

Interactive comment on “Interrelationships between MODIS/Terra remotely sensed snow cover and the hydrometeorology of the Quesnel River Basin, British Columbia, Canada” by J. Tong et al.

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General comments

This study investigates the interrelations between snow cover derived from remote sensing (MODIS) and selected climate and hydrologic characteristics in a large sub-boreal watershed in Canada (Quesnel River Basin). The main goals are: a) to assess the accuracy of selected MODIS/Terra datasets; b) to propose and evaluate the perfor-

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mance of a spatial filter (SF) approach used for cloud reduction in MODIS 8-day product and c) to investigate the relations between snow cover depletion and discharge, air temperature and precipitation. Interestingly, the results indicate that the spatial filter not only reduces the clouds but also somewhat increases the overall accuracy of the 8-day MODIS product. The seasonal assessment of the relation between the snow cover extent and air temperature revealed that the 1C rise in average air temperature leads to a 10-day advance in reaching 50% snow cover fraction index. The analysis of the relation between snow ablation and snowmelt runoff showed different results for a nested subbasin and a whole watershed influenced by a presence of a lake.

Overall this is an interesting study which is within the scope of HESS. Formally, the title adequately represents the addressed topic. The definition of the main objectives is clear and methods used are correct. The study shows that remotely sensed snow cover data may be very helpful in investigation of relations between streamflow and climate related characteristics in data sparse regions. Authors investigate an alternative approach used for cloud reduction in MODIS product and their results support the existing findings that temporal and spatial filtering enables a very effective and accurate way for cloud reduction and snow cover mapping. However, a caution should be taken by transferring particular findings of the accuracy assessment, as the validation is based on only a limited number of snow depth observations. I would suggest to stress more this limitation in the discussion part of the paper. Overall I have only a few specific comments to be considered (see below), so I would suggest to accept the paper for publication with minor changes.

Specific comments

1) Please define more clearly the SCF and SCE. Are they relating the number of pixels classified as snow to the total number of pixels in the region, or to the total number of snow and land classified pixels? In my opinion the latter would be more robust, but the definition is not clear.

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2) What is the area of Horsefly River subbasin? And how are estimated the precipitation and air temperature averages?

3) What is the OA for removed stations? I disagree that 5-10% occurrence of snow coverage will bias the accuracy assessment (especially in this case, where only a few stations are available).

4) Figs. 4, 5, 7. Please use the same units for SCF. (e.g. %)

5) Table 5 caption. It is not clear what the numbers in parentheses are?

6) I would suggest to move the 5.1 and 5.2 subsections into the Results section.

7) p.3699. Authors state: "...complex topography is a main factor to UE...". What is the mean snow depth for underestimation cases? Are the UE errors caused by topographical shading or due to some specific local conditions of snow depth measurement? Please provide more discussion.

8) In the discussion, there are some imprecise statements. Please consider to formulate more precisely the final findings. E.g.

"There are limited evaluations of MODIS snow products in sub-boreal mountainous forests...". Are the snow depth measurements (used for validation) carried out in the forest or on a grassy site? Are then the results relevant for subboreal forest or for a general grassy site (usually used for snow depth measurements)?

"The OA of MODIS snow products in sub-boreal mountainous forests provides a better understanding...". I'm not sure if OA provides a better understanding... The recent study of Gafurov (HESSD, 2009) focuses on the full elimination of the clouds from MODIS images. Please consider to cite this study.

There are several studies focusing on the interrelation between snowmelt runoff and snow cover extent. Please consider to discuss more your interrelation findings with results in existing literature.

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