Third review of « A generalized photon-tracking approach to simulate spectral snow albedo and transmissivity using X-ray microtomography and geometric optics », by Theodore Lechter et al.

General comments

I thank the authors for the significant effort made to revise the manuscript, in particular for the critical discussion on the meaning of scattering coefficient for a porous medium, and for changing their method to compute this quantity from snow samples. I believe the updated discussion is very valuable for the overall quality of the paper and raises issues that would need to be considered in the future, even though I fully agree this is beyond the scope of the present study. The paper can now be published in *The Cryosphere*. Below some final technical issues are pointed out, that can be easily fixed. The most critical is about accounting or not for diffraction when computing the scattering coefficient and g (the choice should be consistent).

Technical comments (lines correspond to the track changes version)

l.87: do not change paragraph

l.91: idem, include all this in the same first paragraph of the section

l.104: "multiple scattering within the two-phase medium" is unclear here. Consider removing that, because independent scattering mostly refers to "no interference"

l.107 the subscript "ext" should not be italic. True everywhere, and for "sca", "ice" etc.

l.107-109: the variables for the physical quantities should not be in parenthesis

l.139: weird to see again Snell's and Fresnel's laws (introduced a few lines earlier). Maybe move to a few lines earlier. If the manuscript is too long, these few formulas (known to most of the readers) could also be put in an Appendix.

l.163: does d_i includes the lengthening of paths due to internal reflections (effect of B)? Or is it the length of the straight line between scattering events? The text suggests option 1, is it what you meant and what is done by Randrianalisoa and Baillis (2010)? I think the usual definition of extinction coefficient would rather use the straight line between scattering events (e.g. Eq. 7 of Malinka, 2014)

l.180: not clear how B and F_{ice} (why not just B and density?) are then used. Clarify here or later (in the RT code) when more relevant

l.212: the reference should be in parenthesis

l.235: diffuse radiation means isotropic which is not random, it corresponds to a well-defined angular distribution

Figure 2: panel a is more a cumulated distribution than a distribution, no? The suptitle is unclear, consider removing it. Also, maybe put the sample first (a) and the optical properties then (switch a and b). In the definition of g isn't the phase function missing? Important point: it seems that diffraction is included in the computation of g, hence considered as scattering. But it is apparently not included in the estimation of the scattering coefficient which relies on geometrical paths. Can you clarify this, and update the estimation of g (using only the geometrical part) if needed. Although it may not impact your results since you don't directly use g, but the full phase function instead.

l.261 : in snow <u>with</u>

l.430: should be "ext", and SSA should not be italic

l.480: <u>larger</u> than

l.490: have <u>a</u>