

Interactive comment on “Characterizing black carbon in rain and ice cores using coupled tangential flow filtration and transmission electron microscopy” by A. Ellis et al.

Anonymous Referee #1

Received and published: 16 July 2015

The paper proposes a very interesting new method to study aerosol in ice and water samples for microscopy study. Due to the important role that black carbon might have on climate through deposition on snow and in water and due to the importance to study the characteristics of black carbon in the past through ice cores, I think the method described here is very interesting and the paper should be published with minor changes. Overall I found the paper to be very well written and mostly clear and I have only a couple of general comments/questions and a few very minor specific comments.

General comments:

C2015

1. It would be good to see some more discussion on the possibility that black carbon particles might aggregate, fragment or collapse during different sample manipulations. For example, the authors in section 3.3 write: “Black carbon particles in both the rain and ice cores appeared to be significantly aged in the atmosphere as indicated by the collapsed structure of the carbon spherules”. Is it possible that the collapse happened during the processing of the sample, e.g. during the drop evaporation, instead of during atmospheric aging? I do believe the authors interpret the results correctly, but some additional discussion on this potential issue would be good. Several studies are available in the literature showing how the structure of black carbon can affect its optical properties (for the same mass) with obvious radiative forcing implications; therefore, this is a potentially important issue.

2. Concentration factor: How was estimated? Maybe I missed it, but it was not fully clear to me. Also, how good is the estimate? Maybe provide an uncertainty.

3. Is the application of the method only for microscopy or do the authors envision also some other application? How?

4. There are some studies available in literature showing how the mixing of black carbon with other particles such as dust, might affect their optical properties; these resources might be relevant to the discussion of the importance of the interesting finding reported in the beautiful figures 4, 5 and 6.

Specific comments:

Section 2.4:

- Lines 18-19, page 6022: “Ice and snow from this site has been...” should probably read “Ice and snow from this site have been...”

- Lines 4-5, page 6023: “Ice cores were approximately 1m in length 5 and 5 cm by 5 cm cross-section before decontamination” this seems a repetition of the sentence on line 23 on the previous page.

C2016

Section 2.5:

- Line 23, page 6023: "Approximately 5mm was" maybe should read "Approximately 5mm were"?
- Line 27, page 6024: Consider removing "a" in front of "SPI"

Section 3.1:

- Line 13, page 6026: Period missing before "Three..."

Interactive comment on Atmos. Meas. Tech. Discuss., 8, 6015, 2015.