

## ***Interactive comment on “Rapid and accurate measurement of the specific surface area of snow using infrared reflectance at 1310 and 1550 nm” by J.-C. Gallet et al.***

### **Anonymous Referee #2**

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This paper outlines a compelling new method for measurement of the SSA in field and in laboratory. A device is proposed which seems to be easy to handle and which allows reasonably fast measurements of the parameters in question. A very detailed sensitivity analysis of the method has been performed which outlines certain problems, specifically at high SSA values. The level of detail is sometimes apparently higher than required and leads to a hard read of the paper contents. Some shortening to the most relevant outcomes of this analyses would help to make the paper more concise. However, the paper shows a novel approach and therefore should be published.

Some minor problems have been identified in the paper:

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In the introductory part, some thoughts about the relation of SSA and snow grain size would be of interest. This is due to the fact that in optical spectroscopy, often the grain size is considered being a driver for reflectance properties and I assume that these two parameters are highly correlated.

The usability of the method to measure real in-situ SSA values is questioned as the snow apparently needs to be taken from its original location and put into a box for measurement. Wouldn't it be interesting having a measurement directly on the natural snow surface without destroying its structure?

It also would be of interest to know, why a single-wavelength approach has been taken for the SSA determination even though two wavelengths are available. Maybe even better results would be achieved if the two signals would be combined. Also, the single band approach is prone to snow impurities. Their potential influence on the method should be mentioned.

The DISORT model is used as a reference, which is ok. However, some information about its configuration (e.g. number of streams) would be of interest; also its assumed accuracy is not mentioned in the paper.

Equation 2 is somewhat confusing (at least to me). How has it been derived and what is the  $(1-r)$  term standing for? Also, the later mentioned parameter  $h$  does nowhere appear in the equations. Minor:  $r$ -dot is not necessarily  $r$  in eq. 4. (not 'because').

The impact of density is mentioned to be very high, but from the numbers a doubling (!) of density leads to an increase of reflectance, which is a very large change of the parameter.

Mentioning the relation to SAI is not of much use in this paper and leads to a bunch of further questions I would recommend to omit all SAI-related information in here and publish those results separately.

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Interactive comment on The Cryosphere Discuss., 3, 33, 2009.

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