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The Cryosphere Discussions

Interactive comment on "Theoretical study of solar light reflectance from vertical snow surfaces" *by* O. V. Nikolaeva and A. A. Kokhanovsky

Anonymous Referee #2

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This paper presents important 3-D radiative transfer modeling results which are of particularly interest in terms of the application of snow grain size retrieval from measurements of NIR reflectance. Overall, the structure of manuscript is presented well, however, there are several minor corrections that should be made to greatly improve the readability. My main issue is that the very few of the variables in section 2, especially in the equations 1-4, are not defined, and it makes this section, and the figures, hard to follow. For example, R is not defined, and I am not even sure what it is supposed to represent after looking over the figures and the equations carefully. As another example, in Figure 1, D (italicized) is used to represent the dimension of the length of the pit, and then D (not italicized) is used to represent a point on the surface of the snow, and neither is defined, and it is not clear if they represent the same dimension or magnitude. This section would be improved if the variables were better defined throughout,

including the dimensions in the figures. My second main concern is that there are several purely technical/grammar corrections to be made that detract from the ease of reading paper. Below, I have listed some of the major technical corrections I think need the most attention, but the entire paper would benefit from a more careful examination. I do think that the many parts of the paper are well written and clear.

Technical Corrections Page 4206, line 13, The sentence starting with, "The physical background of the retrieval is the enhancement of light absorption. . ." is hard to understand, i.e. I don't understand what is meant. I think that it means, "The physical background enhances light absorption by larger grains, which consequently reflect less light." That's only a suggestion, as I am not sure what is meant by the phrase, "the physical background of the retrieval."

Page 4206, line 16, should read, "The main problem with such a method is that. . ."

Page 4206, line 16, I suggest deleting the word, "say" as it is informal.

Page 4206, line 20, should read, "into the snowpack"

Page 4206, line 20, the phrase, "does not bring information on the properties of snow" makes sense, but is awkward. I would suggest, "does not contain information" or "does not reflect from snow below about 5 cm"

Page 4206, line 22, should read, "vertical snow walls have become popular. . ."

Page 4207, line 10, There are some missing articles, and it should be written, "that the surface of the snow."

Page 4207, line 24, I'm not sure if "symmetry plane" is a term I'm just not familiar with, or if what is meant is "because the region under consideration has plane symmetry"

Page 4208, line 14, There is a missing article, and it should read, "the region is taken so that the 1-D slab regime. . ."

Page 4209, line 3, I think that the word "boundaries" should be singular, "boundary"

Page 4209, line 11, The phrase, “one has 3-D snowpack with the pit of the diameter D” doesn’t make sense and/or is grammatically incorrect.

Page 4210, line 2, These first two sentences are confusing.

Page 4214, line 19 and throughout, This is a minor point, but I am continuously thrown off by referring to the dimension of the width of the pit as the diameter, since this is a rectangular pit.

Page 4215, line 9, Do the authors mean “clear” or “clean”?

Page 4215, line 13, The phrase, “the conditions of measurements” is confusing; after initially reading this sentence, I thought it was referring to actual measurements which the model had tried to replicate. I think that what is meant is, “The modeled measurement conditions. . .” or something along those lines.

Page 4216, line 4, The sentence is missing some articles, i.e. it should read, “In the problem under study, a maximum of radiation intensity in the snow near the air/snow boundary. . .”

Page 4216, line 16, The sentence beginning with “Besides these figures give the function r(z). . .” does not make sense to me/is not grammatically correct.

Page 4216, line 25, The sentence beginning with, “Decrease of variation of the derivation r(z)..” does not makes sense to me/is not grammatically correct.

Page 4217, line 4, There are some missing articles in this sentence. It should read, “The thin polluted layer in the center of the pure snowpack. . .”

Page 4217, line 6, There is a missing article in front of the word “shadow.” It should read, “the shadow of the minimum is spread. . .”

Page 4217, line 10, This should read, “reflecting solar light by a rectangular. . .”

Page 4217, line 12, The phrase, “under exact treating complicated peaked scattering

phase” does not make sense/is not grammatically correct.

Page 4220, figure 1, I think that it would be helpful to specify on the figure which wall is being modeled.

Figure 2, I don’t see the need for this figure, as it is identical to Figure 1. If it is meant to illustrate a black film on the pit bottom, there should be either a black film on the bottom of the pit in the figure. I also think that it is not necessary, and clear enough to the reader without a figure illustrating the concept. If Figure 1 were made clearer, perhaps labeling the sides of the pit wall, and then specifying in the text that side "X" is covered in black film, I think that would suffice, and actually be clearer than what is represented in the figure as it is.

Figure 3, See my comment for Figure 2. I don’t think this figure is necessary if Figure 1 is labeled more clearly.

Page 4224, Figure 6, This caption is not grammatically correct. I’m not sure what is meant by the caption, but it should at least be corrected to, "Example of an additional quadrature on angular nodes adapted to a function being integrated." If there is a way to rewrite the sentence to make it clearer what is meant, that would be best.

Interactive comment on The Cryosphere Discuss., 6, 4205, 2012.