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Interactive comment on “Vertical profiles of the specific surface area of the snow at Dome C, Antarctica” by J.-C. Gallet et al.

Anonymous Referee #2

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General comments: A good number of vertical profiles of SSA and density measurements were carried out near Dome C and along traverse between Dome C and coastal area, Antarctica. Further the measured SSA values were used to calculate spectral albedo and comparisons were made with MODIS albedo products. The aim of the paper is not clear from the title of the paper as such, but the work presented in the paper may be of great interest to people working in snow parameter retrievals using remote sensing. The main criticisms of the paper are the methods applied are not explained clearly, paper is not well structured and retrieved albedo values are not supported by field measurements.

For SSA measurement, now there are many non-destructive techniques, which were not discussed in the paper and the instrument used is not well described. Whether

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the instrument used is suitable for field measurements, as microstructure of snow can be disturbed in the present case? As varied kind of snow grains present in field and accordingly the penetration depth varies, how the small sampler / instrument taking care of these effects? Please describe all the steps, calibration and possible errors in present study. If SSA instrument estimate the reflectance at 1310nm, then why spectral albedo was not estimated? This could be helpful in comparison with satellite retrieved products.

The retrieved spectral albedo is compared with MCD43C3 product, which is very coarse 25x25km as mentioned, why not with MCD43A3 product with 500m resolution? Why broadband albedo was retrieved using MODIS 1, 2 and 4, which are in visible or close to visible, as these spectral albedo are calculated with many assumptions like no pollution and cloud effect, so these retrieved values are less reliable for comparison. Since SSA is retrieved using 1310nm wavelength? Secondly why SSA retrieved broadband albedo is less than MODIS retrieved broadband albedo?

The detail stratigraphy shows different types of snow grains (shapes) layers in field. What is the use of this when finally spherical grain model has been selected? Many studies have shown NIR albedo can be modeled more accurately by considering the shapes of the grain. Any measurements of grain size in field? This could help to understand spectral albedo variations?

The paper is not well structured; the method of modeling snow using DISORT should be under method part. Results parts should be concise. What is the need of Snow Area Index, not clear? Therefore it is recommended that the paper needs major revision before the final publication in TC.

Minor comments:

1. Study area Fig. 2 and 6 can be combined and show as Fig.2 with small zoom portion for DC sampling area.

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2. Is there any slope, aspect variations in the terrain? This will effect SSA profiles a lot and in this case how sampling has done?

3. AWS temperature shown is which one? Instantaneous air temp? Normally max., min. temperatures can tell about the variations in snow physical property. Please don't join missing data at Figs 12 and 13.

4. What about T6 data?

5. Please include SSA values with in Figs 14-16.

6. Grain size in Figs 20 and 21 will help to understand figs.

7. Figs. 10 and 11, please add DC in legend with Concordia station

Interactive comment on The Cryosphere Discuss., 4, 1647, 2010.

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