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The Cryosphere Discussions

Interactive comment on "Application of asymptotic radiative transfer theory for the retrievals of snow parameters using reflection and transmission observations" *by* H. S. Negi et al.

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General comments:

We agree that we have limited data set and parameters for the comparison. At the same time there are limited studies on simultaneous snow reflectance and transmittance measurements due to difficult setup. Such measurements can provide the retrievals of different optical parameters using AART as described by Eq.(10) to (21). The extinction coefficient (Kext) as per our knowledge was not determined before for snow samples. The comparison of retrieved grain sizes was discussed in the answer to comment of Dr. M. Schneebeli.

Yes, we have used some fixed parameters in the retrievals like fractal type grain shape, fixed asymmetry parameter etc. but these approximations were found well in agreement for different snow retrieval methods (Kokhanovsky and Zege, 2004; Kokhanovsky et al. 2005 and 2011; Negi and Khokhanovsky 2011).

The AART is valid for optically thick weakly absorbing snow layers. Therefore, we have considered the single scattering albedo as close to 1 in our calculations in the framework of the AART.

Specific comments:

(1) Diffuse exponent was retrieved for the estimation of AFEC and will be shown in the revised paper.

(2) Yes, the Eq.(6) is correct. Eq.(16) is valid for the single scattering albedo close to 1.

(3) P.1245, line 11: aef will be added after "effective grain size"

(4) Sentence will be improved as per suggestion.

(5) P.1248, line 15-16: Yes this is due to fixed single scattering parameters and shapes of grains.

(6) The possible error in retrieved grain size using (18) will depend on the absorption due to concentration of pollution (like soot, dust etc.). Such pollution concentration can be estimated using visible channel. This requires the information of fraction of volume of snow grain filled by pollution, absorption cross-section, average extinction cross-section and refractive index of pollution particles (Zege et al. 2008, Kokhanovsky et al. 2011).

(7) Fig.4 is shown in the paper is generated from the Perovich (2007) fig.5, which shows the profiles of transmittance as the function of snow depth. Yes, the linear line is regression line.

(8) The retrieved e-folding depth will be introduced in Table-1.

(9) Yes, the e-folding depths are affected by snow impurities.

(10) Here we agree that there is a need of relation between in-situ and optical equivalent grain sizes.

(11) In Table-1, S.No. is Serial Number for different observational cases. The paper will be changed to make this point more clear.

(12) We agree with this comment and change the paper accordingly.

(13) The line colours and symbols in Figs.1-3 will be changed in the revised paper.

(14) The scale of vertical axes in Fig.-5 (a) and (b) will be unified.

References:

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