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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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We agree that determining the correct snow grain description for optical purposes is difficult both from an experimental approach and from a radiative transfer perspective. It is an area of ongoing research into how best to treat the complexity of some snow grains. However, we do not believe that traditionally measured grain size is of little value for optical purposes. Indeed Painter et al. (2007) state that "traditional measurements of grain size using a hand lens are only nearly accurate for rounded grains. . ." Four of the five observational cases we present are rounded grains where traditional methods should be reasonable. The case with the columnar crystals, as we pointed out, could

be problematic.

In addition, it remains to be seen that optically equivalent grain size can be accurately measured either by gas adsorption, stereology or tomography. In particular, the optically equivalent grain size as derived from near infrared measurements depends on the wavelength and the theory used (e.g., account for the close-packed media effects, surface roughness, snow wetness, horizontal and vertical photon transport in inhomogeneous snow, treatment of snow pollutants, nonsphericity of scatterers, type of approximations used in derivations, etc.). We underline that the relation of in situ and optically equivalent average grain sizes must be further investigated and this is matter of ongoing research (see, e.g., Aoki et al., 2007).

The main focus of this paper is not the optical particle sizing but rather the first application of the asymptotic radiative transfer theory for the determination of the snow optical characteristics from simultaneous snow reflectance and transmittance measurements. The retrieved local optical parameters of snow are in agreement with previously reported results derived using different data processing approach (Perovich, 2007).

References

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