Hydrol. Earth Syst. Sci. Discuss., 10, C6962–C6965, 2013
www.hydrol-earth-syst-sci-discuss.net/10/C6962/2013/

Hydrology and Earth System Sciences
Discussions

Interactive comment on "Validation of the operational MSG-SEVIRI snow cover product over Austria" *by* S. Surer et al.

S. Surer et al.

serdarsurer@gmail.com

Received and published: 30 December 2013

We would like to thank the anonymous reviewer for her/his helpful comments on the manuscript. We have addressed the comments as follows (listed in the sequence given by the referee):

1) The authors show in the paper that poorer resolution geosationary satellite products have classification results close to better resolution LEO sattellites that are traditionally used to mapping seasonal snow cover. However, one wonders why the authors have not considered exploiting the temporal resolution of SEVIRI product and, especially, better cloud free observations to update classification in MODIS cloud contamined pixels. This approach should at least be considered in Discussion Chapter.

Yes, we agree with the reviewer that this will be an interesting topic to investigate. However, this goes (in our opinion) beyond the scope of this study. The aim of the manuscript was to evaluate the performance of MSG-SEVIRI snow product with respect to ground observations and MODIS snow products. We plan to investigate a merging of MSG SEVIRI and MODIS as well as MSG SEVIRI with some satellite snow water equivalent product in the near future. We have added this information in discussion part (page 11 line 18 as a new paragraph):

"Better snow cover information can be retrieved by using MSG-SEVIRI and MODIS snow products together. The cloud contaminated MODIS snow pixels can be reclassified according to the values observed from MSG-SEVIRI snow product. The merging of snow products having comparatively better spatial resolution (MODIS) and temporal resolution (MSG-SEVIRI) can be done as a future work."

2) Figure 1 seems to be unrealistic. Large areas in Finland and Russia seems to be snow-free in February.

We agree with the reviewer, so we changed the map, which now presents a merged (flat and mountainous) product. (See attached figure on reply for reviewer 1)

3) The authors should consider what kind of errors in classification is caused by the different wieving geometries of the two sensors (GEO vs. LEO). In this study not a detailed analysis presenting the effect of different viewing geometries of the sensors MODIS and SEVIRI on snow mapping was performed. But it is clear that varying MODIS-Terra view zenith angles compared to the ones for MSG-SEVIRI on snow mapping must be investigated. As well as the effect of band widths of the sensors on Green and MIR bands must be stated. The related information is added to the discussion part as follows: "The comparison between MSG-SEVIRI and MODIS snow cover products shows a good overall agreement. The overestimation and underestimation errors of MSG-SEVIRI snow product is larger compared to MODIS-Terra snow product. In both of the products underestimation error is seen in winter months and overestimation er-

ror is seen in spring and summer months. The overestimation and underestimation are more pronounced for mountainous areas compared to flat lands for MSG-SEVIRI snow product. Besides the spatial resolution affecting the snow mapping accuracy, the difference in the viewing geometries of two sensors may have an effect on the snow mapping. The view geometry may be one of the major error sources in snow mapping algorithms. The influence of the varying MODIS view zenith angles on snow mapping algorithm must be investigated in detail. As view zenith angle increases, it is known that NDSI decreases (Xin, 2012). Since MODIS observes the surfaces at much smaller view zenith angle (VZA)s then the SEVIRI, it detects more snow cover area. That may be the reason to observe large underestimation errors for SEVIRI compared to MODIS in winter months. The narrow band width in Green and Mid. Infrared portion of the spectrum for MODIS makes the possibility to map more snow compared to SEVIRI. The over estimation for spring months is due to high percentage of fractional snow cover due to melting in these months. MSG-SEVIRI algorithm tends to map more snow for fractional snow covered areas. The effect of complex topography, and the shadows was not held in MSG-SEVIRI snow mapping algorithm. Therefore the MSG-SEVIRI algorithm can be modified with the use of a proper DEM in order to correct the topography effect."

References: Akyurek Z., S. Surer, J. Parajka, "Calibration of a Conceptual Hydrological Model Using EUMETSAT Snow Covered Area Product", AGU Fall Meeting, San Francisco-USA, 2013. Xin, Q., Woodcock, C.E., Liu, J., Tan, B., Melloh, R.A., Davis, R.A.: View angle effects on MODIS snow mapping in forests, Remote Sensing of Environment, 118,50-59, 2012. HSAF: Product Validation Report for product H10-SN-OBS-1, available at http://hsaf.meteoam.it/PVR-sn.php, 2011

Please also note the supplement to this comment:
http://www.hydrol-earth-syst-sci-discuss.net/10/C6962/2013/hessd-10-C6962-2013-supplement.pdf

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 10, 12153, 2013.