

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

This paper presents an approach used for snow cover mapping during clouds in the daily MODIS snow cover product. The proposed procedure consists from six subsequent steps and is tested over a data sparse region in Afghanistan. The results indicate that the method is efficient in cloud reduction, however its accuracy remains an open question.

Generally the paper addresses a relevant topic, which is within the scope of HESS. Snow cover images retrieved by optical sensors have generally good spatial and temporal resolution and many studies refer about their good accuracy with respect to

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ground observations. However, the problems are clouds, which often limit their practical application. As it is presented in this study, accurate snow cover mapping is appealing especially in data sparse region, where remote sensing often provides a unique source of information important for water resources management and planning. Thus the focus of this study is very interesting from both the engineering and water resources management perspectives. From the scientific point of view, the study needs to be, in my opinion, complemented and extended. The hypothesis (the proposed mapping approach) should be more thoroughly verified. The proposed approach seems to be very efficient in cloud removal, but the accuracy assessment needs to be more complex. In my opinion, taking only two images for a robust hypothesis verification is simply not enough. I understand that the study region is probably not covered with sufficient ground observations, but there are certainly several alternatives which may be used to do the task. These may include e.g. assessment based on greater number of days (seasonal accuracy assessment), considering clear days as partially cloud covered, comparison with another type of remote sensing products etc.). The more general conclusions, e.g. seasonal assessment of the accuracy, performance of individual steps, its relation to different elevation zones or land cover will be certainly of interest to the readers. Additionally, the clarity of presentation should be improved. In following points I'm putting several comments, which may help to improve the structure and readability of the manuscript.

- 1) Please consider to change the title. As it is presented, the main objectives are methods for cloud reduction, not the snow cover application for water balance assessment.
- 2) Abstract should be revised, focusing more on the results found than the general statements.
- 3) Please discuss and justify in more detail the selection and order of the six steps procedure.
- 4) I would suggest to extend the Methodology with the Accuracy assessment section.

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This should include the description of methods used for the hypothesis verification (e.g. contingency table, etc.)

5) The results section should more balanced. The example presentation is fine, but more general assessment (e.g. seasonal) of the results is needed. Please consider to revise the Figure 16 (it is very difficult to read) and to combine the example maps into single figure.

6) A discussion of the results is completely missing. Please provide a discussion, which will highlight the benefits, uncertainties and disadvantages of the proposed method in comparison to existing studies.

Specific comments

1) Introduction: There are some others studies focusing on the cloud reduction (Liang et al. 2008, Pepe et al., 2005, Wang et al., 2008 and accepted) and snow cover mapping in similar region (Khan, Holko, 2008). Please cite them.

2) p.798: The fourth approach is not clear. Which three direct pixels are examined?

3) It may be interesting to see the performance of individual approaches (not applied in the sequence).

I'm recommending to revise the paper before the submission into HESS.

References: Liang T, Zhang X, Xie H, Wu C, Feng Q, Huang X, Chen Q. 2008, Toward improved daily snow cover mapping with advanced combination of MODIS and AMSR-E measurements. Remote Sensing of Environment 112: 3750-3761. DOI: 10-D1016/j.rse.2008-D05-D010.

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Terra and Aqua observations, Computer and Geosciences.

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