

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.

Anonymous Referee #3

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General comments

This manuscript described geochemical and biological characteristics of surface dust on Greenland ice sheet. The first author has revealed the existence of dark region in the ablation area of the ice sheet in the previous paper, and authors in this paper tried to determine the provenance of the dust of the dark region based on the biogeochemical analyses. The dark region has rarely been noticed and must affect melting of the ice sheet. Although the paper could not reach the exact cause of darkening process of the region, their data have good suggestions and would lead further studies on this phenomenon. Therefore, I would support to publish this paper. However, there are some points that could improve the manuscript. I would recommend the following revisions before the publication.

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The major points are:

1. I would recommend to divide the section 3. Results and discussion into two sections of 3. Results and 4. Discussion. That would make clear what are analytical facts and what are interpretations and speculations.
2. There is a lack of analytical data in this paper. For example, XRD curves of each site sample should be shown in a figure, results of ICP-AES, MASS, TOC, N, and CN ratio data (concentrations of each elements for all samples) should be provided. Some of them were mentioned for only mean value in the text. Such raw data are valuable to those who want to compare in further studies.

Minor comments:

1. P.2561 L.3-6 Authors have mentioned that wavy pattern in the dark region. Please describe relationship between the wavy pattern and sampling sites. How could the wavy pattern be visibly seen on the ice surface? Were the samples collected from a dark line? Authors may show the sampling sites on an ASTER image.
2. P.2561 the section of Samples: Authors should describe how the samples were transported from the field to the laboratory. Were the samples kept in frozen state? Transportation and preservation methods can affect conditions of microbes observed with a microscopy.
3. P.2563 L.25 Authors should quantitatively explain the coarseness of mineral particles in the cryoconite. What are the size range, maximum and minimum sizes?
4. P.2565 L.5-13 This paragraph should be moved to Method section.
5. P.2565 L.18 Please mention the reason why Sn and Al were used for this plot. There are many options (elements) shown in Fig. 7.
6. P.2566 L.1 References are necessary to show that they are anthropogenic pollution.

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7. P.2566 L.7 Please specify when the recent the deposition was. In several years or decadal years or more then 100 years?

8. P.2567 L.8-18 This is one of the very important finding of this study. But, please describe more carefully how the cryoconites are distinct between dark region and reference area on the microscopy basis. Fig. 9 shows only the cryoconite from dark region. Show the photographs of both cryoconites in dark region and reference area, and explain how they are different.

9. P.2568 L.9-21 Use a figure or table to compare the organic matter contents among glaciers.

10. Table 1 Please show the coordinates of each sampling site.

11. Fig.3 Why don't you use MODIS image of 2009, the year of your field work? Dark region is not clearly visible on this 2003 image.

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