

***Interactive comment on* “Laboratory, field, mast-borne and airborne spectral reflectance measurements of boreal landscape during spring” by Henna-Reetta Hannula et al.**

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GENERAL COMMENTS

1) General comments from the referee

The paper describes the data collection of spectral reflectances conducted mainly in the Sodankylä region over multiple platforms. The measurements aim to be representative of different snow and weather conditions (e.g. wet or dry snow for the former, clear or covered for the latter) and were organised such that measurements from different platforms were overlapping.

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The manuscript is well written and easy to read from start to finish. The laboratory measurements, field campaigns and instrumentation as well as potential sources of errors and uncertainties are thoroughly described. The multi-platform measurements seem to have been very well coordinated and organised. As a consequence I would change very little of what is currently in the manuscript and only have minor comments/clarifications.

My two main comments therefore do not concern what is in the manuscript, but what is missing from it. Firstly, one of the most interesting aspect of this study is the availability of data looking at the spectral reflectance of the same surfaces but with different instruments. The manuscript incomplete and will remain so unless a section (1) compares the reflectances obtained on different platforms on overlapping dates over the same surfaces (2) discusses the implications of the differences, bearing in mind future users (3) plots from multiple platforms showing spectral reflectances on overlapping days over the same surfaces are added.

Secondly, the data in zenodo are well organised, but their (justified) discretization into platform and scale means there is a large number of files for potential future users to wade through. It would be useful, for each platform and scale, to include representative plots of each dataset in zenodo to have a quick visualisation of the sort of data available. It is one thing to make data available, it is another to make them user-friendly and, as such, re-usable. The manuscript describes invaluable datasets that should be published and used, and I trust that adding such quick visualisation of the data through these plots will help make these datasets more user-friendly.

I trust that the manuscript will be fit to publish when the above suggestions and minor comments below are addressed.

2) Author's response on general comments by the referee

We thank the referee #1 for a thorough reading of the manuscript and bringing out the current weaknesses. We agree that without comparison of reflectance from different

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platforms (from overlapping times and same surface targets) the possibly most valuable part of the data record remains underemphasized. Accordingly, we think that adding some plots of data on Zenodo would benefit the user by giving an instant idea of the dataset content.

3) Author's changes in manuscript

According to the suggestions by the referee, we will add a figure representing reflectance of the same target(s) but measured on different scales. Utilizing the figure we will compare the measurements from different platforms and discuss the implications of the scale.

MINOR COMMENTS

1) Minor comment from the referee

Minor comments: Line 134 - Sodankylä is most probably taiga snow. The Sturm snow cover classification system has been accepted as the standard in our field for a long time, but it is perhaps time we acknowledge its limitations: the European Alps are, after all, classified exclusively as maritime. While it is not the task of this manuscript, I am confident the authors are very familiar with the type of snow in Sodankylä and could therefore rely on their own expertise, rather than on a classification relying exclusively on measurements from Alaska, to describe it.

2) Author's response and 3) changes in manuscript

We will rely on our own knowledge rather than general classification when we will revise the manuscript.

1) Minor comment from the referee

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L149 - Could there be a quick explanation of what Spectralon is?

2) Author's response and 3) changes in manuscript

Yes, there could be a short explanation, and this would benefit especially users outside the spectroscopy community. The explanation will be added.

1) Minor comment from the referee

L395 - Minor difference, but I think changing the start of the sentence to "As an example, Figure 11 shows reflectance values on 5 May 2011 observed over et." would make it sound less like Fig 11 is a random example not even used in the campaign. Adding the exact date to Figure 11, rather than just "May 2011", would also help clarify.

2) Author's response and 3) changes in manuscript

We will reformulate the sentence as suggested by the referee.

1) Minor comment from the referee

Table 2: This is a big table and it is easy to lose some information. If possible, a Gantt chart or something similar showing the multiple platforms and overlapping dates would make it easier to see which measurements from which platforms are overlapping.

2) Author's response and 3) changes in manuscript

We admit the Table 2 is large. However, we would like to keep it to have all the information from different platforms in the same place. In addition, we will compile a Gantt chart (or similar) as suggested to easily see the overlap and time ranges of the different measurements.

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1) Minor comment from the referee

Figure 9: Is the label on the y axis correct? These are not MODIS band 4 reflectance measurements, but mast-spectroradiometer measurements to match MODIS band 4. This should be clearer.

2) Author's response and 3) changes in manuscript

The y-axis label truly is misleading. We will change the label.

1) Minor comment from the referee

Conclusion: Data from Sodankylä are also being used for driving and evaluating snow models (Essery et al., 2016, gi-5-219-2016) and Earth System Models, notably as part of ESM-SnowMIP (Menard et al., 2019, esd-11-865-2019). It may be worth mentioning that adding albedo measurements to these datasets would be invaluable to the snow modelling community.

2) Author's response and 3) changes in manuscript

This is a good point and we will add it as one opportunity for the data usage in the conclusion.

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