript.

4) The remote sensing problem of snow cover is not very well introduced. What are the state-of-the-art methods? Is cloud cover really the only issue with estimating snow cover?

We agree with the referee and we will explain the remote sensing problem of snow cover in the revised manuscript in general and briefly discuss the state-of-the-art methods in such regards. We agree with the referee that the cloud cover, impeding surface view, is not the only issue in observing/estimating snow cover, however, it is indeed a major one (L´opez-Burgos et al., 2013; Hüsler et al., 2014), particularly while using MODIS snow products (Zhou et al., 2005). Other limitations may include obstruction of snow by dense vegetation, surface heterogeneity and spectral similarities with different objects in mountainous areas etc. As the MODIS snow products still contain cloud cover preventing reliable snow cover estimates, our study focuses on removing/reducing the cloud cover from the available MODIS snow products.

5) Validation: The new snow cover products are validated at all. A validation should be included and the results should be compared against a standard before it can be

accepted as a superior product.

We have discussed the validation methodology of our applied cloud filtering technique (Page 13155, Line 16-24) and presented its results (Page 13156, Line 23-26; Page 13157 Line 1-5; Figure 4 and Table 1). Kindly see our detailed response to comment # 2 of Referee # 3.

6) Spatial scale: Wind blow and patchiness of snow are important issues. This inevitably has an impact for the estimation of snow cover with 500 m spatial resolution satellite observations. The magnitude of its impact also depends on the type of snow that is dealt with; alpine, tundra, and prairie. These issues should be addressed in the manuscript.

We agree with the referee that wind blow and patchiness of snow are indeed crucial issues and may impact snow cover estimation, however, ability to take into account such small scale processes over such large study area is limited based on the daily MODIS snow products only. We have chosen our spatial filter of a 7x7 window considering a reasonable number of neighboring cells for deciding whether the current cloud-covered pixel should be replaced with land or snow or will it remain unchanged. Such window size has been reported as optimal for spatial filtering by Gurung et al., (2011). We will address such limitation of our spatially cloud-filtered snow products in the revised manuscript.

7) Teleconnections are interesting, but I wonder if a 500 m snow cover product is needed to prove these relationships. I think it is more effective to test to hypotheses against data from local stations in support with the snow cover product because now it is not clear if a connection is observed or it is anomaly in the RS product.

We fully agree with the referee and we will test this hypothesis using the meteorological observations, which are presently limited to and available within the western part of the study area (lying in Pakistan).

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