

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

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I think that this paper is far from acceptable because it is poorly organized and fails to make significant progress in distilling results for the benefit of readers. Any paper with 21 figures is suspect in this regard.

The writing is less than expressive. For example, the sentence on 1650 near 25 "This method is based on the relationship between the IR reflectance of snow and its SSA (Domine et al., 2006)." It is by no means clear what "This" refers to in "this method" and only a person with a background in radiative transfer would guess that "IR" stands for infrared. But IR reflectance doesn't convey an appropriate sense of geometry, i.e., what is the radiative transfer problem that "IR reflectance" used in the sentence is referring to? ... Is it a surface reflectance or a two-stream reflectance within a mixed optically

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translucent medium?

Aside from criticizing what I believe is the main problem of the paper: its lack of distillation and clarity, I believe that the paper is also scientifically flawed. I believe that it is inappropriate to claim that SSA of snow grains constitutes the main way in which snow surface area influences albedo. To make this claim, a true radiative transfer measurement involving the actual surface roughness of the snow surface needs to be considered. This was done, for example in a paper by Carroll (Carroll, J.J., 1982. The effect of surface striations on the absorption of shortwave radiation. *J. Geophys. Res.*, 87, 9647-9652.) and by Pfeffer and Bretherton (1987. The effect of crevasses on the solar heating of a glacier surface. *IHAS pub. No. 70.*) If the current study is only looking at microscopic roughness (SSA should be defined with a figure and with specific scales in mind). At some level, the radiative effects of SSA observed in the data presented in the study should be compared to the radiative effects of other physical aspects such as macroscopic surface roughness.

Again, my main criticism is that, unless I were an expert in this field (I can't even really identify what field that would be from casual reading of the paper, by the way), I would not be able to understand what specific new knowledge is being reported by the paper. This is an example of a paper where the authors would prefer that the readers do their work for them.

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