

Interactive comment on “Comparison between CARIBIC aerosol samples analysed by accelerator-based methods and optical particle counter measurements” by B. G. Martinsson et al.

B. G. Martinsson et al.

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The authors wish to thank the referees for constructive and useful comments.

Interactive comment on “Comparison between CARIBIC aerosol samples analysed by accelerator-based methods and optical particle counter measurements” by B. G. Martinsson et al.

Anonymous Referee #3 Received and published: 19 May 2014 I agree with referee 1 that the CARIBIC is a very important research program for studying the atmospheric composition in large geographical areas and that the impactor method analyzed here

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is useful for measuring the chemical composition of aerosols. The article is clear and the number of analyzed samples sufficiently high; however there are some points which must be clarified before it can be published. 1) The bouncing of particles outside the impaction zone is a key point in the article. The use of special greases on the impactor substrates before sampling can prevent bouncing which can introduce a serious bias on the presented data. The authors should discuss this point (some of the observed problems could be due to this) and justify why they did not use such a method.

J. Please see answer A to referee 2.

2) One PIXE and PESA spectra inside 5.5 mm and outside could be useful together with more details on the experimental conditions (beam current, measuring time..).

K. The paper already contains 13 figures. I rarely find room for spectra, although you can find PESA spectra in Nguyen and Martinsson (P3283, line 11).

The following was added on P3262, line 28: ... with beam current of 150 nA duration of 200 s
The following was added on P3263, line 1: (beam current 15 nA with duration 3 X 200 s)

3) Why Si is not detected? There are many articles (see articles by the Louvre group or by Willy Maenhaut) showing that PIXE can detect down to Na

K. Due to special conditions explained in Andersson et al (P3279, line 5) connected with the dominance of the S peak in the spectrum and the effects of the tail of that peak.

On page 3260, line 5 the following sentence was added: The lower limit of the PIXE analysis of this study with respect to atomic number is connected with spectral interference, see Andersson et al. (2013) for further details.

4) The ratio of the mass deposited inside 5.5 mm and between 5.5 and 9.5 may be determined only for elements with a strong signal, but the deposition pattern does depend on the typical element size-distribution; therefore S particles (mainly in the fine

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fraction) and Ca particles (mainly in the coarse one) may have a different deposition pattern

M. This problem is already covered in the dealings with the crustal component (Fig. 5 and connected text). To clarify the following was added on page 3263, line 23:

Additionally, this ratio only describes the aerosol components internally mixed with the sulfate aerosol. Components of other size modes, like crustal particles, may behave differently, as will be shown in section 3.1.

5) Carbonaceous aerosol determined by PIXE can be smaller than that obtained by OPC. Is it possible to give an estimate of the effect?

N. The answer to that question is already given on page 3276

6) Par. 2.2: The uncertainty on C_v is 50% and there strong assumptions on particle composition: how reliable may the comparison?

O. The uncertainty of 50% of course sounds very large, but it should be kept in mind that C_v is calculated based on number size distributions. Small uncertainties in the sizing build to large uncertainties due to the third power dependence of volume on diameter. Despite the uncertainties, we see a very strong correlation between the two methods (Fig. 13). This result combined with the thorough investigation of various aspects of the two methods convinces us that we without hesitation can stand behind our conclusions.

Interactive comment on Atmos. Meas. Tech. Discuss., 7, 3253, 2014.

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