

The Cryosphere Discuss., referee comment RC1
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Comment on tc-2022-143

Anonymous Referee #1

Referee comment on "Brooks Range Perennial Snowfields: Extent Detection from the Field and via Satellite" by Molly E. Tedesche et al., The Cryosphere Discuss.,
<https://doi.org/10.5194/tc-2022-143-RC1>, 2022

This interesting study should be significantly improved by a more informative statistical analysis. As other studies have noted, "accuracy" (line 184) is generally a poor measure of fits of identification of surfaces based on remotely sensed data, because it does not differentiate between errors of omission vs errors of commission. For the comparisons of S1 and S2 with the field data, it would be useful to identify true positives, true negatives, false positives, and false negatives, and then calculate statistics of precision, recall, and the F-statistic. For comparisons with S1 and S2, identification of the situations in which either, but not both, identify snow, along with situations in which they both identify snow, and (finally) areas of false identifications. The Discussion and Conclusion are hard to follow and hard to understand the vague references to $S1\ SCA > S2\ SCA$ but it is not clear how they each compare to $S1+S2$ (Union?). In the fractional SCA (i.e. the 250 m or 2 km areas), one could use more specifically quantitative comparisons, i.e. RMS error and Bias.

The description of the SAR processing leaves some details unmentioned. Why the factor of 3 added to the R_{VV} values? How is the "dynamic threshold applied to each image" (line 174) determined?

The analysis uses NDSI to identify snow-covered areas. The NDSI is a binary classification, that is, snow or not-snow. The photos and the description of the field work implicitly indicate that some of the snow fields are small, so the issue of subpixel snow arises. How is it handled?

Some specific line-related comments

Line 27: Tedesche et al. cited but no date, and this paper is also a Tedesche et al. citation. And you delay mentioning that this paper also follows the four-year convention until Line

56. This language can be tightened.

Lines 38-49: This short summary paragraph says nothing about polarization, nor about the contributions of volume and surface scattering. Absorption by liquid water reduces the volume scattering, but surface roughness increases backscattering. Thus the statement that wet snow "reduces the backscatter coefficient" is not entirely true because of surface scattering. If the surface is smooth, then indeed most of the surface scattering is in the forward direction, but if the surface is rough, then the backscattering can be significant.

Line 67: Helicopter-acquired "field" data are also derived from "remote sensing," so perhaps clarify what you mean by "field observations" in Lines 52 and 54.

Lines 70-71: What is the zero value for aspect (i.e., north of south)? In calculating mean aspect, how do you handle the discontinuity at North?

Figure 1: The symbols and the caption do not discriminate between the on-foot surveys and the helicopter data acquisitions.

Line 100: "are" instead of "is" to reflect that the word "data" is the plural of "datum."

Lines 115-117: Given the availability of the 10 m ABoVE DEM, why did you also use the ASTER DEM? The ABoVE DEM would likely be more accurate, especially for calculations of slope/aspect and incidence angle. The citation to the DEM used appears in multiple places in the manuscript, so it would be useful to clarify the DEM used just once.

Figure 2: Are the blue (S1) and cyan (S2) areas distinct? How do you identify snow that both S1 and S2 find, vs snow that only S1 finds and snow that only S2 finds?

Table 2 takes up a lot of space and is hard to interpret. Can this information be synthesized instead of being presented in raw form?

Lines 244-245: "Cohen suggested . . ." Is there a citation to apply here?

Figure 4 needs some geographic context. Moreover, does S2+S1 mean S2 Union S1 (as I interpret)? Is there a way to indicate the S2 Intersection S1 snow?

Figure 5 and Table 2 caption or accompanying text could use a definition of “Conv” in the Figure and Table.

Code Availability: The codes in the Earth Engine are not accessible without a GEE account.