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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Physical and chemical properties of pollution aerosol particles transported from North America to Greenland as measured during the POLARCAT summer campaign" *by* B. Quennehen et al.

Anonymous Referee #2

Received and published: 13 May 2011

Referee Comment:

General scientific comments:

The manuscript presents interesting results on Greenlandic aerosols influenced by anthropogenically polluted air masses. Generally, the manuscript is written in good English language and only a few comments with concern to the language have to be addressed. The figures are easy to understand based on their structure and figure captions are also clear. Nevertheless, figures cause some problems as the colour

codes are sometimes difficult to distinguish and figures schould appear larger in the final version. In addition, I will greatly encourage the authors to take advantage of the DMPS and AMS data by showing a mass comparison if possible. Also, it is recommended to use the nephelometer data for further analysis in dependence on air mass origin.

Summing up, the manuscript is worth for publication in ACP, but I would like the authors to address the general scientific comments listed above and the detailed scientific comments listed below.

Detailed scientific comments:

Abstract

Please clarify a few expressions that you use as "aerosols size distribution". Is it number, mass, etc. distribution? Or "aerosol volatility fraction". Is it volume, mass etc. fraction? You have to be exact when discussing these parameters. This is valid for the whole manuscript.

Page 11773, line 21: This is not a full sentence. Please clarify!

Introduction

Page 11774, line 10-11: The sentence has a bad wording.

Page 11775, line 18: . . . aims at characterizing . . .

Page 11775, line 18: I personally would reformulate the expression "pollution aerosol particles".

2. ATR-42 aircraft measurements

2.1 Physical aerosol properties

As you conclude from number measurements to volume and mass measurements, you should describe your assumptions about shape of particles used in this model.

In addition, how was the overlap between SMPS and OPC done, they are based on different diameter definitions? Any calculation of full size distributions needs some theory behind it. I can also not see any reference on the combination of these two instruments.

2.2 Chemical composition and trace gases

Comments on the use of the AMS are a little beyond my level in this area and are hopefully addressed by other reviewers.

2.3 Aerosol optical properties

A small discussion on the choice of the specific absorption coefficient would be reasonable as there are different numbers which can be found in the literature. Can you deduct from the chemistry, which absorbing material was present?

3. Classification of sampled air masses

Please give an idea about the length of these time windows, which will serve for your further calculations.

4. Results and discussion

4.1 Aerosol chemical composition

Page 11781, line 8-12: I do not understand this. Why summing up the masses by knowing you will overestimate the total mass. It would be more clear showing the non-refractory part as an extra column.

In addition, I would like to have this paragraph providing more information on the size fractions you measured. The inlet was designed for particles smaller 800nm in size. The SMPS was designed for particles smaller 500nm in size. What about the AMS. Was that set to size-selective mode? Please clarify!

4.2 CO concentrations

Page 11782, line 25-28: I would like to see some averaged numbers on this finding giving evidence that CO levels can distinguish between air mass origins.

Page 11782, line 4: . . . and the related “source strength” . . .

Figure 6a and 6b: Take different colours here.

4.3 Aerosol size distributions

Page 11782, line21: If you say raw aerosol size distributions, what do you mean? In order to get real number values, you have to apply an inversion scheme. Please clarify!

As discussed in the abstract section, please always specify the parameter in question. A size distribution can be a number, area, volume, mass, etc. size distribution!

With regard to your combination of a SMPS and a PCASP, please again comment on how you adjusted for different diameters!

Page 11783, line1: . . .” because of its mounting position outside the plane” . . . What do you mean, does it say that other instruments inside were not measuring the truth?

Table 1: You have a few values, which look like beeing set by the fitting routines, please comment on this!

Figure 7: These figures should be larger and a more clear colour code is needed to distinguish between the different time windows.

Page 11784, line 3-5: Is this statement reasonable for an air mass that has been transported for about ten days?

4.4 Aerosol volatility

Figure 10: Give a legend for the colour code of this figure!

It would be great to see if there is any link between volatile volume fractions and aging. Have you looked into that?

4.5 Aerosol absorption properties

Table 2: It would be nice to see that comparison also for the other time windows for a general comparison.

Conclusions

Page 11787, line 22-24: What do you men when saying “the accumulation mode is less important”. It is less important for what? If you talk about scattering efficiency over a white surface (snow, ice) then say it or do you mean it is less pronounced?

Page 11787, line 24-26: Wording! The Aitken mode is not derived from SMPS . . .

Interactive comment on Atmos. Chem. Phys. Discuss., 11, 11771, 2011.