

Interactive comment on “Dust from the dark region in the western ablation zone of the Greenland ice sheet” by I. G. M. Wientjes et al.

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We thank Marek Stibal for his valuable comments and constructive suggestions, which will help to improve the paper. Below we will discuss his comments.

Comment: First, the microbial data here are limited to a few pictures of cryoconite granules with attached cyanobacteria, and presumably only light microscopy was used to inspect the samples. It is important to realize that organisms visible under the microscope (in this case cyanobacteria and algae) are only a small part of all microbes present. That no microbes were observed in the sample from S4 does not mean there aren't any, and certainly the results presented here are in no way quantitative.

C1732

Answer: The microscopic data was not meant to be quantitative, but to qualitatively show that organisms are visible under the microscope and as supplement to our TOC findings. We agree that we were too firm in our statement that no microorganisms are present at S4 based on the microscope analyses. However, microbes do not seem to contribute significantly to the material, based on the low concentrations of TOC and N. We will change this sentence accordingly. Please note that we aim to elucidate the causes of the low albedo in the dark region. Therefore, large dark organic granules are likely to be more important (although not quantified) than microbes that are undetectable with a light microscope.

Comment: Second, no activity measurements were done, and so the claims about increasing activity with altitude are purely speculative (but not necessarily wrong).

Answer: We indeed did no activity measurements and we will state this more clearly in the text.

Comment: Third, no albedo measurements were done (?), so the claims about the significance of cyanobacteria and in situ primary production for it are not substantiated here.

Answer: We indeed did not measure the albedo of the cryoconite of this area, but from literature it is known that the presence of cyanobacteria lower the albedo of the cryoconite. Therefore, we qualitatively can state that the cyanobacteria will contribute to the darkening process. Although cyanobacteria can be blown to the ice sheet from surrounding soils, the absence of soil or plant related organic matter in the same size class makes only wind blown material unlikely. Hence, the detected cyanobacteria are at least partly formed in situ. We will incorporate this discussion in the revised MS.

Comment: And last, the conversion of TOC to organic matter and comparison of these converted OM values with others obtained by gravimetry after furnacing is problematic in my opinion. TOC only would be much safer here. Also, are your TOC:N ratios molar?

C1733

Answer: We were aware that conversion of TOC to organic matter and Loss on Ignition (LOI) are different methods and we will describe more clearly that the literature values are based on LOI. At least we can say that the concentrations of around 5% TOC from S6 and S7 have the same order of magnitude as the 5% TOM (total organic matter) concentrations found by Bøggild et al. (2010). TOM consists not only of TOC, but also of H and O; hence TOM concentrations are at least as high as TOC concentrations. Therefore, our samples from these sites seem to contain at least as much organic matter as the material from northeast Greenland.

The TOC:N ratios are based on weight. We will add the molar ratios.

Comment: I also suggest that the authors have a look at a recently published paper in which material from a very similar transect is analysed for organic C and microbial abundance (Stibal et al. 2010, *Annals of Glaciology* 51(56):1-8). Papers describing cyanobacteria and algae on the GrlS have also been published (Uetake et al. 2010, *Polar Science*; Yallop Anesio, *Annals of Glaciology*).

Answer: These are interesting papers. Stibal et al. (2010) did measure the concentration of organic carbon on almost the same transect as where we collected our samples and investigated the microbial abundance and carbohydrate concentrations in their samples. We will certainly discuss this paper.

Interactive comment on *The Cryosphere Discuss.*, 4, 2557, 2010.