Interactive comment on *"Relating optical and microwave grain metrics of snow: The relevance of grain shape"*, by Q. Krol and H. Löwe.

General comments

The current version of the manuscript has been significantly reshaped since the initial submission. The authors followed most of the reviewers suggestions, which is appreciated. The overall clarity of the manuscript has been improved and critical issues are now discussed in an appropriate way.

Below I provide some complementary suggestions, mostly for the consequent parts that are entirely new at this stage. I let the authors decide whether they find those valuable or not.

Page an line numbers correspond to the changes-tracking version of the revised manuscript.

Technical comments

Abstract

The first sentence could probably be improved. I would start with something like:
"At first order, specific surface area (or optical grain size) is the primary parameter used to simulate snow optical and microwave properties. However, the latter also depend on grain shape...."

I would also suggest being more explicit in the results:
l.5-8 : e.g.: "We show that the exponential correlation length, widely used for snow microwave modeling, can be expressed in terms of SSA and λ_2. Likewise, we show that the absorption enhancement parameter *B* and the asymmetry factor *g*, that determine snow optical properties, can be related to μ_2."

The last sentence is rather unclear. State that this approach allows a simultaneous understanding of snow microwave and optics. Or allows to reconciliate both fields. I would also add a more practical sentence at the end, pointing to the potential applications or suggestions for future work etc.

Generally speaking, an abstract should give as much as possible quantitative results and implications of the work. It should avoid general statements such as : "We derive relationships, we present a method, we introduce a concept...". Such statements should be placed in the introduction rather than in the abstract.

Introduction

Use either *correlation function* or *two-point correlation function*, but try not to alternate.

P2 l.25 : Picard et al. (2009) do not really mention *B* and *g*. They use Monte Carlo ray-tracing on different collections of geometrical shapes instead. Hence for sake of clarity, the reference should be put after "attributed to shape", rather than at the end of the sentence. It might be useful to add The Kokhanovsky and Zege (2004) reference after introducing *B* and *g*, because this is where they originate from (at least *B*).

P2 l.27 : "the question remains which..."

p5 l.17 : in terms ***of the*** ?”

p7 l.22 : *g* is the asymmetry factor. In fact I would say “(phase function, single scattering albedo, etc)” because *g* is just computed from the phase function.

Fig. 2 caption : parameter

p18 l.8 : are calculated ?

P20 l.18 : in ~~the~~ obtaining ?

P20 l.22 : I do not understand the argumentation. Why should this ratio be constant? And constant for all samples? On the contrary, I would expect λ_2 to depend on the samples, because this is a shape parameter. To me, λ_2 should be resolution insensitive. I would have expected you used different resolutions for the same sample and check that the retrieved λ_2 does not change. Maybe I just did not understand well your point, but it might be useful to rephrase this part of the paragraph.

P21 l 1-2 : is there a problem with the syntax of the sentence ?

P21 l.3 : remove “is”, remove “the”

p21 l.12 : a corollary is whether anisotropic media can be satisfactorily represented by “equivalent” isotropic media, for microwave and optical properties. This is probably beyond the scope of this paper, but one sentence at the end of this section 5.1.3 might be relevant if you have an opinion on this.

P25 l.2 : reference in parentheses

p25 l.18 : remove parentheses for reference

p25 l.22 : statistically

p25 l.24 : an exponential

p25 l.29 : correlation

p27 l.24 : in Libois et al. (2013)

p27 l.31 : although the range of *B* obtained experimentally is larger than that resulting from Malinka (2014), because the latter implies a shape independent *B* at weakly absorbing wavelengths, it is worth noting that the actual values are very similar, which suggests that the random two-phase medium is not inconsistent with laboratory and field measurements.

P28 l.25 : “length scales () of snow samples, which”

p30 l.11 : involves

p31 l.10 : moments