

## ***Interactive comment on “Snow cover data derived from MODIS for water balance applications” by A. Gafurov and A. Bárdossy***

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### 1. General Comments

The paper by Gafurov and Bárdossy addresses the problem of cloud cover in the MODIS MOD101A tiled snow cover product at 500m resolution. A sequence of 6 different cloud cover removal methods is presented and evaluated. The article focuses on the critical issue of obtaining spatially distributed snow cover information in sparsely monitored mountainous regions for the application in hydrological applications. The use of remote sensing data for this purpose is the sole feasible way of acquiring such information, thus the assessment and improvement of the quality of such data is essential. The authors present a series of simple yet equitable and efficient decision tree type algorithms to remove cloud cover and illustrate the performance of each. The

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methods are implemented for one year of MODIS data and exemplified for two cases of extensive cloud cover over the study area of the Kokcha basin in north-eastern Afghanistan. While presenting a very interesting approach the presentation of the study should be substantially improved prior to publication. Technical and Linguistic review of the manuscript and precision of expression would substantially improve the paper.

## 2. Specific Comments

- while the paper focuses on the single issue of cloud covered pixel removal in the data, the title and abstract are misleading as they suggest the derivation of snow cover and the application of snow cover in water balance application. The actual topic of the paper should be more clearly stated and the results should be addressed in the abstract.

- clarify that the presented methods are used as a sequence of steps of which each removes more cloud cover; consider a more thorough comparison of the performance of the approaches. Which are essential / most effective? What are advantages and drawbacks?

- expand upon why daily retrieval is required? Is daily change in snow cover substantial enough to make it necessary to derive daily snow cover? Does the applied method provide substantially better information than updating snow cover on pixels whenever cloud free MODIS observations are available?

- p 793 line 2: please cite examples of the mentioned studies.

- p. 793 line 12: At the latitude of the study area, more than 1 daily overpass of each MODIS will take place on most dates. This is most probably utilized in the production of MOD10.

- p. 793 line 13: clarify "global data"; (this refers to the operational MODIS products?)

- p. 793 line 15: MODIS can not observe earth coverage through clouds = trivial for

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optical sensors.

- p. 794 line 4: % of what?
- p 794 line 20: please clarify source of climatological information
- p. 795 line 1: "over 40°C": certainly not a value for the basin. Refers to where?
- p. 795, Data section: MODIS tiles are NOT 2330km x 2030km! Please clarify the difference between MODIS Swath and Tiled Data products. In the context of the work Swath data is irrelevant as only tile H23V05 is used.
- p. 798: Method 4: Not clear: "three direct neighboring pixels"; which neighbors are chosen and why?
- p. 798 Eq (7): The equation does not reflect the use of 8 neighboring pixels.
- p. 798: Figures 3a and b are used to "illustrate the method"; (really?) AND show a pixel cover time series. Please expand upon this; what do the values (200, 50, 25...) stand for? Do they have a specific meaning as numbers? If not consider replacing them by descriptive terms as is done later in the text on page 800. Consider also putting these terms in the figures.
- p. 801 line 11: If it's not visible, why plot it?
- p. 802 "Validation": First paragraph is very fuzzy. Please clarify.
- it appear that if you apply approach 6 as approach 1 you're done. Clarify why approach 6 is used. Generally the order of the sequence of approaches should be explained.
- it would be interesting to address the advantage of the approach when compared to the 8-day composite snow cover product MOD10A2
- The validation of the approach using 2 days out of 1 year of data seems not to be very robust

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- consider combining the maps in fewer figures. The size of the snow cover maps is larger than necessary. Smaller maps next to each other could also make comparison easier.

### 3. Technical Comments

- p 795 line 8: installed ON the Terra and Aqua satellites
- p 796 line 2: consider: pixel cover BENEATH/UNDERNEATH the cloud covered pixels
- p 796 line 22: delete "further in this study"; If Eq. (2) is not...
- p 797 line 8: please clarify the term "snow transition elevation"; suggestion: This approach is suited for pixels located at very low and very high elevations. (Also: Why is this the case?)
- p 797: I am not sure but I think its "snow cover" instead of "snow coverage"
- p 798 line 13: must be "...and THEIR elevation..."
- p 800 line 18: "As is visible from the image, the 8 January 2003..." Please check English language (in other places: In the Table X should be In Table X etc, see above p 796)
- p 800 line 28: please clarify/correct "were corrected from cloud"
- p 801 line 5: A very strange sentence...

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