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Discussions

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

Anonymous Referee #1

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General comments

The paper presents an analysis of the accuracy of snow cover mapping with observations of SEVIRI instrument onboard MSG satellite. The accuracy analysis is conducted over Austria and involves the comparison of MSG SEVIRI snow cover product with in situ snow depth measurements and with snow cover maps derived from MODIS data. The applied validation technique is quite straight forward and involves direct matching of station data with satellite retrievals. For comparison with MSG, MODIS-based snow retrievals have been aggregated within 5 km grid cells to match the spatial resolution of SEVIRI. It is shown that frequent observations of SEVIRI help to substantially reduce cloud contamination in MSG-based daily snow maps as compared to similar maps derived from MODIS. In the same time the accuracy of MODIS snow retrievals is superior

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to snow retrievals from MSG. The latter is apparently due to a better spatial resolution of MODIS.

Overall the paper is organized well, the objectives, the approach and conclusions are fairly clear. It provides a rather detailed characterization of the accuracy of SEVIRI-based snow mapping with respect to the surface elevation and the season. It should be mentioned however that the validation approach used in the paper is not novel: in the last decade a couple of dozens of papers have been published where satellite-based snow products were either compared with in situ observations or matched to other satellte-based maps. The novelty of the study concerns only the source of remote sensing data which is MSG SEVIRI.

The discussion section of the paper could be substantially expanded. What are the sources of snow mapping errors, why the accuracy of MODIS and MSG is different, what can be done to improve the MSG snow mapping algorithm, does the accuracy and the spatial resolution of current SEVIRI snow maps satisfies local hydrological/weather/climate models/applications: all these and many other questions can be covered in the discussion section.

It would be good to give a better justification for limiting the study to the territory of Austria. Since snow cover is one of the primary meteorological and hydrological factors, it would seem more reasonable to define the study region considering the location of local watersheds or the domain of regional weather models.

Particular comments

When describing the SEVIRI-based snow mapping technique it seems important to to more clearly state that two different snow mapping algorithms are used with MSG data, one is applied in the plain areas whereas the other one is used in the mountains.

The map in Figure 1 looks strange: Eastern Europe and Western part of Russia are shown as snow-free, whereas in February these areas should have at least some snow.

Apparently only snow cover in the mountains is shown in the map. If this is the fact, it should be clearly stated in the text of the paper. Otherwise the map is misleading.

There are several other minor issues that the authors may want to correct or clarify. The definition of mountainous areas on page 12157 is not quite clear, particularly its last clause ("range in mean altitude exceeded 800 m and mean altitude exceeds 500 m"), please reformulate.

Page 12158: "...compares the sum of all correctly classiïňA̧ed days with the presence of snow and no snow to the number of all cloud-free days at each meteorological station (station-days) in the selected period..." : generally understandable but sounds a little awkward. Please rephrase.

Page 12159: "...relative frequency of MODIS pixels classiïňA̧ed as clouds is less than 60 %": "fraction" sounds better than "frequency" in this context. The same applies to the two sentences that follow.

Page 12161: I do not think that it is legitimate considering clouds as the snow mapping error. Therefore the K_c index that combines real snow mapping errors and cloudy pixels seems quite confusing. To compare the effective daily area coverage by MODIS and SEVIRI it looks more reasonable to simply examine the total area of cloud-clear portions of the daily snow cover map.

Page 12165: Prior to discussing the difference between the MSG and MODIS snow identification algorithm and particular values of the spectral indices (NDSI and SI) used in the two algorithms these indices have to be introduced.

There is a number of other factors that apparently may affect the snow identification, the accuracy of snow maps and the agreement between MODIS and MSG snow products. In particular MSG mostly observes southern slopes of the mountains which may have less snow especially in spring and summer, whereas MODIS scans the region primarily in the east-west direction. Do the authors observe any effect of the different geometry

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of observation of MODIS and MSG on the accuracy of snow mapping ?

MSG SEVIRI includes an HRV band. Can it be used to improve the spatial resolution of snow cover maps ?

Since the region involved in the analysis is not large, it would be good to discuss whether the results of the study are applicable to other mountainous regions in Europe. Would the accuracy be the same or different over Carpatians/Atlas/Pyrenees/Scandinavia etc. ?

Overall the paper is worth publishing in the journal, however some improvements are definitely needed.

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