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Hydrology and Earth System Sciences Discussions

Interactive comment on "A probability of snow approach to removing cloud cover from MODIS Snow Cover Area products" *by* V. López-Burgos et al.

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General comments

This study evaluates snow mapping accuracy of different techniques used for cloud reduction in daily MODIS snow cover product. The authors examine a combination of Terra and Aqua products, temporal filter, spatial filter and local logistic regression and propose a new multi-step methodology. The methods for clouds reduction are tested over the Upper Salt River basin in Arizona by using data from less than one year. The results indicate that the new method significantly reduces clouds (by 93.8%) with small

impact on mapping accuracy.

Overall the study is interesting and within the scope of the journal. It presents a relevant topic and an interesting and novel methodology. However, I have some important comments, which I strongly suggest to be considered before to recommend the manuscript for publication:

1) As it is already noted in the manuscript, after 12 years of MODIS operation (and availability of MODIS snow cover products), there are many studies which examine the mapping accuracy, approaches for cloud reduction and the trade-off between them. Having said that, it is important, that the new scientific contribution (such as this study) will be properly linked and discussed with respect to existing studies. There are several papers, which are relevant to the topic but not cited (see e.g. for temporal filter- Xie et al., 2009 or Gao et al. 2010, for spatial filter Parajka and Bloschl, 2008, for regional snow line - Parajka et al., 2010, please see also the summary in Parajka and Bloschl, 2012). It would be very beneficial for the readership to make a proper reference to them. I would strongly recommend to discuss the results of this study in the context of those studies. It would be very interesting to translate the accuracy measures found here to the overall accuracy used in other studies and to discuss the seasonal tradeoff between mapping accuracy and cloud reduction (see e.g. Parajka and Blöschl, 2008).

2) The methodology is evaluated for a rather short period. Authors conclude that it would be interesting and important to examine in more detail the proposed methodology. I fully agree, but I would like to see some more detailed assessment also in this manuscript. Evaluation based on larger dataset allows more robust conclusions, particularly about seasonal differences and snow rich/poor seasons. (E.g. based on our results in Parajka et al., 2010, I would expect that different approaches have different performance in snow onset and/or melt period). Please consider to extend your evaluations for longer MODIS time serie.

Specific comments

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1) Title: Please consider to revise the title. The "probability of snow approach " is not concise. If the main objective is to evaluate the multi-step methodology (not only logistic regression), please indicate it in the title.

2) Study area: Please use SI units.

3) Section 3.3: Is it important to mention the COOP data when they were not used in the evaluations?

4) Section 4.4. This part is not clear. The logistic regression is proposed as a novel approach so it needs to be very clearly presented. The presented equations with explanations are not clear enough. Please revise.

5)Fig2: It is not clear what should be considered as a large cloud cover? Please use SI units.

6) Fig.3, 4, 7: Please consider to use the same projection as used in Fig.1. The maps are very skewed and difficult to read.

References

Parajka, J., G. Blöschl (2008) Spatio-temporal combination of MODIS images – potential for snow cover mapping, Water Resources Research, 44, W03406, doi:10.1029/2007WR006204.

Xie, H., Wang, X., and Liang, T. (2009). Development and assessment of combined Terra and Aqua snow cover products in Colorado Plateau, USA and northern Xinjiang, China. Journal of Applied Remote Sensing, 3 (033559), doi:10.1117/1.3265996.

Parajka, J, M. Pepe, A. Rampini, S. Rossi, G. Blöschl (2010) A regional snow line method for estimating snow cover from MODIS during cloud cover. Journal of Hydrology. 381, 3-4 203-212.

Gao, Y., Xie, H., Yao, T., and Xue, C. (2010). Integrated assessment on multi-temporal and multi-sensor combinations for reducing cloud obscuration of MODIS snow cover

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products of the Pacific Northwest USA. Remote Sensing of Environment, 114, 1662-1675.

Parajka, J. and G. Blöschl (2012) MODIS-based Snow Cover Products, Validation, and Hydrologic Applications, In: Eds (Ni-Bin Chang)Multiscale Hydrologic Remote Sensing: Perspectives and Applications, Chapter 9, CRC Press, 550 pp.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 9, 13693, 2012.