

# Review 1

This paper presents a method to retrieve the specific surface area (SSA) of snow from spectral albedo measured at Dome-C, Antarctica with an automatic spectrometer “Autosolex”. To measure the spectral radiant solar flux with Autosolex many correction procedures are discussed in which error analyses for spectral albedo and SSA were conducted. The diurnal cycle and seasonal variation of SSA are also discussed with possible reasons of these variations.

This manuscript is well-written and addresses the issues on the possible error of SSA in case of SSA retrieval from spectral albedo measurements on the Antarctic Plateau. The descriptions of the instrument are careful and the error analyses are appropriate. The observed SSA variation is informative and this kind of continuous measurement under such hard circumstance is important to monitor the climate change in Antarctica. I recommend this paper to be published after technical and minor revisions of the following issues.

We are grateful to the reviewer for his positive remarks and have made modifications in the manuscript according to his recommendations.

Specific comments:

p. 3, L19: Typo “cop” -> “cope”

done

p. 4, L2: “The spectral albedo of the surface is measured” should be preterit.

done

p. 4, L2-5: The terms of “section” appear here. Do these “sections” differ from sections mentioned at the end of 1. Introduction? The term “subsection” is better.

done

p.4, L22: Does the sentence “the second one is dedicated to the ultraviolet” explain the right-hand side spectrometer in Fig.2? It is written as “Spectrometer 700-900 nm” in the figure.

Both were erroneous, ultraviolet is infrared and the range in Fig.2 is 700-1100nm. This is corrected.

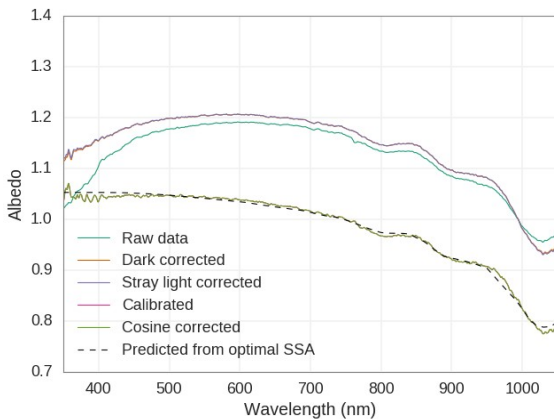
p.5, L16-17: “This arises because both the light collector materials and the sky depend on scattering intensity which usually decreases with longer wavelengths.” This sentence is a bit difficult to understand particular for “sky”. What is it about the sky depend on scattering intensity?

We change to “This arises because scattering by the light collector materials and the atmosphere strongly decreases with longer wavelengths.”

p.7, L10-13: “To estimate the stray light, we assume it affects all the pixels equally ...” Stray light could sometimes cause large error for this kind of instrument. Please show

the fraction of contribution from the stray light to “dark and stray light” here or at Fig. 7.

We have separated the two corrections in the plot below (similar to Fig.7) and found the curve after the stray light correction (violet) can not be distinguished from the curve (orange) after the dark correction which means the stray light is very small. Instead of adding a figure with overlapping curves, we first show and address the first step alone (dark correction) and then add a short paragraph on the stray light correction “The next step (stray light correction) is not shown in Figure 7 because it has a negligible effect.”



p.8, L17: Equation (6) differs from that of Grenfell et al. (1994) in which the correction for diffuse component is applied. I believe this correction would improve the accuracy of the measured diffuse component.

The equation (6) is indeed formally different from that given in Grenfell et al. (1994) because our absolute calibration is done with diffuse radiation and the imperfect cosine. It means the diffuse component is already calibrated after the “absolute calibration step”. Despite this formal difference, considering two steps “absolute calibration”+”cosine correction” together is equivalent to Grenfell et al. We have added an explanation: “The (cosine) correction is applied only to the direct component as the diffuse component has been already calibrated at the absolute calibration step”

p.11, L1: “the small peaks due to damaged pixels like at 862 nm and 1069 nm.” The small peak can be seen around 862 nm but not at 1069 nm in Fig. 7.

The x-axis scale of Figure 7 has been extended to show the peak around 1069 nm.

p.11 and Figure 7: The graph names “graph b)” (L11), “graphs (c)” (L17), “graph b” (L2), and “graph (c)” (L24) are used in the document. However, in Fig. 7 “a)” and “b)” are shown above the top panels, and “(c)” is not indicated. The “graph b)” in L13 seems to discuss on the middle panels.

We have corrected this: letters are used to designate the columns and “top, middle and bottom” are now used for the graphs within a column.

p.12, L13: The left term of Equation (11) is better “ $\alpha(\text{wavelength})$ ” (as a function of wavelength).

Yes, we have also added the angle dependence.

p.14, L19: Equation (16) is not shown.

This blank equation was due to a latex typo,

p.15, L25: “is shown in gray in the background” It is written as “blue dots” in the caption of Fig. 13.

“gray” changed to “blue”.

p.15, L27: “the geophysical features to (Libois et al., 2015).” Some terms may disappear before “(Libois et al., 2015)”?

The parenthesis have been removed and the sentence changed to :

“ The interpretation of the geophysical features is addressed in Libois et al. 2015.”