

Review of Gascoin et al.: Theia Snow collection: high resolution operational snow cover maps from Sentinel-2 and Landsat-8 data

General comments:

The authors present the algorithm for the derivation of high-resolution operational snow cover maps from Sentinel-2 images. They further present an evaluation using station measurements, fine-scale satellite-derived snow maps as well as visual control. Overall, they found good performances though some tendencies were revealed.

On cloudless days, the Theia snow product more likely underestimated snow coverage when compared to station measurements and fine-scale satellite-derived snow maps. When including cloudy days, the visual control with the false color composites revealed that the Theia snow product more likely overestimated snow coverage due to confusion with cloud coverage.

This manuscript presents a complete package consisting of the algorithm to derive a satellite-derived snow product, a thorough evaluation as well as the access point to freely download the snow products via the Theia portal. It is therefore interesting for a broad range of scientists and practitioners.

I already have an account at Theia and previously downloaded snow cover maps via the command line tools on Linux provided on github (https://github.com/olivierhagolle/theia_download).

The manuscript is well written and I have only minor issues, which should be addressed before publication.

Specific comments:

Since Landsat-8 data was not part of the snow product evaluation I would also suggest removing it everywhere (also in the title). However, I would keep mentioning it in the conclusions such that the reader is aware of the Landsat-8 snow maps.

It is only in the conclusion that the user learns he has to apply a forest mask to exclude forested areas from Theia snow maps. I think this should be mentioned earlier, e.g. as a bullet in the 2.1 Scope?

In section 2.2 you mention the correction for atmospheric and terrain slope effects in the Sentinel images. Can you cite something, since it is not explained or referenced later on?

In section 4.1.2 the authors present the evaluation with Spot images having a higher spatial resolution than Sentinel. I might not have fully understood the description of the Spot evaluation with Sentinel data. Did the size of each of the fifteen Spot polygons match one Sentinel pixel, such that fifteen pixels were evaluated for each of the six dates (or per tile)? If this is correct, how many of each were homogeneously snow-covered respectively snow free?

Two of the selected six dates were in August and in October, i.e. in late summer/early fall. How much snow cover was there on 2016-08-13 in tile

31T GK and on 2016-10-12 in tile 32TLS? I guess the snow coverage could have an impact on the performances?

Technical comments:

1) Please check all figure and table numbers, the references to them in the text as well as the order when they are introduced.

2) Page 19, line 5: Should this be: “False negative pixels (i.e. pixels falsely classified as snow-**free**) ...” ?

3) Page 21, line 1: “..**an** excellent accuracy..”

4) Page 21, line 6: “In addition, in situ measurements may not **be** representative of the snow conditions...”