

Dear Dr. Derksen:

We appreciate the attention to this manuscript. Our replies are in red. Your text is in blue and Reviewer 1's comments are in black.

Dear Dr. Bair – I don't find that you have seriously considered the comments of Reviewer 1, as I requested in my previous editorial decision. The Reviewer made reasonable requests to revisit and clarify the description of results in Figure 1c,

We took Reviewer 1's comments seriously. We've copied the relevant text from Reviewer 1 below.

Still the comparison showed in Fig. 1c is a bit strange to me. I would suggest the authors to provide further discussion on this particular comparison. The drop in reflectance for $\lambda < 700\text{nm}$ is marked here. Given that the surface was flat, I assume that in this case the hooking was due to atmospheric correction or related to the refractive index of ice.

In our initial response to Reviewer 1, we provided an extensive description of the spectroscopic methods used in the field and on the PRISMA data for the reviewer and summarized this in manuscript "The measured and modeled spectra in Figure 1a-c and Figures 2a-c are from level and fully snow-covered areas, i.e., no vegetation within the pixel or in adjacent pixels and an optically thick snowpack."

Thus, we agree that the hooking in Fig 1c is due to an atmospheric correction issue, which is discussed in Section 3.1 *Hook caused by atmospheric correction algorithm*. The hook is too large in magnitude to be due to differences in the refractive index of ice.

To emphasize this on l 34, we've added "...likely due to an atmospheric correction error (Section 3.1),..."

and add citations for evidence of the blue hook over glacier ice (such as low relief ablation areas), both of which you have dismissed. I took the liberty of revisiting the reviews of the Bohn et al (2024) manuscript, and I have provided the relevant citations below.

Di Mauro, B., Baccolo, G., Garzonio, R., Giardino, C., Massabò, D., Piazzalunga, A., Rossini, M., and Colombo, R.: Impact of impurities and cryoconite on the optical properties of the Morteratsch Glacier (Swiss Alps), *The Cryosphere*, 11, 2393–2409, <https://doi.org/10.5194/tc-11-2393-2017>, 2017.

Kokhanovsky A, Di Mauro B and Colombo R (2022) Snow surface properties derived from PRISMA satellite data over the Nansen Ice Shelf (East Antarctica). *Front. Environ. Sci.* 10:904585. doi: 10.3389/fenvs.2022.904585

Naegeli K., A. Damm, M. Huss, M. Schaepman, and M. Hoelzle, "Imaging spectroscopy to assess the composition of ice surface materials and their impact on glacier mass balance," *Remote Sens. Environ.*, vol. 168, pp. 388–402, Oct. 2015, doi: 10.1016/j.rse.2015.07.006.

Please revise the manuscript accordingly and publication in *The Cryosphere* can proceed. Best regards,

Chris Derksen

Thank you for providing the references from the anonymous review in Bohn et al. (2024). We've copied the relevant text from Reviewer 1 below and have carefully studied each of the references.

I would also suggest to broaden their discussion also on glacier ice. In my review of Bohn et al. I detailed this issue. The hooking can be observed on glacier ice as well. I think this should be mentioned in this manuscript.

Kokhanovsky et al. (2022) clearly show the hooking problem, but not over exposed glacier ice. The high visible reflectance of the spectra clearly shows optically thick snow, not exposed glacier ice.

Di Mauro et al. (2017) show the hooking issue over ice glacier ice from Hyperion retrievals, but the authors were not able to find a region of clean exposed ice for comparison between the field spectroscopic measurements, which do not show hooking, and those from Hyperion. From Di Mauro et al. (2017), "Unfortunately, we were unable to identify a pure region with clean ice in the ablation zone to compare with ASD spectra on the Hyperion image". This issue was suggested in our previous author's response, "Further we posit that finding clean and level exposed glacier ice over a pixel size of say 30 – 60 m is unusual."

Likewise, Naegeli et al. (2015) show the hook over glacier ice acquired from an aerial imaging spectrometer, however these "bright ice" shown in Fig A1 are clearly dirty, with the light absorbing particles being visible to the naked eye, which is not surprising given the 31 Aug 2013 flight date.

Thus, Kokhanovsky et al. (2022) show snow, not exposed ice and Di Mauro et al. (2017) and Naegeli et al. (2015) show dirty exposed ice. Therefore none of the references show exposed glacier ice with an erroneous hook.

We concede that erroneous hooking could occur over brighter glacier ice (e.g., clean névé). Thus we have added the following L 111-112 "We also suggest that this erroneous hooking could occur over brighter exposed clean glacier ice, e.g., clean névé."