

Interactive comment on “Commentary on comparison of MODIS snow cover and albedo products with ground observations over the mountainous terrain of Turkey” by A. Ü. Şorman et al.

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1. In the abstract (pg 3656, line 14), the abbreviation SWE will be added as ‘snow water equivalent (SWE)’

2. Hall et al., 2002, Hall et al., 2001, Bitner et al. (2002), Klein and Barnett (2003), Maurer et al. (2003), Zhou et al. (2005), Simic et al. (2004) will be added to the citation.

“The applicability of Earth Observation (EO) satellite images and products in hydrolog-

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ical modeling for mountainous terrain, where scarcity of the ground data is obvious, is the main problem for hydrological earth science. The paper present here the critical issues for the comparison of the parameters that optical remote sensing can deliver in terms of snow recognition with snow survey. The authors of this paper would like to enlarge the topic presented by Parajka and Blöschl (2006) by referring to the studies carried on the consistency of satellite snow products of both snow covered area and albedo in comparison with ground truth data in Turkey.” Will be added to that paragraph.

3.1. Snow depth measurements were only used for snow recognition (whether the snow exists or not exist at the measurement site) in this part of the study since the optical satellite products can only deliver binary snow status data. Therefore, more discussion on the robust presentation of snow depth measurements was avoided in this section. It is out of the scope of the ‘commentary’ paper.

The referees comment on pp 3659, line 4 “data on MODIS images should be moved in the section 4” is accepted and will be corrected within the text.

‘Consistency analysis for the winter period was performed’ will be inserted instead of ‘similar study’

3.2. Since the results of the albedo study including the time measurements have already been published in a journal paper to which the authors refer as Tekeli et al (2006), the detailed plots and evaluations were not provided within the text. The overall aim of this paper is to provide an extended discussion on the philosophy of comparison of satellite products with the in-situ data; therefore the details of data were eliminated from the text

4. The detailed methodology was given in the referenced paper of Tekeli et al. (2006): however, this part could be enlarged within the text of this paper.

5. Since the data sample is not sufficient to retrieve new thresholds, the thresholds available in the literature were used in the study.

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This would be a very valuable work and could be the title of another paper to make such an evaluation including in situ snow depths, albedo measurements and snow cover presence; however, the lack of ground measurements and availability of satellite products are scarcely coincides at the same time interval. Most of the ground observations of the cited paper (Tekeli et al, 2005) go back to the year 2003, on the other hand the albedo product of MODIS was delivered after September 2003. Analysis performed for the presence of snow on two specific dates of in situ data collection in 2004 (March 23, and 24) can be seen in Table 2, where the snow depth changes between the 29-127 mm.

6.1. The microwave region of th spectrum offers promise for retrieving important snow information. Depending upon the wavelength, estimates of the depth, water content, and the amount/presence of liquid water in the snow pack are possible (Jensen, 2000). In addition clouds are transparent to many of the microwave frequencies so that mapping of the snow area and properties is possible even in regions where clouds are common. The overall accuracies of the MODIS instrument that operates on both the EOS Terra and Aqua missions are provided in the literature. As it is known there are six instruments on Aqua. MODIS and AMSR-E instruments can be directly used in snow cover mapping. AMSR-E instrument provides passive microwave data and still being used in many of the studies available in the literature. Aqua MODIS instrument band 6, normally centered at 1.640 micrometer has 15 out of 20 of the accompanying detectors that are nonfunctional (Salomonson and Appel, 2006). They proposed in one of their studies using band 7 in the place of band 6 in the calculation of Normalized Difference Snow Index. Terra MODIS instrument is much more dependable in the snow cover mapping.

The validation analysis captures omission errors (there is snow but it is missed by the image) but not commission errors (no snow on the ground and image is showing snow). The error matrices for 2002-2003 winter period and 2003-2004 ablation period are composed of the omission errors. Since the commission errors are missing the

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overall accuracy and the Kappa coefficient can not be calculated. In order to get the commission errors, higher number of automated stations is required.

The resolution of the figures will be increased and the Table captions will be revised.

References:

Salomonson V.V., Appel I. (2006). "Development of the Aqua MODIS NDSI fractional snow cover algorithm and validation results", IEEE Transactions on Geoscience and Remote Sensing, V.44,7, 1747-1756.

Tekeli E., A. Sensoy, A.A. Sorman, Z. Akyurek, A.Ü. Sorman, (2006). "Accuracy assessment of MODIS daily snow albedo retrievals with in situ measurements in Karasu basin, Turkey" Hydrological Processes, 20(4), 705-721.

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