The Cryosphere Discussions

The Cryosphere Discuss., referee comment RC2
https://doi.org/10.5194/tc-2021-361-RC2, 2022

Comment on tc-2021-361

Anonymous Referee #2

Referee comment on "Divergence of apparent and intrinsic snow albedo over a season at a sub-alpine site with implications for remote sensing" by Edward H. Bair et al., The Cryosphere Discuss., https://doi.org/10.5194/tc-2021-361-RC2, 2022

This manuscript presents results from a field campaign to quantify the impact of snow roughness, impurity, and topography on snow surface albedo and its implications for remote sensing. It is a thorough and compelling case study for snow radiative transfer modeling and remote sensing. The experiment is well-designed, while the reviewer finds some critical parameters used in this work lack precise definitions, mostly in section 2.2.

Section 2.2:
Line 151: How do you compute slope and aspect based on a radial mask? Could you give an example ideally with some illustrations? Do you "divide" the snow surface into numerous hollows that the "slope" is the slope of each hollow?

Line 154: It seems surface roughness only accounts for the distribution of slopes? What about the aspect? Given a mask, could you provide an example of how to count the distribution and compute surface roughness?

Line 159: Are downwelling direct irradiance B and diffuse irradiance D used here measured or modeled?

Line 162: What is a "generic ablation hollow", how is this defined in this work?

Line 164 - 166: Similar to the illustration of surface roughness, it is valuable and helpful to provide a figure on illumination angle.

Line 198-202: The description of the method is confusing here. For example, what is the modeled average ð□□¼ spatial?

Line 204: The authors describe the spectral albedo simulations here, while the "simulated albedo" has already been mentioned multiple times in the previous text. Consider rearranging the text so readers understand what is simulated albedo before its being used.

Line 205-206: Why assume San Juan dust with an effective radius of 3 microns?

Figure 4: This is an interesting Figure that requires some details. Mainly, what caused the spread of initial albedo in the x-axis? Snow depth? Grain size? Impurities? Spectral distribution of downwelling flux? What is the roughness of this case?
Please also discuss why the albedo increase is more significant when initial albedos are roughly within 0.68-0.80.

Other comments:

Section 2.1: how often did one adjust the adjustable arm for measurements? Was the goal of each adjustment to maximum the snow coverage in the field of view?

Line 281: It seems Figure 6 is discussed after Figure 7; please consider swapping the Figure label.