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Discussions

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# *Interactive comment on* "The retrieval of snow properties from SLSTR/Sentinel-3 – part 1: method description and sensitivity study" *by* Linlu Mei et al.

Anonymous Referee #1

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The paper describes a comprehensive sensitive study of a new retrieval algorithm to derive snow properties using passive remote sensing. The topic fits TC. The paper is well-written and easy to follow. The main findings in this paper are important for the whole community. For instance, the impact of the ice crystal shape and atmospheric effects on the snow properties retrieval will provide very valuable information for the whole community. Moreover, the authors try to explain the understanding gap between the remote sensing community and the campaign-based community and made a great effort to minimize such gaps. I would suggest the paper to be published after addressing the following minor aspects.

The authors highlight that the current snow shape assumption, such as spherical shape, may be valid for snow albedo estimation, but not for the directional reflectance estimation, due to the different impacts of ice crystal shape on the phase function and extinction/absorption coefficient, by citing the previous publication, it will be helpful if the author can extend the explanation of this part (L134), does the snow albedo purely depend on the particle extinction/absorption coefficient?

I don't think that the SSA is an independent retrieved parameter in the XBAER algorithm, although the author has mentioned in the abstract and also in the introduction part, it will provide a better understanding for the reader, that is, are the snow size and shape the two fundamental inputs for the XBAER algorithm, especially, as the author highlighted, the ice crystal shape cannot be precisely validated and I think it is also very difficult for the user to use the shape rather than SSA, so can the author directly retrieve size and SSA?

Some names, for instance, snow particle shape, ice crystal shape should be harmonized in the paper

Why there are obvious oscillations in Fig 2 and Fig. 3, especially for the phase function?

What is the typical valid range for SSA? How strong the SSA variability is?

What is the physical reason behind that the roughness plays such a minor role in the snow properties retrieval? Are those definitions of the snow surface roughness, with those three values, reasonable? Or those values themselves are too small?

The authors make a good effort to investigate especially the aerosol impact, I can clearly see that aerosol play a very important role in the retrieval, the authors propose some Arctic aerosol scenarios, however, snow occurs also in high polluted regions, at least during winter, the authors should include some explanation for this situation.