

Interactive
Comment

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.

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Received and published: 10 July 2015

This work aimed to improve the capability of measuring and characterizing black carbon (BC) particles and aggregates in remote regions by combining a tangential flow filtration (TFF) to isolate and concentrate BC with transmission electron microscopy (TEM) to characterize the particles. There is much need for a BC characterization method in ice core samples to give insights on paleo-changes to BC form, deposition and transport. This work provides promising qualitative results which could be implemented in a more rigorous field study (rain or ice core) to enhance our understanding of modern and pre-industrial BC.

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The paper demonstrated the care, trial and error, and rigorous quality control applied by the authors, which ultimately resulted in a reduced sample volume compared to a previous, drop-wise, approach. I found the paper overall easy to read and follow and was convinced by the careful method development. However, in the introduction, the author's state the need for a "reasonably quick" method to characterize insoluble BC in precipitation. I wonder how long a sample process, handling, and analysis would be compared to the drop-wise method. While this method does seem effective in its characterizing capabilities, it does seem rigorous (yet optimized for their purpose).

General Comments

GC-1: With both an approximated black carbon concentration and ice core age, can a general deposition of BC onto the ice be estimated? This may not be in the scope of this work, and the authors did stress that this study was a qualitative first application of the method, but a deposition could provide some useful insight.

GC-2: What affect would BC aging and compaction from the weight of overlying ice have on the size of the BC aggregates characterized? I wonder if the smaller size of the BC aggregates in the ice compared to rain is due to transport and deposition processes, or if it is the results of post-deposition processes within the ice core.

Specific Comments

Page 2061, line 18-19: how does the selected filter pore size affect (or not affect) the retention of salts and minerals?

Page 6022, line 24: Which stable isotopes were measured to date this ice core?

Page 6024, line 29: What temperature were the drops left to evaporate at?

Technical Comments

Page 6020, line 25: I suggest making the clean water set-up a separate paragraph to make the flow of this section easier to read.

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Page 2061, line 13: Define/spell out PSL in the header of this section. The acronym is spelled out in the following sentence, which seems out of order.

Page 6022, line 3: When beginning a sentence, spell out acronyms. In this sentence, SEM begins the sentence, but elsewhere acronyms are spelled out if they are at the front of a sentence. This is just for consistency and ease of reading. This is repeated again with BC on page 6027, line 21.

Page 6023, line 4-5: This sentence seems to be repeated from above.

Page 2023, line 24: “Difference” should be “different”

Page 2042, line 16: misspelled “elevate”

Please also note the supplement to this comment:

<http://www.atmos-meas-tech-discuss.net/8/C1937/2015/amtd-8-C1937-2015-supplement.pdf>

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

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